GravityModel

5.0

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  Define the gravity controls.

- file gravity_integ_frame.hh

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- file gravity_interaction.hh

  Define the GravityInteraction class, used to represent the gravitational interaction betweens a DynBody and a set of planetary bodies.

- file gravity_manager.hh

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- file gravity_messages.hh

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- file gravity_source.hh

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- file spherical_harmonics_delta_coeffs.hh

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- file spherical_harmonics_delta_coeffs_init.hh

  Define the class SphericalHarmonicsDeltaCoeffsInit, the base initialization class for tidal effects and temporal gravity sub-models.

- file spherical_harmonics_delta_controls.hh

  Define the gravity controls for the variational gravity models such as solid-body tides.

- file spherical_harmonics_gravity_controls.hh

  Define the gravity controls.

- file spherical_harmonics_gravity_source.hh

  Define the spherical harmonics implementation of a gravity body.

- file spherical_harmonics_solid_body_tides.hh

  Define the SphericalHarmonicsSolidBodyTides class, which models solid-body tidal effects.

- file spherical_harmonics_solid_body_tides_init.hh

  Define the SphericalHarmonicsSolidBodyTidesInit class, which is the initialization class for the solid body tides model.

- file spherical_harmonics_tidal_effects.hh

  Define the class SphericalHarmonicsTidalEffects, which is the base class for solid-body and ocean tidal effects.

- file spherical_harmonics_tidal_effects_init.hh

  Define the SphericalHarmonicsTidalEffectsInit class, the initialization class for tidal effects models.

- file gravity_controls.cc

  Define member functions for the GravityControls class.

- file gravity_integ_frame.cc

  Define member functions for the GravityIntegFrame class.

- file gravity_interaction.cc

  Define methods for the GravityInteraction class.

- file gravity_manager.cc

  Define member functions for the GravityManager class.

- file gravity_messages.cc

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- file gravity_source.cc

  Define member functions for the GravitySource class.

- file spherical_harmonics_calc_nonspherical.cc

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- file spherical_harmonics_delta_coeffs.cc

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- file spherical_harmonics_delta_coeffs_init.cc

  Define member functions for the SphericalHarmonicsDeltaCoeffsInit class.

- file spherical_harmonics_delta_controls.cc

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- file spherical_harmonics_gravity_controls.cc

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- file spherical_harmonics_gravity_source.cc

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- file spherical_harmonics_tidal_effects_init.cc

  Define member functions for the SphericalHarmonicsTidalEffectsInit class.

Namespaces

- jeod

  Namespace jeod.

Macros

- #define PATH "environment/gravity/"

6.3.1 Detailed Description

6.3.2 Macro Definition Documentation

6.3.2.1 #define PATH "environment/gravity/"

Definition at line 44 of file gravity_messages.cc.

Chapter 7

Namespace Documentation

7.1 jeod Namespace Reference

Namespace jeod.

Data Structures

- class SphericalHarmonicsGravitySource_earth_GEMT1_default_data
- class SphericalHarmonicsGravitySource_earth_GGM02C_default_data
- class SphericalHarmonicsGravitySource_earth_GGM05C_default_data
- class SphericalHarmonicsSolidBodyTidesInit_earth_solid_tides_default_data
- class SphericalHarmonicsGravitySource_earth_spherical_default_data
- class SphericalHarmonicsGravitySource_jupiter_spherical_default_data
- class SphericalHarmonicsGravitySource_mars_MRO110B2_default_data
- class SphericalHarmonicsGravitySource_mars_spherical_default_data
- class SphericalHarmonicsGravitySource_moon_LP150Q_default_data
- class SphericalHarmonicsGravitySource_moon_spherical_default_data
- class SphericalHarmonicsGravitySource_default_data
- class SphericalHarmonicsGravitySource_sun_spherical_default_data
- class GravityControls

    Specifies whether and how a GravitySource affects a vehicle.
- class GravityIntegFrame

    Class that aids in determining whether gravity should be applied as a direct effect or a third body effect.
- class GravityInteraction

    Specifies interactions between a vehicle and a set of gravitational bodies.
- class GravityManager

    The master gravitational model for a simulation.
- class GravityMessages

    Specifies the message IDs used in the gravity model.
- class GravitySource

    Models the gravity for a specific planet; pure virtual.
- class SphericalHarmonicsDeltaCoeffs

    Base class for tidal and temporal gravity models.
- class SphericalHarmonicsDeltaCoeffsInit

    Initialization data for a SphericalHarmonicsDeltaCoeffs instance.
- class SphericalHarmonicsDeltaControls

    Provides controls for how a variational model affects a vehicle.
- class SphericalHarmonicsGravityControls

Specifies whether and how a SphericalHarmonicsGravitySource affects a vehicle.

- class SphericalHarmonicsGravitySource

    Models the gravity for a specific planet using spherical harmonics.

- class SphericalHarmonicsSolidBodyTides

    Models solid body tidal effects.

- class SphericalHarmonicsSolidBodyTidesInit

    Initializes a solid body tides model.

- class SphericalHarmonicsTidalEffects

    Models tidal effects as a delta on top of a gravity model.

- class SphericalHarmonicsTidalEffectsInit

    Initializes a tidal gravity model.

Variables

- static constexpr double speed_of_light_sq = 89875517873681764.0

    The speed of light squared, in m^2/s^2.

7.1.1 Detailed Description

Namespace jeod.

7.1.2 Variable Documentation

7.1.2.1 constexpr double jeod::speed_of_light_sq = 89875517873681764.0 `[static]`

The speed of light squared, in m^2/s^2.

Definition at line 77 of file gravity_controls.cc.

Referenced by jeod::GravityControls::calc_relativistic().

Chapter 8

Data Structure Documentation

8.1 jeod::GravityControls Class Reference

Specifies whether and how a GravitySource affects a vehicle.

`#include <gravity_controls.hh>`

Inheritance diagram for jeod::GravityControls:
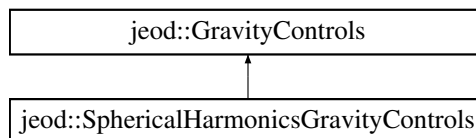
Public Member Functions

- GravityControls ()

    GravityControls constructor.
- virtual ~GravityControls ()

    GravityControls destructor.
- virtual void initialize_control (GravityManager &grav_man)

    Initialize this GravityControl.
- virtual void reset_control (BaseDynManager &dyn_manager)

    Reset subscriptions for this GravityControl.
- void gravitation (const double integ_pos[3], unsigned int integ_frame_idx, double body_grav_accel[3], double dgdx[3][3], double Pot[1])

    Compute the gravitation at a given position toward a gravity body.
- void gravitation (const RefFrame &point_of_interest, unsigned int integ_frame_idx, double body_grav_-accel[3], double dgdx[3][3], double &pot)

    Compute the gravitation at a given position toward a gravity body.

Static Public Member Functions

- static bool accel_mag_less_ptr (const GravityControls ∗a, const GravityControls ∗b)

    Compares the magnitude of the two input gravity controls, returning true if a->grav_accel_magsq is less than b->grav_accel_magsq, false otherwise.

Data Fields

- std::string source_name

    Planet name.
- bool active

    Gravity for this body active?
- bool spherical

    Ignore non-spherical effects?
- bool gradient

    Compute gravity gradient matrix?
- bool perturbing_only

    Compute only the perturbing gravity?
- bool battin_method

    Compute third body gravity using Battin's method (Battin, Mathematics and Methods of Astrodynamics)?
- bool relativistic

    Indicates that the relativistic correction to Newtonian gravitation is to be computed.
- GravitySource ∗ body

    Pointer to the GravitySource object named by planet_name.
- double grav_accel [3]

    Gravitational acceleration toward the GravitySource at the location of the DynBody, including third body effects.
- double grav_grad [3][3]

    Gradient of the gravitational acceleration.
- double grav_pot

    Gravitational potential.
- double grav_accel_magsq

    Square of the magnitude of grav_accel.

Protected Member Functions

- virtual void calc_nonspherical (const double posn[3], double body_grav_accel[3], double dgdx[3][3], double Pot[1])=0

    Nominally, compute the non-spherical contribution to gravity at a given position.
- void calc_relativistic (const RefFrame &point_of_interest, const double rel_pos[3], const double rel_vel[3], double delta_accel[3])

    Calculates the relativistic correction to gravitational acceleration.
- void calc_spherical (const double integ_pos[3], const double posn[3], const GravityIntegFrame &grav_source_frame, double body_grav_accel[3], double dgdx[3][3], double &pot)

    Calculate the spherical gravitational acceleration, either directly or as a third body acceleration.

Protected Attributes

- GravityManager ∗ grav_manager

    Pointer to the simulation-wide GravityManager object.
- bool subscribed_to_inertial

    Indicates that a subscription to the planet-centered inertial frame of the planet associated with the gravity_source been issued.
- bool subscribed_to_pfix

    Indicates that a subscription to the planet-centered, planet-fixed frame of the planet associated with the gravity_source been issued.
- bool skip_spherical

    Some derived classes' calc_nonspherical method computes all contributions to gravitation, including spherical.

Private Member Functions

- GravityControls (const GravityControls &)

  Not implemented.
- GravityControls & operator= (const GravityControls &)

  Not implemented.

Friends

- class InputProcessor
- void init_attrjeod__GravityControls ()

8.1.1 Detailed Description

Specifies whether and how a GravitySource affects a vehicle.

Definition at line 75 of file gravity_controls.hh.

8.1.2 Constructor & Destructor Documentation

8.1.2.1 jeod::GravityControls::GravityControls (const **GravityControls** &) `[private]`

Not implemented.

8.1.2.2 jeod::GravityControls::GravityControls ( )

GravityControls constructor.

Definition at line 84 of file gravity_controls.cc.

References grav_accel, grav_accel_magsq, grav_grad, and grav_pot.

8.1.2.3 jeod::GravityControls::∼GravityControls ( ) `[virtual]`

GravityControls destructor.

Definition at line 109 of file gravity_controls.cc.

8.1.3 Member Function Documentation

8.1.3.1 static bool jeod::GravityControls::accel_mag_less_ptr (const **GravityControls** ∗ *a,* const **GravityControls** ∗ *b*) `[inline],[static]`

Compares the magnitude of the two input gravity controls, returning true if a->grav_accel_magsq is less than b->grav_accel_magsq, false otherwise.

Returns

Result of comparison

Parameters

a	First control to be compared.
b	Second control to be compared.

Definition at line 240 of file gravity_controls.hh.

Referenced by jeod::GravityInteraction::sort_controls().

8.1.3.2 virtual void jeod::GravityControls::calc_nonspherical (const double *posn[3]*, double *body_grav_accel[3]*, double *dgdx[3][3]*, double *Pot[1]*) `[protected]`,`[pure virtual]`

Nominally, compute the non-spherical contribution to gravity at a given position.

Derived classes whose override of this function computes the full gravitation model, including the spherical contribution, should set the skip_spherical flag.

Parameters

`in`	*posn*	Inertial position of the point of interest relative to the gravitional body.
`out`	*body_grav_accel*	Acceleration at the point of interest due to the gravitional body.
`out`	*dgdx*	Gravity gradient at the point of interest.
`out`	*Pot*	Specific gravitational potential energy.

Implemented in jeod::SphericalHarmonicsGravityControls.

Referenced by gravitation().

8.1.3.3 void jeod::GravityControls::calc_relativistic (const RefFrame & *point_of_interest*, const double *rel_pos[3]*, const double *rel_vel[3]*, double *perturbing_accel[3]*) `[protected]`

Calculates the relativistic correction to gravitational acceleration.

Parameters

point_of_interest	The point of interest, as a reference frame.
rel_pos	Displacement vector from the grav body to the POI.
rel_vel	Time derivative of rel_pos.
delta_accel	Output relativistic accel, sans the Newtonian term.

Implements equation 27 (Folkner) / equation 4 (Genova) to compute a parameteric post-Newtonian correction to gravitation. The referenced equation is of the form

$$
\begin{aligned}
a_{A,\text{pm-pm}} = \ & \sum_{B \neq A} \frac{GM_B}{r_{AB}^3}(r_B - r_A)\left(1 + \frac{s_1}{c^2}\right) \\
& + \frac{1}{c^2} \sum_{B \neq A} \frac{GM_B}{r_{AB}^3}(v_A - v_B)\left((r_A - r_B) \cdot \left((2 + 2\gamma)v_A - (1 + 2\gamma)v_B\right)\right) \\
& + \frac{3 + 4\gamma}{2c^2} \sum_{B \neq A} \frac{GM_B}{r_{AB}} a_B
\end{aligned}
$$

where a_B is the net acceleration of gravitating body *B* toward the other gravitating bodies (typically taken to be the Newtonian gravitational acceleration) and

$$
\begin{aligned}
s_1 = \ & -2(\beta + \gamma)\sum_{C \neq A} \frac{GM_C}{r_{AC}} - (2\beta - 1)\sum_{C \neq A} \frac{GM_C}{r_{BC}} \\
& + \gamma v_a^2 + (1 + \gamma)v_b^2 - 2(1 + \gamma)v_A \cdot v_B \\
& - \frac{3}{2}\left(\frac{(r_A - r_B) \cdot v_B}{r_B}\right)^2 \\
& + \frac{1}{2}(r_B - r_A) \cdot a_B
\end{aligned}
$$

In terms of the referenced equation, the intent of this function is to compute the relativistic portion of the acceleration of body *A* toward body *B*. With this, the expression this function computes is

$$\Delta a_{\mathsf{A,B}} = \frac{1}{c}^2 \frac{GM_B}{r_{AB}} \left\{ \frac{r_B - r_A}{r_{AB}^2} s_1 \right.$$
$$+ \frac{v_A - v_B}{r_{AB}^2} \left((r_A - r_B) \cdot ((2 + 2\gamma)v_A - (1 + 2\gamma)v_B) \right)$$
$$\left. + \frac{3 + 4\gamma}{2} a_B \right\}$$

Note that the common factor $\frac{1}{c}^2 \frac{GM_B}{r_{AB}}$ is unitless and thus each of the three terms in the braced expression has units of acceleration.

The referenced equations explicitly involve the parameterized post-Newtonian (PPN) factors β and γ. This function hardcodes both of those factors as one, consistent with general relativity. For example, the factor $(3 + 4\gamma)/2$ becomes 3.5 in the code. Magic numbers that involve β or γ, including a factor of one (e.g., $2\beta - 1$), are noted in comments.

References:

- William M. Folkner, et al., *Planetary and Lunar Ephemerides DE430 and DE431*, IPN Progress Report 42-196, 15 February 2014.
  `ftp://naif.jpl.nasa.gov/pub/naif/generic_kernels/spk/planets/de430_-` `and_de431.pdf`

- Antonio Genova, et al., *Solar system expansion and strong equivalence principle as seen by the NAS-A MESSENGER mission*, Nature Communications 9:289, 18 January 2018, DOI: 10.1038/s41467-017-02558-1.
  `https://www.nature.com/articles/s41467-017-02558-1`

Definition at line 513 of file gravity_controls.cc.

References body, jeod::GravityManager::get_bodies(), grav_manager, jeod::GravitySource::inertial, jeod::Gravity-Source::mu, and jeod::speed_of_light_sq.

Referenced by gravitation().

8.1.3.4 void jeod::GravityControls::calc_spherical (const double *integ_pos[3]*, const double *posn[3]*, const GravityIntegFrame & *grav_source_frame*, double *body_grav_accel[3]*, double *dgdx[3][3]*, double & *pot*) `[protected]`

Calculate the spherical gravitational acceleration, either directly or as a third body acceleration.

Parameters

integ_pos	Point of interest location, integ frame coordinates
posn	Vector from gravitational body to point of interest
grav_source_-frame	Frame corresponding to the gravitational body
body_grav_accel	Acceleration at integ_pos due to the grav body
dgdx	Gravity gradient at integ_pos due to the grav body
pot	Gravitational potential at integ_pos due to the grav body.

Definition at line 350 of file gravity_controls.cc.

References battin_method, body, gradient, jeod::GravityIntegFrame::is_third_body, jeod::GravitySource::mu, and jeod::GravityIntegFrame::pos.

Referenced by gravitation().

8.1.3.5 void jeod::GravityControls::gravitation (const double *integ_pos[3],* unsigned int *integ_frame_idx,* double *body_grav_accel[3],* double *dgdx[3][3],* double *Pot[1]*)

Compute the gravitation at a given position toward a gravity body.

Parameters

in	*integ_pos*	Point of interest, integ coords
		Units: M
in	*integ_frame_idx*	Integ frame index
out	*body_grav_accel*	Accel for given grav body
		Units: M/s2
out	*dgdx*	Gradient for given grav body
		Units: 1/s2
out	*Pot*	Potential

Definition at line 235 of file gravity_controls.cc.

References body, calc_nonspherical(), calc_spherical(), jeod::GravitySource::frames, jeod::GravitySource::inertial, perturbing_only, jeod::GravityIntegFrame::pos, jeod::GravityIntegFrame::ref_frame, skip_spherical, and spherical.

Referenced by jeod::GravityManager::gravitation().

8.1.3.6   void jeod::GravityControls::gravitation (const RefFrame & *point_of_interest,* unsigned int *integ_frame_idx,* double *body_grav_accel[3],* double *dgdx[3][3],* double & *pot*)

Compute the gravitation at a given position toward a gravity body.

Parameters

in	*point_of_interest*	Point of interest, as a reference frame.
in	*integ_frame_idx*	Integ frame index.
out	*body_grav_accel*	Accel for given grav body.
out	*dgdx*	Gradient for given grav body.
out	*pot*	Specific gravitational potential for given grev body.

Definition at line 285 of file gravity_controls.cc.

References body, calc_nonspherical(), calc_relativistic(), calc_spherical(), jeod::GravitySource::frames, jeod::-GravitySource::inertial, perturbing_only, jeod::GravityIntegFrame::pos, jeod::GravityIntegFrame::ref_frame, relativistic, skip_spherical, and spherical.

8.1.3.7   void jeod::GravityControls::initialize_control (GravityManager & *grav_man*)   `[virtual]`

Initialize this GravityControl.

Parameters

in	*grav_manager*	Ref to Gravity Manager

Reimplemented in jeod::SphericalHarmonicsGravityControls.

Definition at line 123 of file gravity_controls.cc.

References body, jeod::GravityManager::find_grav_source(), grav_manager, jeod::GravitySource::inertial, jeod::-GravityMessages::invalid_object, jeod::GravityMessages::missing_entry, jeod::GravitySource::name, and source_-name.

Referenced by jeod::SphericalHarmonicsGravityControls::initialize_control().

8.1.3.8   GravityControls& jeod::GravityControls::operator= (const GravityControls &)   `[private]`

Not implemented.

8.1.3.9   void jeod::GravityControls::reset_control (BaseDynManager & *dyn_manager*) `[virtual]`

Reset subscriptions for this GravityControl.

Parameters

`in`	*dyn_manager*	Ptr to dynamics manager

Definition at line 170 of file gravity_controls.cc.

References active, body, jeod::GravitySource::inertial, jeod::GravityMessages::null_pointer, jeod::GravitySource-::pfix, source_name, spherical, subscribed_to_inertial, and subscribed_to_pfix.

8.1.4 Friends And Related Function Documentation

8.1.4.1 void init_attrjeod__GravityControls ( ) `[friend]`

8.1.4.2 friend class InputProcessor `[friend]`

Definition at line 77 of file gravity_controls.hh.

8.1.5 Field Documentation

8.1.5.1 bool jeod::GravityControls::active

Gravity for this body active?

trick_units(–)

Definition at line 89 of file gravity_controls.hh.

Referenced by jeod::GravityManager::gravitation(), reset_control(), jeod::GravityInteraction::sort_controls(), and jeod::SphericalHarmonicsGravityControls::update_deltacoeffs().

8.1.5.2 bool jeod::GravityControls::battin_method

Compute third body gravity using Battin's method (Battin, Mathematics and Methods of Astrodynamics)?

trick_units(–)

Definition at line 110 of file gravity_controls.hh.

Referenced by calc_spherical().

8.1.5.3 GravitySource∗ jeod::GravityControls::body

Pointer to the GravitySource object named by planet_name.

Note

> Users should not set this data member in the input file.trick_units(–)

Definition at line 123 of file gravity_controls.hh.

Referenced by calc_relativistic(), calc_spherical(), gravitation(), jeod::SphericalHarmonicsGravityControls::initialize-_control(), initialize_control(), and reset_control().

8.1.5.4 bool jeod::GravityControls::gradient

Compute gravity gradient matrix?

trick_units(–)

Definition at line 99 of file gravity_controls.hh.

Referenced by jeod::SphericalHarmonicsGravityControls::calc_nonspherical(), calc_spherical(), and jeod::-SphericalHarmonicsGravityControls::check_validity().

8.1.5.5 double jeod::GravityControls::grav_accel[3]

Gravitational acceleration toward the GravitySource at the location of the DynBody, including third body effects.

trick_units(m/s2)

Definition at line 129 of file gravity_controls.hh.

Referenced by jeod::GravityManager::gravitation(), GravityControls(), and jeod::GravityInteraction::sort_controls().

8.1.5.6 double jeod::GravityControls::grav_accel_magsq

Square of the magnitude of grav_accel.

trick_units(m2/s4)

Definition at line 144 of file gravity_controls.hh.

Referenced by GravityControls(), and jeod::GravityInteraction::sort_controls().

8.1.5.7 double jeod::GravityControls::grav_grad[3][3]

Gradient of the gravitational acceleration.

trick_units(1/s2)

Definition at line 134 of file gravity_controls.hh.

Referenced by jeod::GravityManager::gravitation(), and GravityControls().

8.1.5.8 GravityManager∗ jeod::GravityControls::grav_manager [protected]

Pointer to the simulation-wide GravityManager object.

Note

Users should not set this data member in the input file.trick_units(–)

Definition at line 153 of file gravity_controls.hh.

Referenced by calc_relativistic(), and initialize_control().

8.1.5.9 double jeod::GravityControls::grav_pot

Gravitational potential.

trick_units(m2/s2)

Definition at line 139 of file gravity_controls.hh.

Referenced by jeod::GravityManager::gravitation(), and GravityControls().

8.1.5.10 bool jeod::GravityControls::perturbing_only

Compute only the perturbing gravity?

trick_units(–)

Definition at line 104 of file gravity_controls.hh.

Referenced by gravitation().

8.1.5.11 bool jeod::GravityControls::relativistic

Indicates that the relativistic correction to Newtonian gravitation is to be computed.

The public methods enable_relativistic_correction and disable_relativistic_correction set / clear this flag.trick_units(−)

Definition at line 117 of file gravity_controls.hh.

Referenced by gravitation().

8.1.5.12 bool jeod::GravityControls::skip_spherical `[protected]`

Some derived classes' calc_nonspherical method computes all contributions to gravitation, including spherical.

Those classes need to set this flag. The flag is clear in the base class and in the SphericalHarmonicsGravityControls derived class.trick_units(−)

Definition at line 175 of file gravity_controls.hh.

Referenced by gravitation().

8.1.5.13 std::string jeod::GravityControls::source_name

Planet name.

trick_units(−)

Definition at line 84 of file gravity_controls.hh.

Referenced by jeod::SphericalHarmonicsGravityControls::check_validity(), initialize_control(), and reset_control().

8.1.5.14 bool jeod::GravityControls::spherical

Ignore non-spherical effects?

trick_units(−)

Definition at line 94 of file gravity_controls.hh.

Referenced by jeod::SphericalHarmonicsGravityControls::check_validity(), gravitation(), and reset_control().

8.1.5.15 bool jeod::GravityControls::subscribed_to_inertial `[protected]`

Indicates that a subscription to the planet-centered inertial frame of the planet associated with the gravity_source been issued.

Note

Users should not set this data member in the input file.trick_units(−)

Definition at line 160 of file gravity_controls.hh.

Referenced by reset_control().

8.1.5.16 bool jeod::GravityControls::subscribed_to_pfix `[protected]`

Indicates that a subscription to the planet-centered, planet-fixed frame of the planet associated with the gravity_-source been issued.

Note

 Users should not set this data member in the input file.trick_units(–)

Definition at line 167 of file gravity_controls.hh.

Referenced by reset_control().

The documentation for this class was generated from the following files:

- gravity_controls.hh
- gravity_controls.cc

8.2 jeod::GravityIntegFrame Class Reference

Class that aids in determining whether gravity should be applied as a direct effect or a third body effect.

```
#include <gravity_integ_frame.hh>
```

Public Member Functions

- GravityIntegFrame ()

 GravityIntegFrame constructor.
- ∼GravityIntegFrame ()

 GravityIntegFrame destructor.

Data Fields

- const EphemerisRefFrame ∗ ref_frame

 Reference frame.
- bool is_third_body

 Is it a third body effect in this frame?
- double pos [3]

 Position of the integration frame origin with respect to a body.
- double accel [3]

 Acceleration of the frame origin with respect to the body.
- double time

 Timestamp of last update to this class.

Friends

- class InputProcessor
- void init_attrjeod__GravityIntegFrame ()

8.2.1 Detailed Description

Class that aids in determining whether gravity should be applied as a direct effect or a third body effect.

Definition at line 60 of file gravity_integ_frame.hh.

8.2.2 Constructor & Destructor Documentation

8.2.2.1 jeod::GravityIntegFrame::GravityIntegFrame (void)

[GravityIntegFrame](#) constructor.

Definition at line 51 of file gravity_integ_frame.cc.

References accel, is_third_body, pos, ref_frame, and time.

8.2.2.2 jeod::GravityIntegFrame::∼GravityIntegFrame (void)

[GravityIntegFrame](#) destructor.

Definition at line 65 of file gravity_integ_frame.cc.

8.2.3 Friends And Related Function Documentation

8.2.3.1 void init_attrjeod__GravityIntegFrame ( ) `[friend]`

8.2.3.2 friend class InputProcessor `[friend]`

Definition at line 62 of file gravity_integ_frame.hh.

8.2.4 Field Documentation

8.2.4.1 double jeod::GravityIntegFrame::accel[3]

Acceleration of the frame origin with respect to the body.

trick_units(m/s2)

Definition at line 83 of file gravity_integ_frame.hh.

Referenced by GravityIntegFrame().

8.2.4.2 bool jeod::GravityIntegFrame::is_third_body

Is it a third body effect in this frame?

trick_units(−)

Definition at line 73 of file gravity_integ_frame.hh.

Referenced by jeod::GravityControls::calc_spherical(), GravityIntegFrame(), and jeod::GravitySource::initialize_-state().

8.2.4.3 double jeod::GravityIntegFrame::pos[3]

Position of the integration frame origin with respect to a body.

trick_units(m)

Definition at line 78 of file gravity_integ_frame.hh.

Referenced by jeod::GravityControls::calc_spherical(), jeod::GravityControls::gravitation(), and GravityInteg-Frame().

8.2.4.4   const EphemerisRefFrame∗ jeod::GravityIntegFrame::ref_frame

Reference frame.

trick_units(–)

Definition at line 68 of file gravity_integ_frame.hh.

Referenced by jeod::GravityControls::gravitation(), GravityIntegFrame(), and jeod::GravitySource::initialize_state().

8.2.4.5   double jeod::GravityIntegFrame::time

Timestamp of last update to this class.

trick_units(s)

Definition at line 88 of file gravity_integ_frame.hh.

Referenced by GravityIntegFrame(), and jeod::GravitySource::initialize_state().

The documentation for this class was generated from the following files:

- gravity_integ_frame.hh
- gravity_integ_frame.cc

8.3   jeod::GravityInteraction Class Reference

Specifies interactions between a vehicle and a set of gravitational bodies.

```
#include <gravity_interaction.hh>
```

Public Member Functions

- GravityInteraction ()

    Construct a GravityInteraction instance.
- virtual ∼GravityInteraction ()

    Destruct a GravityInteraction instance.
- virtual void set_integ_frame (const EphemerisRefFrame &ref_frame_in, const BaseDynManager &dyn_-manager)

    Set the integration frame and associated integration frame index.
- virtual void add_control (GravityControls ∗control)

    Add a new GravityControls to the grav_controls list.
- virtual void remove_control (GravityControls ∗control)

    Remove a GravityControls from the grav_controls list.
- virtual void initialize_controls (BaseDynManager &dyn_manager, GravityManager &grav_manager)

    Initialize all GravityControls in the grav_controls list.
- virtual void reset_controls (BaseDynManager &dyn_manager)

    Reset all GravityControls in the grav_controls list.
- virtual void sort_controls ()

    Sort the GravityControls in the grav_controls list in increasing acceleration magnitude order.

Data Fields

- unsigned int integ_frame_index

    The integration frame index number of the DynBody's integration frame.

- double grav_accel [3]

    The total gravitational acceleration of the DynBody toward all planetary with which the vehicle interacts gravitationally.
- double grav_grad [3][3]

    The gradient of the gravitational acceleration vector evaluated at the DynBody's position, expressed in the vehicle's integration frame.
- double grav_pot

    The total gravitational potential at the location of the DynBody due to the gravity fields of all "active" gravitational bodies (i.e., planets).
- JeodPointerVector
  < GravityControls >::type grav_controls

    The gravity controls list for a DynBody specifies the planetary bodies with which the DynBody interacts and specifies the nature of those interactions.

Private Member Functions

- GravityInteraction (const GravityInteraction &frame)

    Not implemented.
- GravityInteraction & operator= (const GravityInteraction &frame)

    Not implemented.

Friends

- class InputProcessor
- void init_attrjeod__GravityInteraction ()

8.3.1 Detailed Description

Specifies interactions between a vehicle and a set of gravitational bodies.

Definition at line 70 of file gravity_interaction.hh.

8.3.2 Constructor & Destructor Documentation

8.3.2.1 jeod::GravityInteraction::GravityInteraction (const GravityInteraction & *frame* **)** `[private]`

Not implemented.

8.3.2.2 jeod::GravityInteraction::GravityInteraction (void)

Construct a GravityInteraction instance.

Definition at line 76 of file gravity_interaction.cc.

References grav_accel, grav_controls, and grav_grad.

8.3.2.3 jeod::GravityInteraction::∼GravityInteraction (void) `[virtual]`

Destruct a GravityInteraction instance.

Definition at line 94 of file gravity_interaction.cc.

References grav_controls.

8.3.3 Member Function Documentation

8.3.3.1 void jeod::GravityInteraction::add_control (GravityControls ∗ *control*) `[virtual]`

Add a new GravityControls to the grav_controls list.

Parameters

in	*control*	Control to be added

Definition at line 124 of file gravity_interaction.cc.

References jeod::GravityMessages::duplicate_entry, and grav_controls.

8.3.3.2 void jeod::GravityInteraction::initialize_controls (BaseDynManager & *dyn_manager,* GravityManager & *grav_manager*) `[virtual]`

Initialize all GravityControls in the grav_controls list.

Parameters

in	*grav_manager*	Ref to Gravity Manager

Definition at line 173 of file gravity_interaction.cc.

References grav_controls, and reset_controls().

8.3.3.3 GravityInteraction& jeod::GravityInteraction::operator= (const GravityInteraction & *frame*) `[private]`

Not implemented.

8.3.3.4 void jeod::GravityInteraction::remove_control (GravityControls ∗ *control*) `[virtual]`

Remove a GravityControls from the grav_controls list.

Parameters

in	*control*	GravityControls to be removed.

Definition at line 150 of file gravity_interaction.cc.

References grav_controls, and jeod::GravityMessages::missing_entry.

8.3.3.5 void jeod::GravityInteraction::reset_controls (BaseDynManager & *dyn_manager*) `[virtual]`

Reset all GravityControls in the grav_controls list.

Definition at line 193 of file gravity_interaction.cc.

References grav_controls.

Referenced by initialize_controls().

8.3.3.6 void jeod::GravityInteraction::set_integ_frame (const EphemerisRefFrame & *ref_frame,* const BaseDynManager & *dyn_manager*) `[virtual]`

Set the integration frame and associated integration frame index.

Assumptions and Limitations

- Provided frame is a valid integration frame.

Parameters

in	*ref_frame*	Integration frame
in	*dyn_manager*	Dynamics manager

Definition at line 111 of file gravity_interaction.cc.

References integ_frame_index.

8.3.3.7   void jeod::GravityInteraction::sort_controls (void) `[virtual]`

Sort the [GravityControls](#) in the grav_controls list in increasing acceleration magnitude order.

Definition at line 210 of file gravity_interaction.cc.

References jeod::GravityControls::accel_mag_less_ptr(), jeod::GravityControls::active, jeod::GravityControls::grav-_accel, jeod::GravityControls::grav_accel_magsq, and grav_controls.

8.3.4   Friends And Related Function Documentation

8.3.4.1   void init_attrjeod__GravityInteraction ( ) `[friend]`

8.3.4.2   friend class InputProcessor `[friend]`

Definition at line 72 of file gravity_interaction.hh.

8.3.5   Field Documentation

8.3.5.1   double jeod::GravityInteraction::grav_accel[3]

The total gravitational acceleration of the DynBody toward all planetary with which the vehicle interacts gravitationally.

The acceleration is expressed in the DynBody's integration frame. The gravitational acceleration of the integration frame itself toward the planetary bodies is excluded from this total acceleration. For example, for a vehicle integrated in Earth-centered inertial, the Sun component of the total gravitational acceleration is the Newtonian gravitation acceleration of the vehicle toward the Sun less the Newtonian gravitational acceleration of the Earth toward the Sun.trick_units(m/s2)

Definition at line 96 of file gravity_interaction.hh.

Referenced by jeod::GravityManager::gravitation(), and GravityInteraction().

8.3.5.2   JeodPointerVector<GravityControls>::type jeod::GravityInteraction::grav_controls

The gravity controls list for a DynBody specifies the planetary bodies with which the DynBody interacts and specifies the nature of those interactions.

trick_io(**)

Definition at line 116 of file gravity_interaction.hh.

Referenced by add_control(), jeod::GravityManager::gravitation(), GravityInteraction(), initialize_controls(), remove-_control(), reset_controls(), sort_controls(), and ~GravityInteraction().

8.3.5.3   double jeod::GravityInteraction::grav_grad[3][3]

The gradient of the gravitational acceleration vector evaluated at the DynBody's position, expressed in the vehicle's integration frame.

trick_units(1/s2)

Definition at line 102 of file gravity_interaction.hh.

Referenced by jeod::GravityManager::gravitation(), and GravityInteraction().

8.3.5.4 double jeod::GravityInteraction::grav_pot

The total gravitational potential at the location of the DynBody due to the gravity fields of all "active" gravitational bodies (i.e., planets).

trick_units(m2/s2)

Definition at line 109 of file gravity_interaction.hh.

Referenced by jeod::GravityManager::gravitation().

8.3.5.5 unsigned int jeod::GravityInteraction::integ_frame_index

The integration frame index number of the DynBody's integration frame.

This data member must be kept in strict synchronization with the DynBody's integration frame.trick_units(–)

Definition at line 83 of file gravity_interaction.hh.

Referenced by jeod::GravityManager::gravitation(), and set_integ_frame().

The documentation for this class was generated from the following files:

- gravity_interaction.hh
- gravity_interaction.cc

8.4 jeod::GravityManager Class Reference

The master gravitational model for a simulation.

```
#include <gravity_manager.hh>
```

Public Member Functions

- GravityManager ()

    GravityManager constructor.
- ∼GravityManager ()

    GravityManager destructor.
- GravitySource ∗ find_grav_source (std::string source_name) const

    Find the gravitational body with the given name.
- void add_grav_source (GravitySource &source)

    Create a gravitational body, initialize it with the supplied gravity coefficients, and add it to the vector of bodies.
- void initialize_model (BaseDynManager &manager)

    Perform base initialization.
- void initialize_state (BaseDynManager &manager)

    Pass the initialize_state method to each GravitySource object registered with the gravity manager.
- void gravitation (const double integ_pos[3], GravityInteraction &grav)

    Compute the gravitational attraction of gravitational bodies on the provided dynamic body.
- void gravitation (const RefFrame &point, GravityInteraction &grav)

    Compute the gravitational attraction of gravitational bodies on the provided dynamic body.

- const std::vector
  < GravitySource ∗ > & get_bodies () const
    Get the vector of gravitational bodies.

Private Member Functions

- GravityManager (const GravityManager &)
- GravityManager & operator= (const GravityManager &)

Private Attributes

- JeodPointerVector
  < GravitySource >::type sources
    The gravitational bodies.

Friends

- class InputProcessor
- void init_attrjeod__GravityManager ()

8.4.1   Detailed Description

The master gravitational model for a simulation.

Definition at line 66 of file gravity_manager.hh.

8.4.2   Constructor & Destructor Documentation

8.4.2.1   jeod::GravityManager::GravityManager (const **GravityManager &**)   `[private]`

8.4.2.2   jeod::GravityManager::GravityManager (void)

GravityManager constructor.

Definition at line 76 of file gravity_manager.cc.

8.4.2.3   jeod::GravityManager::∼GravityManager (void)

GravityManager destructor.

Definition at line 88 of file gravity_manager.cc.

References sources.

8.4.3   Member Function Documentation

8.4.3.1   void jeod::GravityManager::add_grav_source (**GravitySource &** *source*)

Create a gravitational body, initialize it with the supplied gravity coefficients, and add it to the vector of bodies.

Parameters

in	*body*	Gravity body to be added

Definition at line 135 of file gravity_manager.cc.

References jeod::GravityMessages::duplicate_entry, find_grav_source(), jeod::GravityMessages::invalid_name, jeod::GravitySource::name, and sources.

8.4.3.2 GravitySource ∗ **jeod::GravityManager::find_grav_source (std::string** *source_name* **) const**

Find the gravitational body with the given name.

Returns

Pointer to found body

Parameters

in	*body_name*	Name of body to be found

Definition at line 102 of file gravity_manager.cc.

References jeod::GravityMessages::invalid_name, jeod::GravitySource::name, and sources.

Referenced by add_grav_source(), and jeod::GravityControls::initialize_control().

8.4.3.3 const std::vector<**GravitySource**∗>**& jeod::GravityManager::get_bodies ( ) const** [inline]

Get the vector of gravitational bodies.

Warning

Do not modify the vector, or elements of it.

Definition at line 138 of file gravity_manager.hh.

References sources.

Referenced by jeod::GravityControls::calc_relativistic().

8.4.3.4 void jeod::GravityManager::gravitation (const double *integ_pos[3],* **GravityInteraction &** *grav* **)**

Compute the gravitational attraction of gravitational bodies on the provided dynamic body.

Assumptions and Limitations

- Only the gravitational bodies specified in the dynamic body's gravity controls have a bearing on the dynamic body's state.

Warning

This overload is deprecated.

Parameters

in	*integ_pos*	Dyn body location (integ frm)
		Units: M
in,out	*grav*	Gravity interaction

Definition at line 210 of file gravity_manager.cc.

References jeod::GravityControls::active, jeod::GravityInteraction::grav_accel, jeod::GravityControls::grav_accel, jeod::GravityInteraction::grav_controls, jeod::GravityInteraction::grav_grad, jeod::GravityControls::grav_grad, jeod::GravityInteraction::grav_pot, jeod::GravityControls::grav_pot, jeod::GravityControls::gravitation(), and jeod::GravityInteraction::integ_frame_index.

8.4.3.5   void jeod::GravityManager::gravitation (const RefFrame & *point,* GravityInteraction & *grav*)

Compute the gravitational attraction of gravitational bodies on the provided dynamic body.

Assumptions and Limitations

- Only the gravitational bodies specified in the dynamic body's gravity controls have a bearing on the dynamic body's state.
- The supplied reference frame is assumed to be a direct child of the dynamic body's integration frame.

Parameters

| in | *point* | Point of interest, as a reference frame. |
| in,out | *grav* | Gravity interaction |

Definition at line 257 of file gravity_manager.cc.

References jeod::GravityControls::active, jeod::GravityInteraction::grav_accel, jeod::GravityControls::grav_accel, jeod::GravityInteraction::grav_controls, jeod::GravityInteraction::grav_grad, jeod::GravityControls::grav_grad, jeod::GravityInteraction::grav_pot, jeod::GravityControls::grav_pot, jeod::GravityControls::gravitation(), and jeod::GravityInteraction::integ_frame_index.

8.4.3.6   void jeod::GravityManager::initialize_model (BaseDynManager & *manager*)

Perform base initialization.

Note

This method differs from the other initialize_models methods in that this method takes no coefficients as arguments. The S_define must call add_grav_source explicitly when this signature is used.

Parameters

| in,out | *manager* | Dynamics manager |

Definition at line 171 of file gravity_manager.cc.

8.4.3.7   void jeod::GravityManager::initialize_state (BaseDynManager & *manager*)

Pass the initialize_state method to each GravitySource object registered with the gravity manager.

Assumptions and Limitations

- Initialization phasing: The following must have been called prior to calling this method:
  - GravityManager::initialize_model to register the GravityManager object with the dynamics manager
  - GravityManager::add_grav_source to register all GravitySource objects in the simulation with the gravity manager.

– Planet::register_model to associate the planet with a GravitySource.

– DynamicsManager::activate_ephemerides to identify which reference frames can serve as integration frames.

Parameters

in,out	*manager*	Dynamics manager

Definition at line 195 of file gravity_manager.cc.

References sources.

8.4.3.8 GravityManager& jeod::GravityManager::operator= (const GravityManager &) `[private]`

8.4.4 Friends And Related Function Documentation

8.4.4.1 void init_attrjeod__GravityManager ( ) `[friend]`

8.4.4.2 friend class InputProcessor `[friend]`

Definition at line 68 of file gravity_manager.hh.

8.4.5 Field Documentation

8.4.5.1 JeodPointerVector<GravitySource>::type jeod::GravityManager::sources `[private]`

The gravitational bodies.

trick_io(**)

Definition at line 80 of file gravity_manager.hh.

Referenced by add_grav_source(), find_grav_source(), get_bodies(), initialize_state(), and ∼GravityManager().

The documentation for this class was generated from the following files:

- gravity_manager.hh
- gravity_manager.cc

8.5 jeod::GravityMessages Class Reference

Specifies the message IDs used in the gravity model.

```
#include <gravity_messages.hh>
```

Static Public Attributes

- static char const ∗ duplicate_entry = "environment/gravity/" "duplicate_entry"

    Issued when a duplicate entry is detected.
- static char const ∗ missing_entry = "environment/gravity/" "missing_entry"

    Issued when a missing entry is detected.
- static char const ∗ invalid_name = "environment/gravity/" "invalid_name"

    Error issued when a name is invalid (null or empty).
- static char const ∗ invalid_object = "environment/gravity/" "invalid_object"

    Error issued when an object is invalid (wrong type).
- static char const ∗ invalid_limit = "environment/gravity/" "invalid_limit"

Issued when a limit is out of range.

- static char const ∗ domain_error = "environment/gravity/" "domain_error"

    Issued when a value is outside the known-to-be-valid range, e.g., a radial distance less than the planet's equatorial radius.

- static char const ∗ null_pointer = "environment/gravity/" "null_pointer"

    Error issued when a pointer is invalid (null or empty).

Private Member Functions

- GravityMessages (void)
- GravityMessages (const GravityMessages &)
- GravityMessages & operator= (const GravityMessages &)

Friends

- class InputProcessor
- void init_attrjeod__GravityMessages ()

8.5.1 Detailed Description

Specifies the message IDs used in the gravity model.

Definition at line 56 of file gravity_messages.hh.

8.5.2 Constructor & Destructor Documentation

8.5.2.1 jeod::GravityMessages::GravityMessages (void) `[private]`

8.5.2.2 jeod::GravityMessages::GravityMessages (const GravityMessages &) `[private]`

8.5.3 Member Function Documentation

8.5.3.1 GravityMessages& jeod::GravityMessages::operator= (const GravityMessages &) `[private]`

8.5.4 Friends And Related Function Documentation

8.5.4.1 void init_attrjeod__GravityMessages ( ) `[friend]`

8.5.4.2 friend class InputProcessor `[friend]`

Definition at line 59 of file gravity_messages.hh.

8.5.5 Field Documentation

8.5.5.1 char const ∗ jeod::GravityMessages::domain_error = "environment/gravity/" "domain_error" `[static]`

Issued when a value is outside the known-to-be-valid range, e.g., a radial distance less than the planet's equatorial radius.

trick_units(–)

Definition at line 94 of file gravity_messages.hh.

Referenced by jeod::SphericalHarmonicsGravityControls::calc_nonspherical().

8.5.5.2 char const ∗ jeod::GravityMessages::duplicate_entry = "environment/gravity/" "duplicate_entry" `[static]`

Issued when a duplicate entry is detected.

trick_units(–)

Definition at line 68 of file gravity_messages.hh.

Referenced by jeod::GravityInteraction::add_control(), jeod::SphericalHarmonicsGravitySource::add_deltacoeff(), and jeod::GravityManager::add_grav_source().

8.5.5.3 char const ∗ jeod::GravityMessages::invalid_limit = "environment/gravity/" "invalid_limit" `[static]`

Issued when a limit is out of range.

trick_units(–)

Definition at line 88 of file gravity_messages.hh.

Referenced by jeod::SphericalHarmonicsGravityControls::check_validity().

8.5.5.4 char const ∗ jeod::GravityMessages::invalid_name = "environment/gravity/" "invalid_name" `[static]`

Error issued when a name is invalid (null or empty).

trick_units(–)

Definition at line 78 of file gravity_messages.hh.

Referenced by jeod::GravityManager::add_grav_source(), jeod::GravityManager::find_grav_source(), and jeod::-SphericalHarmonicsTidalEffects::initialize().

8.5.5.5 char const ∗ jeod::GravityMessages::invalid_object = "environment/gravity/" "invalid_object" `[static]`

Error issued when an object is invalid (wrong type).

trick_units(–)

Definition at line 83 of file gravity_messages.hh.

Referenced by jeod::SphericalHarmonicsGravityControls::check_validity(), jeod::SphericalHarmonicsTidalEffects-::initialize(), and jeod::GravityControls::initialize_control().

8.5.5.6 char const ∗ jeod::GravityMessages::missing_entry = "environment/gravity/" "missing_entry" `[static]`

Issued when a missing entry is detected.

trick_units(–)

Definition at line 73 of file gravity_messages.hh.

Referenced by jeod::GravityControls::initialize_control(), and jeod::GravityInteraction::remove_control().

8.5.5.7 char const ∗ jeod::GravityMessages::null_pointer = "environment/gravity/" "null_pointer" `[static]`

Error issued when a pointer is invalid (null or empty).

trick_units(–)

Definition at line 99 of file gravity_messages.hh.

Referenced by jeod::GravityControls::reset_control().

The documentation for this class was generated from the following files:

- gravity_messages.hh
- gravity_messages.cc

8.6 jeod::GravitySource Class Reference

Models the gravity for a specific planet; pure virtual.

```
#include <gravity_source.hh>
```

Inheritance diagram for jeod::GravitySource:
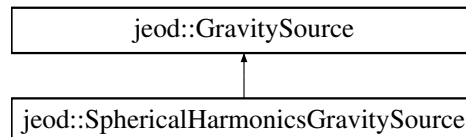
Public Member Functions

- GravitySource ()

  GravitySource constructor.
- virtual ∼GravitySource ()

  GravitySource destructor.
- virtual void initialize_state (const std::vector< EphemerisRefFrame ∗ > &integ_frames, const Gravity-Manager &gravity_manager)

  Initialize frame states for the gravity body.

Data Fields

- std::string name

  The name of the source (i.e.
- EphemerisRefFrame ∗ inertial

  The pseudo-inertial frame associated with this gravity source.
- EphemerisRefFrame ∗ pfix

  Planetoid fixed frame.
- double mu

  The planet's standard gravitational parameter, G times planet mass.
- GravityIntegFrame ∗ frames

  Relative states with respect to this body, for each integration frame.

Private Member Functions

- GravitySource (const GravitySource &)

  Not implemented.
- GravitySource & operator= (const GravitySource &)

  Not implemented.

Friends

- class InputProcessor
- void init_attrjeod__GravitySource ()

8.6.1 Detailed Description

Models the gravity for a specific planet; pure virtual.

Definition at line 75 of file gravity_source.hh.

8.6.2 Constructor & Destructor Documentation

8.6.2.1 jeod::GravitySource::GravitySource (const GravitySource &) `[private]`

Not implemented.

8.6.2.2 jeod::GravitySource::GravitySource (void)

[GravitySource](#) constructor.

Definition at line 81 of file gravity_source.cc.

8.6.2.3 jeod::GravitySource::∼GravitySource (void) `[virtual]`

[GravitySource](#) destructor.

Definition at line 97 of file gravity_source.cc.

References frames.

8.6.3 Member Function Documentation

8.6.3.1 void jeod::GravitySource::initialize_state (const std::vector< EphemerisRefFrame ∗ > & *integ_frames,* const GravityManager & *gravity_manager*) `[virtual]`

Initialize frame states for the gravity body.

Parameters

in	*integ_frames*	All possible integration frames
in	*gravity_manager*	Gravity Manager

Definition at line 112 of file gravity_source.cc.

References frames, inertial, jeod::GravityIntegFrame::is_third_body, jeod::GravityIntegFrame::ref_frame, and jeod-::GravityIntegFrame::time.

8.6.3.2 GravitySource& jeod::GravitySource::operator= (const GravitySource &) `[private]`

Not implemented.

8.6.4 Friends And Related Function Documentation

8.6.4.1 void init_attrjeod__GravitySource ( ) `[friend]`

8.6.4.2 friend class InputProcessor `[friend]`

Definition at line 77 of file gravity_source.hh.

8.6.5 Field Documentation

8.6.5.1 GravityIntegFrame∗ jeod::GravitySource::frames

Relative states with respect to this body, for each integration frame.

trick_units(–)

Definition at line 111 of file gravity_source.hh.

Referenced by jeod::GravityControls::gravitation(), initialize_state(), and ∼GravitySource().

8.6.5.2 EphemerisRefFrame∗ jeod::GravitySource::inertial

The pseudo-inertial frame associated with this gravity source.

Used for most basic gravity calculations planet represented by thistrick_units(–)

Definition at line 94 of file gravity_source.hh.

Referenced by jeod::GravityControls::calc_relativistic(), jeod::GravityControls::gravitation(), jeod::GravityControls-::initialize_control(), initialize_state(), and jeod::GravityControls::reset_control().

8.6.5.3 double jeod::GravitySource::mu

The planet's standard gravitational parameter, G times planet mass.

trick_units(m3/s2)

Definition at line 106 of file gravity_source.hh.

Referenced by jeod::SphericalHarmonicsGravityControls::calc_nonspherical(), jeod::GravityControls::calc_-relativistic(), jeod::GravityControls::calc_spherical(), jeod::SphericalHarmonicsGravitySource_earth_spherical_-default_data::initialize(), jeod::SphericalHarmonicsGravitySource_moon_spherical_default_data::initialize(), jeod-::SphericalHarmonicsGravitySource_moon_LP150Q_default_data::initialize(), jeod::SphericalHarmonicsGravity-Source_mars_spherical_default_data::initialize(), jeod::SphericalHarmonicsGravitySource_earth_GGM02C_-default_data::initialize(), jeod::SphericalHarmonicsGravitySource_mars_MRO110B2_default_data::initialize(), jeod-::SphericalHarmonicsGravitySource_earth_GEMT1_default_data::initialize(), jeod::SphericalHarmonicsGravity-Source_earth_GGM05C_default_data::initialize(), jeod::SphericalHarmonicsGravitySource_sun_spherical_default-_data::initialize(), jeod::SphericalHarmonicsGravitySource_jupiter_spherical_default_data::initialize(), and jeod::-SphericalHarmonicsSolidBodyTides::update().

8.6.5.4 std::string jeod::GravitySource::name

The name of the source (i.e.

associated planet or planetoid) The GravitySource object, the BasePlanet derived object that points to the Gravity-Source object, and the EphemerisPlanet that enables populating the planetoid's inertial RefFrame object must all have the exact same name.trick_units(–)

Definition at line 87 of file gravity_source.hh.

Referenced by jeod::SphericalHarmonicsGravitySource::add_deltacoeff(), jeod::GravityManager::add_grav-_source(), jeod::SphericalHarmonicsGravityControls::calc_nonspherical(), jeod::SphericalHarmonicsGravity-Controls::check_validity(), jeod::SphericalHarmonicsGravitySource::find_deltacoeff(), jeod::GravityManager::find_-grav_source(), jeod::SphericalHarmonicsGravitySource_earth_spherical_default_data::initialize(), jeod::Spherical-HarmonicsGravitySource_moon_LP150Q_default_data::initialize(), jeod::SphericalHarmonicsGravitySource_-earth_GEMT1_default_data::initialize(), jeod::SphericalHarmonicsGravitySource_earth_GGM02C_default_data-::initialize(), jeod::SphericalHarmonicsGravitySource_mars_MRO110B2_default_data::initialize(), jeod::Spherical-HarmonicsGravitySource_earth_GGM05C_default_data::initialize(), jeod::SphericalHarmonicsGravitySource_-mars_spherical_default_data::initialize(), jeod::SphericalHarmonicsGravitySource_moon_spherical_default_data-

::initialize(), jeod::SphericalHarmonicsGravitySource_sun_spherical_default_data::initialize(), jeod::Spherical-HarmonicsGravitySource_jupiter_spherical_default_data::initialize(), and jeod::GravityControls::initialize_control().

8.6.5.5 EphemerisRefFrame∗ jeod::GravitySource::pfix

Planetoid fixed frame.

The Cartesian reference frame centered and fixed on the associated gravity source. Used for advanced (e.g. nonspherical gravity effects.trick_units(–)

Definition at line 101 of file gravity_source.hh.

Referenced by jeod::SphericalHarmonicsGravityControls::calc_nonspherical(), jeod::SphericalHarmonicsTidal-Effects::initialize(), and jeod::GravityControls::reset_control().

The documentation for this class was generated from the following files:

- gravity_source.hh
- gravity_source.cc

8.7   jeod::SphericalHarmonicsDeltaCoeffs Class Reference

Base class for tidal and temporal gravity models.

```
#include <spherical_harmonics_delta_coeffs.hh>
```

Inheritance diagram for jeod::SphericalHarmonicsDeltaCoeffs:
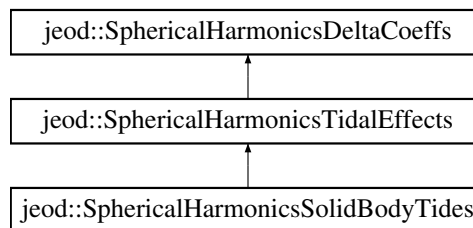
```
┌─────────────────────────────────────────┐
│   jeod::SphericalHarmonicsDeltaCoeffs    │
└─────────────────────────────────────────┘
                    ▲
┌─────────────────────────────────────────┐
│   jeod::SphericalHarmonicsTidalEffects   │
└─────────────────────────────────────────┘
                    ▲
┌─────────────────────────────────────────┐
│  jeod::SphericalHarmonicsSolidBodyTides  │
└─────────────────────────────────────────┘
```

Public Member Functions

- SphericalHarmonicsDeltaCoeffs ()

    SphericalHarmonicsDeltaCoeffs constructor.
- virtual ∼SphericalHarmonicsDeltaCoeffs ()

    SphericalHarmonicsDeltaCoeffs destructor.
- virtual void initialize (SphericalHarmonicsDeltaCoeffsInit &var_init, BaseDynManager &dyn_manager)

    Initialize the class.
- virtual void update (SphericalHarmonicsGravityControls &controls)

    Pure virtual update method.

Data Fields

- SphericalHarmonicsGravitySource ∗ grav_source

    Pointer to the gravity body associated with this effect.
- double ∗∗ delta_Cnm

    Normalized real (cosine) variational spherical harmonic coefficients.
- double ∗∗ delta_Snm

Normalized imaginary (sine) variational spherical harmonic coeffs.

- unsigned int degree

    Coefficient degree to be used for this SphericalHarmonicsDeltaCoeffs.

- unsigned int order

    Coefficient order to be used for this SphericalHarmonicsDeltaCoeffs.

- double dC20

    delta C20 coefficient for first order effect

Friends

- class InputProcessor
- void init_attrjeod__SphericalHarmonicsDeltaCoeffs ()

8.7.1 Detailed Description

Base class for tidal and temporal gravity models.

Definition at line 60 of file spherical_harmonics_delta_coeffs.hh.

8.7.2 Constructor & Destructor Documentation

8.7.2.1 jeod::SphericalHarmonicsDeltaCoeffs::SphericalHarmonicsDeltaCoeffs (void)

SphericalHarmonicsDeltaCoeffs constructor.

Definition at line 62 of file spherical_harmonics_delta_coeffs.cc.

8.7.2.2 jeod::SphericalHarmonicsDeltaCoeffs::∼SphericalHarmonicsDeltaCoeffs (void) `[virtual]`

SphericalHarmonicsDeltaCoeffs destructor.

Definition at line 79 of file spherical_harmonics_delta_coeffs.cc.

References degree, delta_Cnm, and delta_Snm.

8.7.3 Member Function Documentation

8.7.3.1 void jeod::SphericalHarmonicsDeltaCoeffs::initialize (SphericalHarmonicsDeltaCoeffsInit & *var_init,* BaseDynManager & *dyn_manager*) `[virtual]`

Initialize the class.

Parameters

in	*var_init*	Init structure
in,out	*dyn_manager*	Dynamics manager

Reimplemented in jeod::SphericalHarmonicsTidalEffects, and jeod::SphericalHarmonicsSolidBodyTides.

Definition at line 99 of file spherical_harmonics_delta_coeffs.cc.

References jeod::SphericalHarmonicsDeltaCoeffsInit::degree, degree, jeod::SphericalHarmonicsDeltaCoeffs-Init::delta_Cnm, delta_Cnm, jeod::SphericalHarmonicsDeltaCoeffsInit::delta_Snm, delta_Snm, jeod::Spherical-HarmonicsDeltaCoeffsInit::order, and order.

Referenced by jeod::SphericalHarmonicsGravitySource::add_deltacoeff(), and jeod::SphericalHarmonicsTidal-Effects::initialize().

8.7.3.2 void jeod::SphericalHarmonicsDeltaCoeffs::update (SphericalHarmonicsGravityControls & *controls* **)**
`[virtual]`

Pure virtual update method.

8.7.3.2   void jeod::SphericalHarmonicsDeltaCoeffs::update (SphericalHarmonicsGravityControls & *controls* **)**

Parameters

in	*controls*	Ignored

Reimplemented in jeod::SphericalHarmonicsTidalEffects, and jeod::SphericalHarmonicsSolidBodyTides.

Definition at line 134 of file spherical_harmonics_delta_coeffs.cc.

8.7.4 Friends And Related Function Documentation

8.7.4.1 void init_attrjeod__SphericalHarmonicsDeltaCoeffs ( ) `[friend]`

8.7.4.2 friend class InputProcessor `[friend]`

Definition at line 62 of file spherical_harmonics_delta_coeffs.hh.

8.7.5 Field Documentation

8.7.5.1 double jeod::SphericalHarmonicsDeltaCoeffs::dC20

delta C20 coefficient for first order effect

trick_units(–)

Definition at line 96 of file spherical_harmonics_delta_coeffs.hh.

Referenced by jeod::SphericalHarmonicsGravityControls::sum_deltacoeffs(), and jeod::SphericalHarmonicsSolid-BodyTides::update().

8.7.5.2 unsigned int jeod::SphericalHarmonicsDeltaCoeffs::degree

Coefficient degree to be used for this SphericalHarmonicsDeltaCoeffs.

trick_units(–)

Definition at line 86 of file spherical_harmonics_delta_coeffs.hh.

Referenced by jeod::SphericalHarmonicsGravityControls::add_deltacontrol(), initialize(), jeod::SphericalHarmonics-TidalEffects::initialize(), ∼SphericalHarmonicsDeltaCoeffs(), and jeod::SphericalHarmonicsTidalEffects::∼-SphericalHarmonicsTidalEffects().

8.7.5.3 double∗∗ jeod::SphericalHarmonicsDeltaCoeffs::delta_Cnm

Normalized real (cosine) variational spherical harmonic coefficients.

trick_units(–)

Definition at line 76 of file spherical_harmonics_delta_coeffs.hh.

Referenced by initialize(), jeod::SphericalHarmonicsGravityControls::sum_deltacoeffs(), and ∼Spherical-HarmonicsDeltaCoeffs().

8.7.5.4 double∗∗ jeod::SphericalHarmonicsDeltaCoeffs::delta_Snm

Normalized imaginary (sine) variational spherical harmonic coeffs.

trick_units(–)

Definition at line 81 of file spherical_harmonics_delta_coeffs.hh.

Referenced by initialize(), jeod::SphericalHarmonicsGravityControls::sum_deltacoeffs(), and ∼Spherical-HarmonicsDeltaCoeffs().

8.7.5.5 **SphericalHarmonicsGravitySource**∗ **jeod::SphericalHarmonicsDeltaCoeffs::grav_source**

Pointer to the gravity body associated with this effect.

trick_units(–)

Definition at line 71 of file spherical_harmonics_delta_coeffs.hh.

Referenced by jeod::SphericalHarmonicsGravitySource::add_deltacoeff(), jeod::SphericalHarmonicsTidalEffects-::initialize(), and jeod::SphericalHarmonicsSolidBodyTides::update().

8.7.5.6 **unsigned int jeod::SphericalHarmonicsDeltaCoeffs::order**

Coefficient order to be used for this SphericalHarmonicsDeltaCoeffs.

trick_units(–)

Definition at line 91 of file spherical_harmonics_delta_coeffs.hh.

Referenced by jeod::SphericalHarmonicsGravityControls::add_deltacontrol(), initialize(), and jeod::Spherical-HarmonicsTidalEffects::initialize().

The documentation for this class was generated from the following files:

- spherical_harmonics_delta_coeffs.hh
- spherical_harmonics_delta_coeffs.cc

8.8 jeod::SphericalHarmonicsDeltaCoeffsInit Class Reference

Initialization data for a SphericalHarmonicsDeltaCoeffs instance.

```
#include <spherical_harmonics_delta_coeffs_init.hh>
```

Inheritance diagram for jeod::SphericalHarmonicsDeltaCoeffsInit:
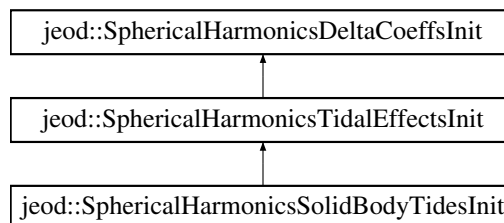
```
jeod::SphericalHarmonicsDeltaCoeffsInit
                    ↑
jeod::SphericalHarmonicsTidalEffectsInit
                    ↑
jeod::SphericalHarmonicsSolidBodyTidesInit
```

Public Member Functions

- SphericalHarmonicsDeltaCoeffsInit ()

    SphericalHarmonicsDeltaCoeffsInit constructor.
- virtual ∼SphericalHarmonicsDeltaCoeffsInit ()

    SphericalHarmonicsDeltaCoeffsInit destructor.

Data Fields

- double ∗∗ delta_Cnm

    Normalized real (cosine) variational spherical harmonic coefficients.
- double ∗∗ delta_Snm

    Normalized imaginary (sine) variational spherical harmonic coeffs.

- unsigned int [degree](#)

    Coefficient degree to be used for this [SphericalHarmonicsDeltaCoeffs](#).

- unsigned int [order](#)

    Coefficient order to be used for this [SphericalHarmonicsDeltaCoeffs](#).

Friends

- class [InputProcessor](#)
- void [init_attrjeod__SphericalHarmonicsDeltaCoeffsInit](#) ()

8.8.1 Detailed Description

Initialization data for a [SphericalHarmonicsDeltaCoeffs](#) instance.

Definition at line 52 of file spherical_harmonics_delta_coeffs_init.hh.

8.8.2 Constructor & Destructor Documentation

8.8.2.1 jeod::SphericalHarmonicsDeltaCoeffsInit::SphericalHarmonicsDeltaCoeffsInit (void)

[SphericalHarmonicsDeltaCoeffsInit](#) constructor.

Definition at line 48 of file spherical_harmonics_delta_coeffs_init.cc.

References degree, delta_Cnm, delta_Snm, and order.

8.8.2.2 jeod::SphericalHarmonicsDeltaCoeffsInit::∼SphericalHarmonicsDeltaCoeffsInit (void) `[virtual]`

[SphericalHarmonicsDeltaCoeffsInit](#) destructor.

Definition at line 61 of file spherical_harmonics_delta_coeffs_init.cc.

8.8.3 Friends And Related Function Documentation

8.8.3.1 void init_attrjeod__SphericalHarmonicsDeltaCoeffsInit ( ) `[friend]`

8.8.3.2 friend class InputProcessor `[friend]`

Definition at line 54 of file spherical_harmonics_delta_coeffs_init.hh.

8.8.4 Field Documentation

8.8.4.1 unsigned int jeod::SphericalHarmonicsDeltaCoeffsInit::degree

Coefficient degree to be used for this [SphericalHarmonicsDeltaCoeffs](#).

trick_units(–)

Definition at line 73 of file spherical_harmonics_delta_coeffs_init.hh.

Referenced by jeod::SphericalHarmonicsDeltaCoeffs::initialize(), and SphericalHarmonicsDeltaCoeffsInit().

8.8.4.2 double∗∗ jeod::SphericalHarmonicsDeltaCoeffsInit::delta_Cnm

Normalized real (cosine) variational spherical harmonic coefficients.

trick_units(–)

Definition at line 63 of file spherical_harmonics_delta_coeffs_init.hh.

Referenced by jeod::SphericalHarmonicsDeltaCoeffs::initialize(), and SphericalHarmonicsDeltaCoeffsInit().

8.8.4.3 double∗∗ jeod::SphericalHarmonicsDeltaCoeffsInit::delta_Snm

Normalized imaginary (sine) variational spherical harmonic coeffs.

trick_units(–)

Definition at line 68 of file spherical_harmonics_delta_coeffs_init.hh.

Referenced by jeod::SphericalHarmonicsDeltaCoeffs::initialize(), and SphericalHarmonicsDeltaCoeffsInit().

8.8.4.4 unsigned int jeod::SphericalHarmonicsDeltaCoeffsInit::order

Coefficient order to be used for this SphericalHarmonicsDeltaCoeffs.

trick_units(–)

Definition at line 78 of file spherical_harmonics_delta_coeffs_init.hh.

Referenced by jeod::SphericalHarmonicsDeltaCoeffs::initialize(), and SphericalHarmonicsDeltaCoeffsInit().

The documentation for this class was generated from the following files:

- spherical_harmonics_delta_coeffs_init.hh
- spherical_harmonics_delta_coeffs_init.cc

8.9 jeod::SphericalHarmonicsDeltaControls Class Reference

Provides controls for how a variational model affects a vehicle.

```
#include <spherical_harmonics_delta_controls.hh>
```

Public Member Functions

- SphericalHarmonicsDeltaControls ()

    SphericalHarmonicsDeltaControls constructor.
- ∼SphericalHarmonicsDeltaControls ()

    SphericalHarmonicsDeltaControls destructor.

Data Fields

- SphericalHarmonicsDeltaCoeffs ∗ grav_effect

    Pointer to associated coefficient-altering gravitational effect.
- SphericalHarmonicsGravitySource ∗ grav_source

    Pointer to the gravity body associated with this effect.
- bool active

    Is this variational gravity effect active for this body?
- bool first_order_only

Calculate first-order term of this effect only; default to true for 2.0.

- unsigned int [degree](#)

  Coefficient degree to be used for this gravity effect.

- unsigned int [order](#)

  Coefficient order to be used for this gravity effect.

Friends

- class [InputProcessor](#)
- void [init_attrjeod__SphericalHarmonicsDeltaControls](#) ()

8.9.1 Detailed Description

Provides controls for how a variational model affects a vehicle.

Definition at line 59 of file spherical_harmonics_delta_controls.hh.

8.9.2 Constructor & Destructor Documentation

8.9.2.1 jeod::SphericalHarmonicsDeltaControls::SphericalHarmonicsDeltaControls (void)

[SphericalHarmonicsDeltaControls](#) constructor.

Definition at line 55 of file spherical_harmonics_delta_controls.cc.

8.9.2.2 jeod::SphericalHarmonicsDeltaControls::∼SphericalHarmonicsDeltaControls (void)

[SphericalHarmonicsDeltaControls](#) destructor.

Definition at line 72 of file spherical_harmonics_delta_controls.cc.

8.9.3 Friends And Related Function Documentation

8.9.3.1 void init_attrjeod__SphericalHarmonicsDeltaControls ( ) `[friend]`

8.9.3.2 friend class InputProcessor `[friend]`

Definition at line 61 of file spherical_harmonics_delta_controls.hh.

8.9.4 Field Documentation

8.9.4.1 bool jeod::SphericalHarmonicsDeltaControls::active

Is this variational gravity effect active for this body?

trick_units(–)

Definition at line 80 of file spherical_harmonics_delta_controls.hh.

Referenced by jeod::SphericalHarmonicsGravityControls::sum_deltacoeffs().

8.9.4.2 unsigned int jeod::SphericalHarmonicsDeltaControls::degree

Coefficient degree to be used for this gravity effect.

trick_units(–)

Definition at line 90 of file spherical_harmonics_delta_controls.hh.

Referenced by jeod::SphericalHarmonicsGravityControls::sum_deltacoeffs().

8.9.4.3 bool jeod::SphericalHarmonicsDeltaControls::first_order_only

Calculate first-order term of this effect only; default to true for 2.0.

trick_units(–)

Definition at line 85 of file spherical_harmonics_delta_controls.hh.

Referenced by jeod::SphericalHarmonicsGravityControls::sum_deltacoeffs().

8.9.4.4 SphericalHarmonicsDeltaCoeffs∗ jeod::SphericalHarmonicsDeltaControls::grav_effect

Pointer to associated coefficient-altering gravitational effect.

trick_units(–)

Definition at line 70 of file spherical_harmonics_delta_controls.hh.

Referenced by jeod::SphericalHarmonicsGravityControls::add_deltacontrol(), and jeod::SphericalHarmonics-GravityControls::sum_deltacoeffs().

8.9.4.5 SphericalHarmonicsGravitySource∗ jeod::SphericalHarmonicsDeltaControls::grav_source

Pointer to the gravity body associated with this effect.

trick_units(–)

Definition at line 75 of file spherical_harmonics_delta_controls.hh.

8.9.4.6 unsigned int jeod::SphericalHarmonicsDeltaControls::order

Coefficient order to be used for this gravity effect.

trick_units(–)

Definition at line 95 of file spherical_harmonics_delta_controls.hh.

Referenced by jeod::SphericalHarmonicsGravityControls::sum_deltacoeffs().

The documentation for this class was generated from the following files:

- spherical_harmonics_delta_controls.hh
- spherical_harmonics_delta_controls.cc

8.10 jeod::SphericalHarmonicsGravityControls Class Reference

Specifies whether and how a SphericalHarmonicsGravitySource affects a vehicle.

`#include <spherical_harmonics_gravity_controls.hh>`

Inheritance diagram for jeod::SphericalHarmonicsGravityControls:

```
         jeod::GravityControls
                  ▲
                  │
    jeod::SphericalHarmonicsGravityControls
```
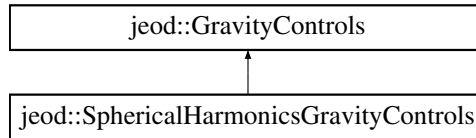
Public Member Functions

- SphericalHarmonicsGravityControls ()

  SphericalHarmonicsGravityControls constructor.
- virtual ∼SphericalHarmonicsGravityControls ()

  SphericalHarmonicsGravityControls destructor.
- virtual void initialize_control (GravityManager &grav_manager)

  Initialize this GravityControl.
- virtual void add_deltacontrol (SphericalHarmonicsDeltaControls ∗delta_control)

  Add a new GravityDeltaControls to the var_effects list.
- unsigned int get_degree (void)

  Output the current functional degree.
- unsigned int get_order (void)

  Output the current functional order.
- void get_degree_order (unsigned int &current_degree, unsigned int &current_order)

  Output the current functional degree and order.
- unsigned int get_grad_degree (void)

  Output the current functional gradient degree.
- unsigned int get_grad_order (void)

  Output the current functional gradient order.
- void get_grad_degree_order (unsigned int &curr_grad_degree, unsigned int &curr_grad_order)

  Output the current functional gradient degree and order.
- void set_degree (unsigned int new_degree)

  Update the functional degree.
- void set_order (unsigned int new_order)

  Update the functional order.
- void set_degree_order (unsigned int new_degree, unsigned int new_order)

  Update the functional degree and order.
- void set_grad_degree (unsigned int new_grad_degree)

  Update the functional gradient degree.
- void set_grad_order (unsigned int new_grad_order)

  Update the functional gradient order.
- void set_grad_degree_order (unsigned int new_grad_degree, unsigned int new_grad_order)

  Update the functional gradient degree and order.
- void disable_min_radius_warnings ()

  Disable minimum radius warnings for this spherical harmonics gravity control.

Data Fields

- SphericalHarmonicsGravitySource ∗ harmonics_source

  The GravitySource pointer from the base class, recast.
- double ∗∗ Pnm

  LeGendre polynomials used to calculate non-spherical attraction.
- unsigned int delta_degree

Coefficient degree to be used for totaling up all active delta_coeffs.

- unsigned int delta_order

    Coefficient order to be used for totaling up all active delta_coeffs.

- double ∗∗ delta_Cnm

    Array for collecting all active normalized real (cosine) variational spherical harmonic coefficients.

- double ∗∗ delta_Snm

    Array for collecting all active normalized real (sine) variational spherical harmonic coefficients.

- double total_dC20

    delta C20 coefficient for collecting first order effects of all active delta_coeffs.

- unsigned int degree

    Non-spherical degree to be used.

- unsigned int order

    Non-spherical order to be used.

- unsigned int gradient_degree

    Non-spherical degree to be used for computing gradient.

- unsigned int gradient_order

    Non-spherical order to be used for computing gradient.

- JeodPointerVector
  < SphericalHarmonicsDeltaControls >
  ::type var_effects

    List of controls for variational gravity effects like solid-body tides.

Protected Member Functions

- virtual void calc_nonspherical (const double posn[3], double body_grav_accel[3], double dgdx[3][3], double Pot[1])

    Compute the gravitational acceleration at a given position toward a gravitational body assuming the body has a non-spherical mass distribution.

- virtual void check_validity (void)

    Check the validity of the gravity controls.

- virtual void update_deltacoeffs (void)

    Command all of the gravitational variation effects to update themselves.

- virtual void sum_deltacoeffs (void)

    Loop over all of the active gravitational variation effects models and aggregate their changes to the gravity coefficients into the top-level delta-coeffs "bin" for this gravity body.

Protected Attributes

- bool min_radius_warn

    Indicates that the minimum radius threshold has been crossed and that a warning has been issued for such.

Private Member Functions

- SphericalHarmonicsGravityControls (const SphericalHarmonicsGravityControls &)
    Not implemented.
- SphericalHarmonicsGravityControls & operator= (const SphericalHarmonicsGravityControls &)
    Not implemented.

Friends

- class InputProcessor
- void init_attrjeod__SphericalHarmonicsGravityControls ()

Additional Inherited Members

8.10.1 Detailed Description

Specifies whether and how a SphericalHarmonicsGravitySource affects a vehicle.

Definition at line 74 of file spherical_harmonics_gravity_controls.hh.

8.10.2 Constructor & Destructor Documentation

8.10.2.1 jeod::SphericalHarmonicsGravityControls::SphericalHarmonicsGravityControls (const SphericalHarmonicsGravityControls &) `[private]`

Not implemented.

8.10.2.2 jeod::SphericalHarmonicsGravityControls::SphericalHarmonicsGravityControls (void)

SphericalHarmonicsGravityControls constructor.

Definition at line 75 of file spherical_harmonics_gravity_controls.cc.

References var_effects.

8.10.2.3 jeod::SphericalHarmonicsGravityControls::∼SphericalHarmonicsGravityControls (void) `[virtual]`

SphericalHarmonicsGravityControls destructor.

Definition at line 102 of file spherical_harmonics_gravity_controls.cc.

References jeod::SphericalHarmonicsGravitySource::degree, delta_Cnm, delta_degree, delta_Snm, harmonics_-source, Pnm, and var_effects.

8.10.3 Member Function Documentation

8.10.3.1 void jeod::SphericalHarmonicsGravityControls::add_deltacontrol (SphericalHarmonicsDeltaControls ∗ *delta_control*) `[virtual]`

Add a new GravityDeltaControls to the var_effects list.

Parameters

in	*delta_control*	Control to be added

Definition at line 205 of file spherical_harmonics_gravity_controls.cc.

References jeod::SphericalHarmonicsDeltaCoeffs::degree, delta_Cnm, delta_degree, delta_order, delta_Snm, jeod::SphericalHarmonicsDeltaControls::grav_effect, jeod::SphericalHarmonicsDeltaCoeffs::order, and var_effects.

8.10.3.2 void jeod::SphericalHarmonicsGravityControls::calc_nonspherical (const double *posn[3],* double *body_grav_accel[3],* double *dgdx[3][3],* double *Pot[1]*) `[protected],[virtual]`

Compute the gravitational acceleration at a given position toward a gravitational body assuming the body has a non-spherical mass distribution.

Parameters

in	*posn*	Point of interest, inrtl coords
		Units: M
out	*body_grav_accel*	Accel for given grav body
		Units: M/s2
out	*dgdx*	Gradient for given grav body
		Units: 1/s2
out	*Pot*	Potential

Implements jeod::GravityControls.

Definition at line 87 of file spherical_harmonics_calc_nonspherical.cc.

References jeod::SphericalHarmonicsGravitySource::alpha, jeod::SphericalHarmonicsGravitySource::beta, jeod-
::SphericalHarmonicsGravitySource::Cnm,   degree,   jeod::GravityMessages::domain_error,   jeod::Spherical-
HarmonicsGravitySource::eta, jeod::GravityControls::gradient, gradient_degree, gradient_order, harmonics_-
source, jeod::SphericalHarmonicsGravitySource::int_to_double, min_radius_warn, jeod::GravitySource::mu, jeod::-
GravitySource::name, jeod::SphericalHarmonicsGravitySource::nrdiag, order, jeod::GravitySource::pfix, Pnm, jeod-
::SphericalHarmonicsGravitySource::radius,   jeod::SphericalHarmonicsGravitySource::Snm,   sum_deltacoeffs(),
jeod::SphericalHarmonicsGravitySource::tide_free, jeod::SphericalHarmonicsGravitySource::tide_free_delta, total-
_dC20,   update_deltacoeffs(),   jeod::SphericalHarmonicsGravitySource::upsilon,   var_effects,   jeod::Spherical-
HarmonicsGravitySource::xi, and jeod::SphericalHarmonicsGravitySource::zeta.

8.10.3.3   void jeod::SphericalHarmonicsGravityControls::check_validity (void) `[protected],[virtual]`

Check the validity of the gravity controls.

Definition at line 446 of file spherical_harmonics_gravity_controls.cc.

References jeod::SphericalHarmonicsGravitySource::degree, degree, jeod::GravityControls::gradient, gradient_-
degree, gradient_order, harmonics_source, jeod::GravityMessages::invalid_limit, jeod::GravityMessages::invalid-
_object, jeod::GravitySource::name, jeod::SphericalHarmonicsGravitySource::order, order, jeod::GravityControls-
::source_name, and jeod::GravityControls::spherical.

Referenced by initialize_control(), set_degree(), set_degree_order(), set_grad_degree(), set_grad_degree_order(),
set_grad_order(), and set_order().

8.10.3.4   void jeod::SphericalHarmonicsGravityControls::disable_min_radius_warnings ( ) `[inline]`

Disable minimum radius warnings for this spherical harmonics gravity control.

Definition at line 250 of file spherical_harmonics_gravity_controls.hh.

8.10.3.5   unsigned int jeod::SphericalHarmonicsGravityControls::get_degree (void)

Output the current functional degree.

Returns

Current degree

Definition at line 257 of file spherical_harmonics_gravity_controls.cc.

References degree.

8.10.3.6   void jeod::SphericalHarmonicsGravityControls::get_degree_order (unsigned int & *current_degree,* unsigned int & *current_order*)

Output the current functional degree and order.

Parameters

out	*current_degree*	Current degree
out	*current_order*	Current order

Definition at line 282 of file spherical_harmonics_gravity_controls.cc.

References degree, and order.

8.10.3.7 unsigned int jeod::SphericalHarmonicsGravityControls::get_grad_degree (void)

Output the current functional gradient degree.

Returns

Current gradient degree

Definition at line 298 of file spherical_harmonics_gravity_controls.cc.

References gradient_degree.

8.10.3.8 void jeod::SphericalHarmonicsGravityControls::get_grad_degree_order (unsigned int & *curr_grad_degree,* unsigned int & *curr_grad_order*)

Output the current functional gradient degree and order.

Parameters

out	*curr_grad_-degree*	Current gradient degree
out	*curr_grad_order*	Current gradient order

Definition at line 323 of file spherical_harmonics_gravity_controls.cc.

References gradient_degree, and gradient_order.

8.10.3.9 unsigned int jeod::SphericalHarmonicsGravityControls::get_grad_order (void)

Output the current functional gradient order.

Returns

Current gradient order

Definition at line 310 of file spherical_harmonics_gravity_controls.cc.

References gradient_order.

8.10.3.10 unsigned int jeod::SphericalHarmonicsGravityControls::get_order (void)

Output the current functional order.

Returns

Current order

Definition at line 269 of file spherical_harmonics_gravity_controls.cc.

References order.

8.10.3.11   void jeod::SphericalHarmonicsGravityControls::initialize_control (GravityManager & *grav_manager*)
`[virtual]`

Initialize this GravityControl.

Parameters

in	*grav_manager*	Ref to Gravity Manager

Reimplemented from jeod::GravityControls.

Definition at line 140 of file spherical_harmonics_gravity_controls.cc.

References jeod::GravityControls::body, check_validity(), jeod::SphericalHarmonicsGravitySource::degree, harmonics_source, jeod::GravityControls::initialize_control(), and Pnm.

8.10.3.12 SphericalHarmonicsGravityControls& jeod::SphericalHarmonicsGravityControls::operator= (const SphericalHarmonicsGravityControls &) `[private]`

Not implemented.

8.10.3.13 void jeod::SphericalHarmonicsGravityControls::set_degree (unsigned int *new_degree*)

Update the functional degree.

Parameters

in	*new_degree*	New desired degree

Definition at line 339 of file spherical_harmonics_gravity_controls.cc.

References check_validity(), and degree.

8.10.3.14 void jeod::SphericalHarmonicsGravityControls::set_degree_order (unsigned int *new_degree,* unsigned int *new_order*)

Update the functional degree and order.

Parameters

in	*new_degree*	New desired degree
in	*new_order*	New desired order

Definition at line 374 of file spherical_harmonics_gravity_controls.cc.

References check_validity(), degree, and order.

8.10.3.15 void jeod::SphericalHarmonicsGravityControls::set_grad_degree (unsigned int *new_grad_degree*)

Update the functional gradient degree.

Parameters

in	*new_grad_-* *degree*	New desired degree

Definition at line 393 of file spherical_harmonics_gravity_controls.cc.

References check_validity(), and gradient_degree.

8.10.3.16 void jeod::SphericalHarmonicsGravityControls::set_grad_degree_order (unsigned int *new_grad_degree,* unsigned int *new_grad_order*)

Update the functional gradient degree and order.

Parameters

in	new_grad_- degree	New desired degree
in	new_grad_order	New desired order

Definition at line 428 of file spherical_harmonics_gravity_controls.cc.

References check_validity(), gradient_degree, and gradient_order.

8.10.3.17 void jeod::SphericalHarmonicsGravityControls::set_grad_order (unsigned int *new_grad_order*)

Update the functional gradient order.

Parameters

in	new_grad_order	New desired order

Definition at line 410 of file spherical_harmonics_gravity_controls.cc.

References check_validity(), and gradient_order.

8.10.3.18 void jeod::SphericalHarmonicsGravityControls::set_order (unsigned int *new_order*)

Update the functional order.

Parameters

in	new_order	New desired order

Definition at line 356 of file spherical_harmonics_gravity_controls.cc.

References check_validity(), and order.

8.10.3.19 void jeod::SphericalHarmonicsGravityControls::sum_deltacoeffs (void) `[protected],[virtual]`

Loop over all of the active gravitational variation effects models and aggregate their changes to the gravity coefficients into the top-level delta-coeffs "bin" for this gravity body.

Definition at line 575 of file spherical_harmonics_gravity_controls.cc.

References jeod::SphericalHarmonicsDeltaControls::active, jeod::SphericalHarmonicsDeltaCoeffs::dC20, jeod::-SphericalHarmonicsDeltaControls::degree, jeod::SphericalHarmonicsDeltaCoeffs::delta_Cnm, delta_Cnm, jeod::-SphericalHarmonicsGravitySource::delta_coeffs, delta_degree, delta_order, jeod::SphericalHarmonicsDeltaCoeffs-::delta_Snm, delta_Snm, jeod::SphericalHarmonicsDeltaControls::first_order_only, jeod::SphericalHarmonicsDelta-Controls::grav_effect, harmonics_source, jeod::SphericalHarmonicsDeltaControls::order, total_dC20, and var_-effects.

Referenced by calc_nonspherical().

8.10.3.20 void jeod::SphericalHarmonicsGravityControls::update_deltacoeffs (void) `[protected],[virtual]`

Command all of the gravitational variation effects to update themselves.

Definition at line 553 of file spherical_harmonics_gravity_controls.cc.

References jeod::GravityControls::active, jeod::SphericalHarmonicsGravitySource::delta_coeffs, harmonics_-source, and var_effects.

Referenced by calc_nonspherical().

8.10.4 Friends And Related Function Documentation

8.10.4.1 void init_attrjeod__SphericalHarmonicsGravityControls ( ) `[friend]`

8.10.4.2 friend class InputProcessor `[friend]`

Definition at line 76 of file spherical_harmonics_gravity_controls.hh.

8.10.5 Field Documentation

8.10.5.1 unsigned int jeod::SphericalHarmonicsGravityControls::degree

Non-spherical degree to be used.

NOTE: this data being public is deprecated and should not be relied upon in future releases. Use the provided accessor methods instead.trick_units(–)

Definition at line 137 of file spherical_harmonics_gravity_controls.hh.

Referenced by calc_nonspherical(), check_validity(), get_degree(), get_degree_order(), set_degree(), and set_-degree_order().

8.10.5.2 double∗∗ jeod::SphericalHarmonicsGravityControls::delta_Cnm

Array for collecting all active normalized real (cosine) variational spherical harmonic coefficients.

trick_units(–)

Definition at line 117 of file spherical_harmonics_gravity_controls.hh.

Referenced by add_deltacontrol(), sum_deltacoeffs(), and ∼SphericalHarmonicsGravityControls().

8.10.5.3 unsigned int jeod::SphericalHarmonicsGravityControls::delta_degree

Coefficient degree to be used for totaling up all active delta_coeffs.

trick_units(–)

Definition at line 106 of file spherical_harmonics_gravity_controls.hh.

Referenced by add_deltacontrol(), sum_deltacoeffs(), and ∼SphericalHarmonicsGravityControls().

8.10.5.4 unsigned int jeod::SphericalHarmonicsGravityControls::delta_order

Coefficient order to be used for totaling up all active delta_coeffs.

trick_units(–)

Definition at line 111 of file spherical_harmonics_gravity_controls.hh.

Referenced by add_deltacontrol(), and sum_deltacoeffs().

8.10.5.5 double∗∗ jeod::SphericalHarmonicsGravityControls::delta_Snm

Array for collecting all active normalized real (sine) variational spherical harmonic coefficients.

trick_units(–)

Definition at line 123 of file spherical_harmonics_gravity_controls.hh.

Referenced by add_deltacontrol(), sum_deltacoeffs(), and ∼SphericalHarmonicsGravityControls().

8.10.5.6 unsigned int jeod::SphericalHarmonicsGravityControls::gradient_degree

Non-spherical degree to be used for computing gradient.

NOTE: this data being public is deprecated and should not be relied upon in future releases. Use the provided accessor methods instead.trick_units(–)

Definition at line 151 of file spherical_harmonics_gravity_controls.hh.

Referenced by calc_nonspherical(), check_validity(), get_grad_degree(), get_grad_degree_order(), set_grad_-degree(), and set_grad_degree_order().

8.10.5.7 unsigned int jeod::SphericalHarmonicsGravityControls::gradient_order

Non-spherical order to be used for computing gradient.

NOTE: this data being public is deprecated and should not be relied upon in future releases. Use the provided accessor methods instead.trick_units(–)

Definition at line 158 of file spherical_harmonics_gravity_controls.hh.

Referenced by calc_nonspherical(), check_validity(), get_grad_degree_order(), get_grad_order(), set_grad_-degree_order(), and set_grad_order().

8.10.5.8 SphericalHarmonicsGravitySource∗ jeod::SphericalHarmonicsGravityControls::harmonics_source

The GravitySource pointer from the base class, recast.

Note

> Users should not set this data member in the input file.trick_units(–)

Definition at line 95 of file spherical_harmonics_gravity_controls.hh.

Referenced by calc_nonspherical(), check_validity(), initialize_control(), sum_deltacoeffs(), update_deltacoeffs(), and ∼SphericalHarmonicsGravityControls().

8.10.5.9 bool jeod::SphericalHarmonicsGravityControls::min_radius_warn `[protected]`

Indicates that the minimum radius threshold has been crossed and that a warning has been issued for such.

This prevents a spew of messages regarding such under-threshold conditions.

Note

> Users should not set this data member in the input file unless you wish to disable all such messages.trick_-units(–)

Definition at line 88 of file spherical_harmonics_gravity_controls.hh.

Referenced by calc_nonspherical().

8.10.5.10 unsigned int jeod::SphericalHarmonicsGravityControls::order

Non-spherical order to be used.

NOTE: this data being public is deprecated and should not be relied upon in future releases. Use the provided accessor methods instead.trick_units(–)

Definition at line 144 of file spherical_harmonics_gravity_controls.hh.

Referenced by calc_nonspherical(), check_validity(), get_degree_order(), get_order(), set_degree_order(), and set-_order().

8.10.5.11 double∗∗ jeod::SphericalHarmonicsGravityControls::Pnm

LeGendre polynomials used to calculate non-spherical attraction.

trick_units(–)

Definition at line 100 of file spherical_harmonics_gravity_controls.hh.

Referenced by calc_nonspherical(), initialize_control(), and ∼SphericalHarmonicsGravityControls().

8.10.5.12 double jeod::SphericalHarmonicsGravityControls::total_dC20

delta C20 coefficient for collecting first order effects of all active delta_coeffs.

trick_units(–)

Definition at line 129 of file spherical_harmonics_gravity_controls.hh.

Referenced by calc_nonspherical(), and sum_deltacoeffs().

8.10.5.13 JeodPointerVector<SphericalHarmonicsDeltaControls>::type jeod::SphericalHarmonicsGravityControls::var-_effects

List of controls for variational gravity effects like solid-body tides.

trick_io(∗∗)

Definition at line 163 of file spherical_harmonics_gravity_controls.hh.

Referenced by add_deltacontrol(), calc_nonspherical(), SphericalHarmonicsGravityControls(), sum_deltacoeffs(), update_deltacoeffs(), and ∼SphericalHarmonicsGravityControls().

The documentation for this class was generated from the following files:

- spherical_harmonics_gravity_controls.hh
- spherical_harmonics_calc_nonspherical.cc
- spherical_harmonics_gravity_controls.cc

8.11 jeod::SphericalHarmonicsGravitySource Class Reference

Models the gravity for a specific planet using spherical harmonics.

`#include <spherical_harmonics_gravity_source.hh>`

Inheritance diagram for jeod::SphericalHarmonicsGravitySource:
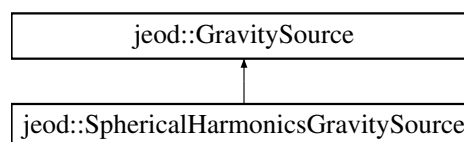
jeod::GravitySource

jeod::SphericalHarmonicsGravitySource

Public Member Functions

- SphericalHarmonicsGravitySource ()

    SphericalHarmonicsGravitySource constructor.
- virtual ∼SphericalHarmonicsGravitySource ()

    SphericalHarmonicsGravitySource destructor.
- virtual void initialize_body (void)

Initialize Gottlieb gravity coefficients.

- int find_deltacoeff (const SphericalHarmonicsDeltaCoeffs &delta_coeff) const

    Find the given variational gravity effect if already exists.

- void add_deltacoeff (SphericalHarmonicsDeltaCoeffsInit &var_init, BaseDynManager &dyn_manager, SphericalHarmonicsDeltaCoeffs &var_effect)

    Add a gravitational variation effect (i.e., a delta coeffs) to the vector of effects.

Data Fields

- double radius

    Spherical harmonics distance scale, typically the planet's mean equatorial radius.

- unsigned int degree

    The degree of the spherical harmonics gravity coefficients.

- unsigned int order

    The order of the spherical harmonics gravity coefficients.

- double ∗∗ Cnm

    Normalized real (cosine) spherical harmonic coefficients.

- double ∗∗ Snm

    Normalized imaginary (sine) spherical harmonic coefficients.

- bool tide_free

    Is C20 coefficient free of the permanent tide effect?

- double tide_free_delta

    Number to be added to C20 to remove the permanent tide.

- double ∗ a_by_rad

    (Planet radius/vehicle distance)$^\wedge$n

- double ∗ alpha

    Gottlieb coefficient alpha.

- double ∗ beta

    Gottlieb coefficient beta.

- double ∗∗ xi

    Gottlieb coefficient xi.

- double ∗∗ eta

    Gottlieb coefficient eta.

- double ∗∗ zeta

    Gottlieb coefficient zeta.

- double ∗∗ upsilon

    Gottlieb coefficient upsilon.

- double ∗ nrdiag

    Gottlieb coefficient nrdiag.

- double ∗ int_to_double

    0 to degree+1 cast as doubles

- JeodPointerVector
  < SphericalHarmonicsDeltaCoeffs >
  ::type delta_coeffs

    List of all gravity coefficient altering effects such as solid-body tides.

Private Member Functions

- SphericalHarmonicsGravitySource (const SphericalHarmonicsGravitySource &)

    Not implemented.

- SphericalHarmonicsGravitySource & operator= (const SphericalHarmonicsGravitySource &)

    Not implemented.

Friends

- class [InputProcessor](#)
- void [init_attrjeod__SphericalHarmonicsGravitySource](#) ()

8.11.1 Detailed Description

Models the gravity for a specific planet using spherical harmonics.

Definition at line 75 of file spherical_harmonics_gravity_source.hh.

8.11.2 Constructor & Destructor Documentation

8.11.2.1 jeod::SphericalHarmonicsGravitySource::SphericalHarmonicsGravitySource (const SphericalHarmonicsGravitySource &) `[private]`

Not implemented.

8.11.2.2 jeod::SphericalHarmonicsGravitySource::SphericalHarmonicsGravitySource (void)

[SphericalHarmonicsGravitySource](#) constructor.

Definition at line 86 of file spherical_harmonics_gravity_source.cc.

References delta_coeffs.

8.11.2.3 jeod::SphericalHarmonicsGravitySource::∼SphericalHarmonicsGravitySource (void) `[virtual]`

[SphericalHarmonicsGravitySource](#) destructor.

Definition at line 117 of file spherical_harmonics_gravity_source.cc.

References a_by_rad, alpha, beta, Cnm, degree, delta_coeffs, eta, int_to_double, nrdiag, Snm, upsilon, xi, and zeta.

8.11.3 Member Function Documentation

8.11.3.1 void jeod::SphericalHarmonicsGravitySource::add_deltacoeff (SphericalHarmonicsDeltaCoeffsInit & *var_init,* BaseDynManager & *dyn_manager,* SphericalHarmonicsDeltaCoeffs & *var_effect*)

Add a gravitational variation effect (i.e., a delta coeffs) to the vector of effects.

Parameters

in	*var_init*	Effect init structure
in	*dyn_manager*	Dynamics manager
in	*var_effect*	Delta coeff to be added

Definition at line 324 of file spherical_harmonics_gravity_source.cc.

References delta_coeffs, jeod::GravityMessages::duplicate_entry, find_deltacoeff(), jeod::SphericalHarmonics-DeltaCoeffs::grav_source, jeod::SphericalHarmonicsDeltaCoeffs::initialize(), and jeod::GravitySource::name.

8.11.3.2 int jeod::SphericalHarmonicsGravitySource::find_deltacoeff (const SphericalHarmonicsDeltaCoeffs & *delta_coeff*) const

Find the given variational gravity effect if already exists.

Returns

> Index number of delta-coeff; -1 if not found

Parameters

in	*delta_coeff*	delta-coeff to be found

Definition at line 293 of file spherical_harmonics_gravity_source.cc.

References delta_coeffs, and jeod::GravitySource::name.

Referenced by add_deltacoeff().

8.11.3.3   void jeod::SphericalHarmonicsGravitySource::initialize_body (void) `[virtual]`

Initialize Gottlieb gravity coefficients.

Definition at line 157 of file spherical_harmonics_gravity_source.cc.

References a_by_rad, alpha, beta, degree, eta, int_to_double, nrdiag, upsilon, xi, and zeta.

8.11.3.4   SphericalHarmonicsGravitySource& jeod::SphericalHarmonicsGravitySource::operator= (const SphericalHarmonicsGravitySource &) `[private]`

Not implemented.

8.11.4   Friends And Related Function Documentation

8.11.4.1   void init_attrjeod__SphericalHarmonicsGravitySource ( ) `[friend]`

8.11.4.2   friend class InputProcessor `[friend]`

Definition at line 77 of file spherical_harmonics_gravity_source.hh.

8.11.5   Field Documentation

8.11.5.1   double∗ jeod::SphericalHarmonicsGravitySource::a_by_rad

(Planet radius/vehicle distance)$^\wedge$n

trick_units(–)

Definition at line 120 of file spherical_harmonics_gravity_source.hh.

Referenced by initialize_body(), and ∼SphericalHarmonicsGravitySource().

8.11.5.2   double∗ jeod::SphericalHarmonicsGravitySource::alpha

Gottlieb coefficient alpha.

trick_units(–)

Definition at line 124 of file spherical_harmonics_gravity_source.hh.

Referenced by jeod::SphericalHarmonicsGravityControls::calc_nonspherical(), initialize_body(), and ∼SphericalHarmonicsGravitySource().

8.11.5.3   double∗ jeod::SphericalHarmonicsGravitySource::beta

Gottlieb coefficient beta.

trick_units(−)

Definition at line 128 of file spherical_harmonics_gravity_source.hh.

Referenced by jeod::SphericalHarmonicsGravityControls::calc_nonspherical(), initialize_body(), and ∼Spherical-HarmonicsGravitySource().

8.11.5.4   double∗∗ jeod::SphericalHarmonicsGravitySource::Cnm

Normalized real (cosine) spherical harmonic coefficients.

trick_units(−)

Definition at line 100 of file spherical_harmonics_gravity_source.hh.

Referenced by jeod::SphericalHarmonicsGravityControls::calc_nonspherical(), jeod::SphericalHarmonicsGravity-Source_earth_GGM02C_default_data::initialize(), jeod::SphericalHarmonicsGravitySource_earth_GGM05C_-default_data::initialize(), jeod::SphericalHarmonicsGravitySource_moon_LP150Q_default_data::initialize(), jeod::-SphericalHarmonicsGravitySource_mars_MRO110B2_default_data::initialize(), jeod::SphericalHarmonicsGravity-Source_earth_GEMT1_default_data::initialize(), and ∼SphericalHarmonicsGravitySource().

8.11.5.5   unsigned int jeod::SphericalHarmonicsGravitySource::degree

The degree of the spherical harmonics gravity coefficients.

trick_units(−)

Definition at line 90 of file spherical_harmonics_gravity_source.hh.

Referenced by jeod::SphericalHarmonicsGravityControls::check_validity(), jeod::SphericalHarmonicsGravity-Source_earth_spherical_default_data::initialize(), jeod::SphericalHarmonicsGravitySource_earth_GEMT1_default-_data::initialize(), jeod::SphericalHarmonicsGravitySource_earth_GGM02C_default_data::initialize(), jeod::-SphericalHarmonicsGravitySource_mars_MRO110B2_default_data::initialize(), jeod::SphericalHarmonicsGravity-Source_earth_GGM05C_default_data::initialize(), jeod::SphericalHarmonicsGravitySource_moon_LP150Q_-default_data::initialize(), initialize_body(), jeod::SphericalHarmonicsGravityControls::initialize_control(), jeod::-SphericalHarmonicsGravityControls::∼SphericalHarmonicsGravityControls(), and ∼SphericalHarmonicsGravity-Source().

8.11.5.6   JeodPointerVector<**SphericalHarmonicsDeltaCoeffs**>**::type jeod::SphericalHarmonicsGravitySource::delta_-coeffs**

List of all gravity coefficient altering effects such as solid-body tides.

trick_io(∗∗)

Definition at line 158 of file spherical_harmonics_gravity_source.hh.

Referenced by add_deltacoeff(), find_deltacoeff(), SphericalHarmonicsGravitySource(), jeod::SphericalHarmonics-GravityControls::sum_deltacoeffs(), jeod::SphericalHarmonicsGravityControls::update_deltacoeffs(), and ∼-SphericalHarmonicsGravitySource().

8.11.5.7   double∗∗ jeod::SphericalHarmonicsGravitySource::eta

Gottlieb coefficient eta.

trick_units(−)

Definition at line 136 of file spherical_harmonics_gravity_source.hh.

Referenced by jeod::SphericalHarmonicsGravityControls::calc_nonspherical(), initialize_body(), and ∼Spherical-HarmonicsGravitySource().

8.11.5.8 double∗ jeod::SphericalHarmonicsGravitySource::int_to_double

0 to degree+1 cast as doubles

trick_units(−)

Definition at line 152 of file spherical_harmonics_gravity_source.hh.

Referenced by jeod::SphericalHarmonicsGravityControls::calc_nonspherical(), initialize_body(), and ∼Spherical-HarmonicsGravitySource().

8.11.5.9 double∗ jeod::SphericalHarmonicsGravitySource::nrdiag

Gottlieb coefficient nrdiag.

trick_units(−)

Definition at line 148 of file spherical_harmonics_gravity_source.hh.

Referenced by jeod::SphericalHarmonicsGravityControls::calc_nonspherical(), initialize_body(), and ∼Spherical-HarmonicsGravitySource().

8.11.5.10 unsigned int jeod::SphericalHarmonicsGravitySource::order

The order of the spherical harmonics gravity coefficients.

trick_units(−)

Definition at line 95 of file spherical_harmonics_gravity_source.hh.

Referenced by jeod::SphericalHarmonicsGravityControls::check_validity(), jeod::SphericalHarmonicsGravity-Source_earth_spherical_default_data::initialize(), jeod::SphericalHarmonicsGravitySource_moon_LP150Q_-default_data::initialize(), jeod::SphericalHarmonicsGravitySource_mars_MRO110B2_default_data::initialize(), jeod-::SphericalHarmonicsGravitySource_earth_GGM02C_default_data::initialize(), jeod::SphericalHarmonicsGravity-Source_earth_GGM05C_default_data::initialize(), and jeod::SphericalHarmonicsGravitySource_earth_GEMT1_-default_data::initialize().

8.11.5.11 double jeod::SphericalHarmonicsGravitySource::radius

Spherical harmonics distance scale, typically the planet's mean equatorial radius.

trick_units(m)

Definition at line 85 of file spherical_harmonics_gravity_source.hh.

Referenced by jeod::SphericalHarmonicsGravityControls::calc_nonspherical(), jeod::SphericalHarmonicsGravity-Source_earth_spherical_default_data::initialize(), jeod::SphericalHarmonicsGravitySource_earth_GGM02C_-default_data::initialize(), jeod::SphericalHarmonicsGravitySource_moon_LP150Q_default_data::initialize(), jeod-::SphericalHarmonicsGravitySource_moon_spherical_default_data::initialize(), jeod::SphericalHarmonicsGravity-Source_earth_GEMT1_default_data::initialize(), jeod::SphericalHarmonicsGravitySource_mars_spherical_default-_data::initialize(), jeod::SphericalHarmonicsGravitySource_mars_MRO110B2_default_data::initialize(), jeod:-SphericalHarmonicsGravitySource_earth_GGM05C_default_data::initialize(), jeod::SphericalHarmonicsGravity-Source_jupiter_spherical_default_data::initialize(), jeod::SphericalHarmonicsGravitySource_sun_spherical_-default_data::initialize(), and jeod::SphericalHarmonicsSolidBodyTides::update().

8.11.5.12 double∗∗ jeod::SphericalHarmonicsGravitySource::Snm

Normalized imaginary (sine) spherical harmonic coefficients.

trick_units(–)

Definition at line 105 of file spherical_harmonics_gravity_source.hh.

Referenced by jeod::SphericalHarmonicsGravityControls::calc_nonspherical(), jeod::SphericalHarmonicsGravity-Source_earth_GGM02C_default_data::initialize(), jeod::SphericalHarmonicsGravitySource_earth_GGM05C_-default_data::initialize(), jeod::SphericalHarmonicsGravitySource_moon_LP150Q_default_data::initialize(), jeod::-SphericalHarmonicsGravitySource_mars_MRO110B2_default_data::initialize(), jeod::SphericalHarmonicsGravity-Source_earth_GEMT1_default_data::initialize(), and ∼SphericalHarmonicsGravitySource().

8.11.5.13 bool jeod::SphericalHarmonicsGravitySource::tide_free

Is C20 coefficient free of the permanent tide effect?

trick_units(–)

Definition at line 110 of file spherical_harmonics_gravity_source.hh.

Referenced by jeod::SphericalHarmonicsGravityControls::calc_nonspherical(), jeod::SphericalHarmonicsGravity-Source_earth_GGM05C_default_data::initialize(), jeod::SphericalHarmonicsGravitySource_moon_LP150Q_-default_data::initialize(), jeod::SphericalHarmonicsGravitySource_mars_MRO110B2_default_data::initialize(), jeod::SphericalHarmonicsGravitySource_earth_GEMT1_default_data::initialize(), and jeod::SphericalHarmonics-GravitySource_earth_GGM02C_default_data::initialize().

8.11.5.14 double jeod::SphericalHarmonicsGravitySource::tide_free_delta

Number to be added to C20 to remove the permanent tide.

trick_units(–)

Definition at line 115 of file spherical_harmonics_gravity_source.hh.

Referenced by jeod::SphericalHarmonicsGravityControls::calc_nonspherical(), jeod::SphericalHarmonicsGravity-Source_earth_GGM02C_default_data::initialize(), jeod::SphericalHarmonicsGravitySource_moon_LP150Q_-default_data::initialize(), jeod::SphericalHarmonicsGravitySource_earth_GGM05C_default_data::initialize(), and jeod::SphericalHarmonicsGravitySource_earth_GEMT1_default_data::initialize().

8.11.5.15 double∗∗ jeod::SphericalHarmonicsGravitySource::upsilon

Gottlieb coefficient upsilon.

trick_units(–)

Definition at line 144 of file spherical_harmonics_gravity_source.hh.

Referenced by jeod::SphericalHarmonicsGravityControls::calc_nonspherical(), initialize_body(), and ∼Spherical-HarmonicsGravitySource().

8.11.5.16 double∗∗ jeod::SphericalHarmonicsGravitySource::xi

Gottlieb coefficient xi.

trick_units(–)

Definition at line 132 of file spherical_harmonics_gravity_source.hh.

Referenced by jeod::SphericalHarmonicsGravityControls::calc_nonspherical(), initialize_body(), and ∼Spherical-HarmonicsGravitySource().

8.11.5.17 double∗∗ jeod::SphericalHarmonicsGravitySource::zeta

Gottlieb coefficient zeta.

trick_units(–)

Definition at line 140 of file spherical_harmonics_gravity_source.hh.

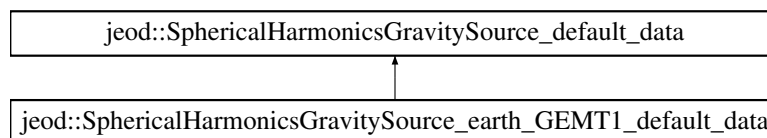Referenced by jeod::SphericalHarmonicsGravityControls::calc_nonspherical(), initialize_body(), and ∼Spherical-HarmonicsGravitySource().

The documentation for this class was generated from the following files:

- spherical_harmonics_gravity_source.hh
- spherical_harmonics_gravity_source.cc

8.12 jeod::SphericalHarmonicsGravitySource_default_data Class Reference

`#include <spherical_harmonics_gravity_source_default_data.hh>`

Inheritance diagram for jeod::SphericalHarmonicsGravitySource_default_data:
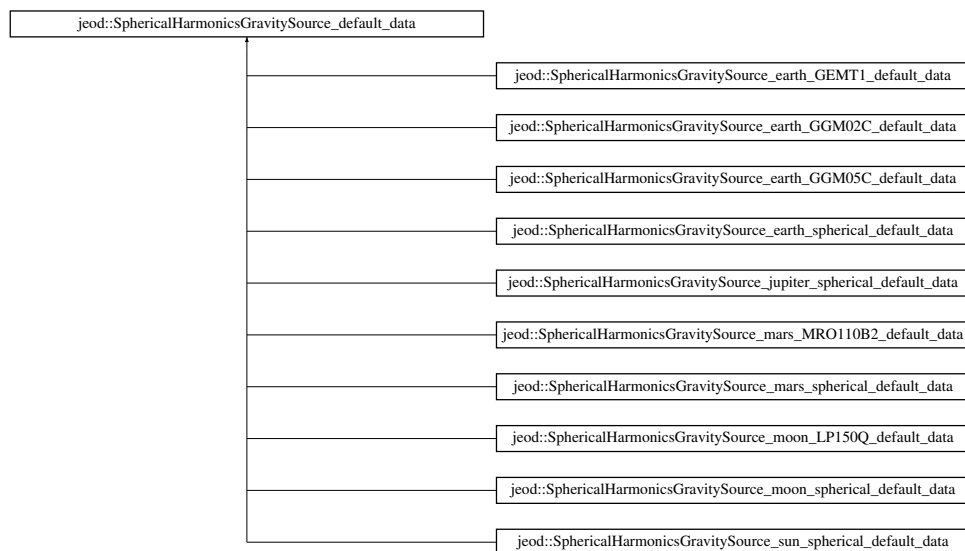
Public Member Functions

- virtual void initialize (SphericalHarmonicsGravitySource ∗)=0
- virtual ∼SphericalHarmonicsGravitySource_default_data ()

8.12.1 Detailed Description

Definition at line 14 of file spherical_harmonics_gravity_source_default_data.hh.

8.12.2 Constructor & Destructor Documentation

8.12.2.1 virtual jeod::SphericalHarmonicsGravitySource_default_data::∼SphericalHarmonicsGravitySource_default_data ( )
`[inline],[virtual]`

Definition at line 17 of file spherical_harmonics_gravity_source_default_data.hh.

8.12.3 Member Function Documentation

8.12.3.1 virtual void jeod::SphericalHarmonicsGravitySource_default_data::initialize (SphericalHarmonicsGravitySource ∗) `[pure virtual]`

Implemented in jeod::SphericalHarmonicsGravitySource_jupiter_spherical_default_data, jeod::SphericalHarmonics-GravitySource_sun_spherical_default_data, jeod::SphericalHarmonicsGravitySource_earth_GEMT1_default_-data, jeod::SphericalHarmonicsGravitySource_earth_GGM02C_default_data, jeod::SphericalHarmonicsGravity-Source_earth_GGM05C_default_data, jeod::SphericalHarmonicsGravitySource_mars_MRO110B2_default_data, jeod::SphericalHarmonicsGravitySource_mars_spherical_default_data, jeod::SphericalHarmonicsGravitySource_-moon_LP150Q_default_data, jeod::SphericalHarmonicsGravitySource_moon_spherical_default_data, and jeod::-SphericalHarmonicsGravitySource_earth_spherical_default_data.

The documentation for this class was generated from the following file:

- spherical_harmonics_gravity_source_default_data.hh

8.13 jeod::SphericalHarmonicsGravitySource_earth_GEMT1_default_data Class Reference

`#include <earth_GEMT1.hh>`

Inheritance diagram for jeod::SphericalHarmonicsGravitySource_earth_GEMT1_default_data:

```
┌─────────────────────────────────────────────────────────────┐
│   jeod::SphericalHarmonicsGravitySource_default_data          │
└─────────────────────────────────────────────────────────────┘
                              ▲
┌─────────────────────────────────────────────────────────────┐
│  jeod::SphericalHarmonicsGravitySource_earth_GEMT1_default_data│
└─────────────────────────────────────────────────────────────┘
```

Public Member Functions

- virtual void initialize (SphericalHarmonicsGravitySource ∗)

8.13.1 Detailed Description

Definition at line 18 of file earth_GEMT1.hh.

8.13.2 Member Function Documentation

8.13.2.1 void jeod::SphericalHarmonicsGravitySource_earth_GEMT1_default_data::initialize (SphericalHarmonicsGravitySource ∗ SphericalHarmonicsGravitySource_ptr) `[virtual]`

Implements jeod::SphericalHarmonicsGravitySource_default_data.

Definition at line 70 of file earth_GEMT1.cc.

References jeod::SphericalHarmonicsGravitySource::Cnm, jeod::SphericalHarmonicsGravitySource::degree, jeod-::GravitySource::mu, jeod::GravitySource::name, jeod::SphericalHarmonicsGravitySource::order, jeod::Spherical-HarmonicsGravitySource::radius, jeod::SphericalHarmonicsGravitySource::Snm, jeod::SphericalHarmonics-GravitySource::tide_free, and jeod::SphericalHarmonicsGravitySource::tide_free_delta.

The documentation for this class was generated from the following files:

- earth_GEMT1.hh
- earth_GEMT1.cc

8.14 jeod::SphericalHarmonicsGravitySource_earth_GGM02C_default_data Class Reference

```
#include <earth_GGM02C.hh>
```

Inheritance diagram for jeod::SphericalHarmonicsGravitySource_earth_GGM02C_default_data:

```
┌──────────────────────────────────────────────────────────┐
│   jeod::SphericalHarmonicsGravitySource_default_data       │
└──────────────────────────────────────────────────────────┘
                            ▲
                            │
┌──────────────────────────────────────────────────────────┐
│ jeod::SphericalHarmonicsGravitySource_earth_GGM02C_default_data │
└──────────────────────────────────────────────────────────┘
```
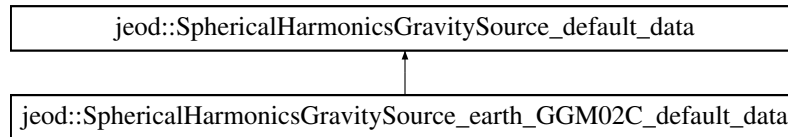
Public Member Functions

- virtual void initialize (SphericalHarmonicsGravitySource ∗)

8.14.1 Detailed Description

Definition at line 18 of file earth_GGM02C.hh.

8.14.2 Member Function Documentation

8.14.2.1 void jeod::SphericalHarmonicsGravitySource_earth_GGM02C_default_data::initialize (SphericalHarmonicsGravitySource ∗ *SphericalHarmonicsGravitySource_ptr*) [virtual]

Implements jeod::SphericalHarmonicsGravitySource_default_data.

Definition at line 64 of file earth_GGM02C.cc.

References jeod::SphericalHarmonicsGravitySource::Cnm, jeod::SphericalHarmonicsGravitySource::degree, jeod-::GravitySource::mu, jeod::GravitySource::name, jeod::SphericalHarmonicsGravitySource::order, jeod::Spherical-HarmonicsGravitySource::radius, jeod::SphericalHarmon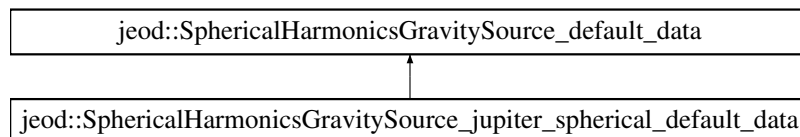icsGravitySource::Snm, jeod::SphericalHarmonics-GravitySource::tide_free, and jeod::SphericalHarmonicsGravitySource::tide_free_delta.

The documentation for this class was generated from the following files:

- earth_GGM02C.hh
- earth_GGM02C.cc

8.15 jeod::SphericalHarmonicsGravitySource_earth_GGM05C_default_data Class Reference

```
#include <earth_GGM05C.hh>
```

Inheritance diagram for jeod::SphericalHarmonicsGravitySource_earth_GGM05C_default_data:

```
┌──────────────────────────────────────────────────────────┐
│   jeod::SphericalHarmonicsGravitySource_default_data       │
└──────────────────────────────────────────────────────────┘
                            ▲
                            │
┌──────────────────────────────────────────────────────────┐
│ jeod::SphericalHarmonicsGravitySource_earth_GGM05C_default_data │
└──────────────────────────────────────────────────────────┘
```
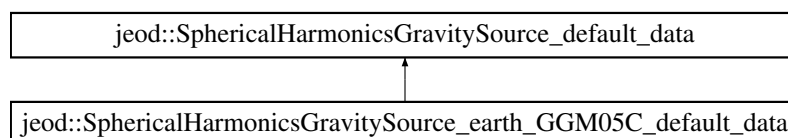
Public Member Functions

- virtual void initialize (SphericalHarmonicsGravitySource ∗)

8.15.1 Detailed Description

Definition at line 18 of file earth_GGM05C.hh.

8.15.2 Member Function Documentation

8.15.2.1 void jeod::SphericalHarmonicsGravitySource_earth_GGM05C_default_data::initialize (
SphericalHarmonicsGravitySource ∗ *SphericalHarmonicsGravitySource_ptr*) `[virtual]`

Implements jeod::SphericalHarmonicsGravitySource_default_data.

Definition at line 33 of file earth_GGM05C.cc.

References jeod::SphericalHarmonicsGravitySource::Cnm, jeod::SphericalHarmonicsGravitySource::degree, jeod-
::GravitySource::mu, jeod::GravitySource::name, jeod::SphericalHarmonicsGravitySource::order, jeod::Spherical-
HarmonicsGravitySource::radius, jeod::SphericalHarmonicsGravitySource::Snm, jeod::SphericalHarmonics-
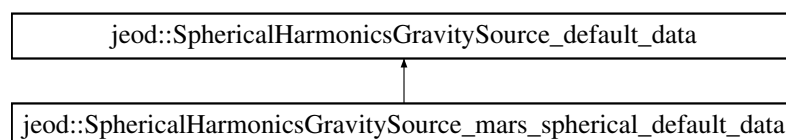GravitySource::tide_free, and jeod::SphericalHarmonicsGravitySource::tide_free_delta.

The documentation for this class was generated from the following files:

- earth_GGM05C.hh
- earth_GGM05C.cc

8.16 jeod::SphericalHarmonicsGravitySource_earth_spherical_default_data Class Reference

`#include <earth_spherical.hh>`

Inheritance diagram for jeod::SphericalHarmonicsGravitySource_earth_spherical_default_data:

```
┌─────────────────────────────────────────────────────────────┐
│     jeod::SphericalHarmonicsGravitySource_default_data       │
└─────────────────────────────────────────────────────────────┘
                              ▲
┌─────────────────────────────────────────────────────────────┐
│ jeod::SphericalHarmonicsGravitySource_earth_spherical_default_data │
└─────────────────────────────────────────────────────────────┘
```
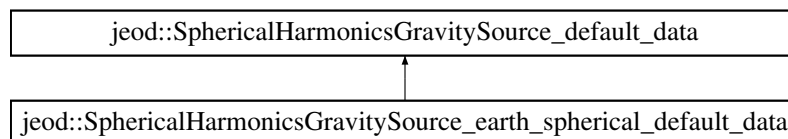
Public Member Functions

- virtual void initialize (SphericalHarmonicsGravitySource ∗)

8.16.1 Detailed Description

Definition at line 17 of file earth_spherical.hh.

8.16.2 Member Function Documentation

8.16.2.1 void jeod::SphericalHarmonicsGravitySource_earth_spherical_default_data::initialize (
SphericalHarmonicsGravitySource ∗ *SphericalHarmonicsGravitySource_ptr*) `[virtual]`

Implements jeod::SphericalHarmonicsGravitySource_default_data.

Definition at line 50 of file earth_spherical.cc.

References jeod::SphericalHarmonicsGravitySource::degree, jeod::GravitySource::mu, jeod::GravitySource::name, jeod::SphericalHarmonicsGravitySource::order, and jeod::SphericalHarmonicsGravitySource::radius.

The documentation for this class was generated from the following files:

- earth_spherical.hh
- earth_spherical.cc

8.17 jeod::SphericalHarmonicsGravitySource_jupiter_spherical_default_data Class Reference

`#include <jupiter_spherical.hh>`

Inheritance diagram for jeod::SphericalHarmonicsGravitySource_jupiter_spherical_default_data:

```
┌─────────────────────────────────────────────────────────────┐
│     jeod::SphericalHarmonicsGravitySource_default_data       │
└─────────────────────────────────────────────────────────────┘
                              ▲
┌─────────────────────────────────────────────────────────────────┐
│ jeod::SphericalHarmonicsGravitySource_jupiter_spherical_default_data │
└─────────────────────────────────────────────────────────────────┘
```

Public Member Functions

- virtual void initialize (SphericalHarmonicsGravitySource ∗)

8.17.1 Detailed Description

Definition at line 18 of file jupiter_spherical.hh.

8.17.2 Member Function Documentation

8.17.2.1 void jeod::SphericalHarmonicsGravitySource_jupiter_spherical_default_data::initialize (
SphericalHarmonicsGravitySource ∗ *SphericalHarmonicsGravitySource_ptr*) `[virtual]`

Implements jeod::SphericalHarmonicsGravitySource_default_data.

Definition at line 41 of file jupiter_spherical.cc.

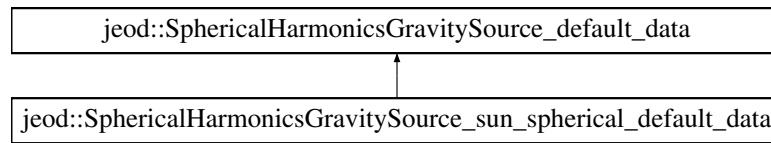References jeod::GravitySource::mu, jeod::GravitySource::name, and jeod::SphericalHarmonicsGravitySource-::radius.

The documentation for this class was generated from the following files:

- jupiter_spherical.hh
- jupiter_spherical.cc

8.18 jeod::SphericalHarmonicsGravitySource_mars_MRO110B2_default_data Class Reference

`#include <mars_MRO110B2.hh>`

Inheritance diagram for jeod::SphericalHarmonicsGravitySource_mars_MRO110B2_default_data:

```
┌─────────────────────────────────────────────────────────┐
│   jeod::SphericalHarmonicsGravitySource_default_data      │
└─────────────────────────────────────────────────────────┘
                          ▲
┌─────────────────────────────────────────────────────────┐
│ jeod::SphericalHarmonicsGravitySource_mars_MRO110B2_default_data │
└─────────────────────────────────────────────────────────┘
```
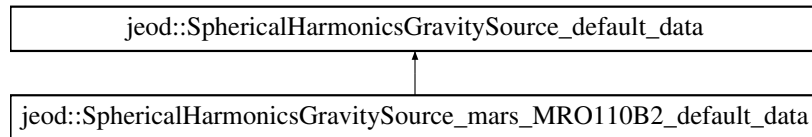
Public Member Functions

- virtual void [initialize](#) ([SphericalHarmonicsGravitySource](#) ∗)

8.18.1 Detailed Description

Definition at line 18 of file mars_MRO110B2.hh.

8.18.2 Member Function Documentation

8.18.2.1 void jeod::SphericalHarmonicsGravitySource_mars_MRO110B2_default_data::initialize (SphericalHarmonicsGravitySource ∗ *SphericalHarmonicsGravitySource_ptr*) `[virtual]`

Implements [jeod::SphericalHarmonicsGravitySource_default_data](#).

Definition at line 54 of file mars_MRO110B2.cc.

References jeod::SphericalHarmonicsGravitySource::Cnm, jeod::SphericalHarmonicsGravitySource::degree, jeod-::GravitySource::mu, jeod::GravitySource::name, jeod::SphericalHarmonicsGravitySource::order, jeod::Spherical-HarmonicsGravitySource::radius, jeod::SphericalHarmonicsGravitySource::Snm, and jeod::SphericalHarmonics-GravitySource::tide_free.

The documentation for this class was generated from the following files:

- [mars_MRO110B2.hh](#)
- [mars_MRO110B2.cc](#)

8.19 jeod::SphericalHarmonicsGravitySource_mars_spherical_default_data Class Reference

`#include <mars_spherical.hh>`

Inheritance diagram for jeod::SphericalHarmonicsGravitySource_mars_spherical_default_data:

```
┌─────────────────────────────────────────────────────────┐
│   jeod::SphericalHarmonicsGravitySource_default_data      │
└─────────────────────────────────────────────────────────┘
                          ▲
┌─────────────────────────────────────────────────────────┐
│ jeod::SphericalHarmonicsGravitySource_mars_spherical_default_data │
└─────────────────────────────────────────────────────────┘
```

Public Member Functions

- virtual void initialize (SphericalHarmonicsGravitySource ∗)

8.19.1 Detailed Description

Definition at line 18 of file mars_spherical.hh.

8.19.2 Member Function Documentation

8.19.2.1 void jeod::SphericalHarmonicsGravitySource_mars_spherical_default_data::initialize (
SphericalHarmonicsGravitySource ∗ *SphericalHarmonicsGravitySource_ptr* **)** `[virtual]`

Implements jeod::SphericalHarmonicsGravitySource_default_data.

Definition at line 44 of file mars_spherical.cc.

References jeod::GravitySource::mu, jeod::GravitySource::name, and jeod::SphericalHarmonicsGravitySource::radius.

The documentation for this class was generated from the following files:

- mars_spherical.hh
- mars_spherical.cc

8.20 jeod::SphericalHarmonicsGravitySource_moon_LP150Q_default_data Class Reference

`#include <moon_LP150Q.hh>`

Inheritance diagram for jeod::SphericalHarmonicsGravitySource_moon_LP150Q_default_data:

```
┌─────────────────────────────────────────────────────────┐
│      jeod::SphericalHarmonicsGravitySource_default_data   │
└─────────────────────────────────────────────────────────┘
                              ▲
                              │
┌─────────────────────────────────────────────────────────────────┐
│  jeod::SphericalHarmonicsGravitySource_moon_LP150Q_default_data   │
└─────────────────────────────────────────────────────────────────┘
```
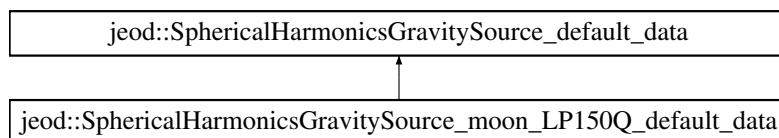
Public Member Functions

- virtual void initialize (SphericalHarmonicsGravitySource ∗)

8.20.1 Detailed Description

Definition at line 18 of file moon_LP150Q.hh.

8.20.2 Member Function Documentation

8.20.2.1 void jeod::SphericalHarmonicsGravitySource_moon_LP150Q_default_data::initialize (
SphericalHarmonicsGravitySource ∗ *SphericalHarmonicsGravitySource_ptr* **)** `[virtual]`

Implements jeod::SphericalHarmonicsGravitySource_default_data.

Definition at line 63 of file moon_LP150Q.cc.

References jeod::SphericalHarmonicsGravitySource::Cnm, jeod::SphericalHarmonicsGravitySource::degree, jeod-::GravitySource::mu, jeod::GravitySource::name, jeod::SphericalHarmonicsGravitySource::order, jeod::Spherical-HarmonicsGravitySource::radius, jeod::SphericalHarmonicsGravitySource::Snm, jeod::SphericalHarmonics-GravitySource::tide_free, and jeod::SphericalHarmonicsGravitySource::tide_free_delta.

The documentation for this class was generated from the following files:

- moon_LP150Q.hh
- moon_LP150Q.cc

8.21 jeod::SphericalHarmonicsGravitySource_moon_spherical_default_data Class Reference

`#include <moon_spherical.hh>`

Inheritance diagram for jeod::SphericalHarmonicsGravitySource_moon_spherical_default_data:

```
┌─────────────────────────────────────────────────────────────┐
│     jeod::SphericalHarmonicsGravitySource_default_data       │
└─────────────────────────────────────────────────────────────┘
                              ▲
                              │
┌─────────────────────────────────────────────────────────────┐
│ jeod::SphericalHarmonicsGravitySource_moon_spherical_default_data │
└─────────────────────────────────────────────────────────────┘
```
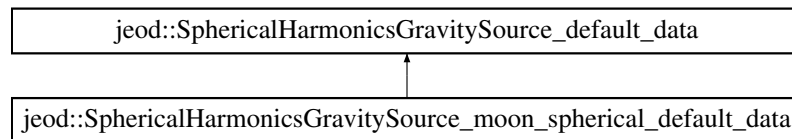
Public Member Functions

- virtual void initialize (SphericalHarmonicsGravitySource ∗)

8.21.1 Detailed Description

Definition at line 18 of file moon_spherical.hh.

8.21.2 Member Function Documentation

8.21.2.1 void jeod::SphericalHarmonicsGravitySource_moon_spherical_default_data::initialize (SphericalHarmonicsGravitySource ∗ *SphericalHarmonicsGravitySource_ptr*) [virtual]

Implements jeod::SphericalHarmonicsGravitySource_default_data.

Definition at line 46 of file moon_spherical.cc.

References jeod::GravitySource::mu, jeod::GravitySource::name, and jeod::SphericalHarmonicsGravitySource-::radius.

The documentation for this class was generated from the following files:

- moon_spherical.hh
- moon_spherical.cc

8.22 jeod::SphericalHarmonicsGravitySource_sun_spherical_default_data Class Reference

`#include <sun_spherical.hh>`

Inheritance diagram for jeod::SphericalHarmonicsGravitySource_sun_spherical_default_data:

```
┌──────────────────────────────────────────────────────────┐
│      jeod::SphericalHarmonicsGravitySource_default_data   │
└──────────────────────────────────────────────────────────┘
                              ▲
                              │
┌──────────────────────────────────────────────────────────┐
│ jeod::SphericalHarmonicsGravitySource_sun_spherical_default_data │
└──────────────────────────────────────────────────────────┘
```

Public Member Functions

- virtual void initialize (SphericalHarmonicsGravitySource *)

8.22.1 Detailed Description

Definition at line 18 of file sun_spherical.hh.

8.22.2 Member Function Documentation

8.22.2.1 void jeod::SphericalHarmonicsGravitySource_sun_spherical_default_data::initialize (SphericalHarmonicsGravitySource * *SphericalHarmonicsGravitySource_ptr*) [virtual]

Implements jeod::SphericalHarmonicsGravitySource_default_data.

Definition at line 47 of file sun_spherical.cc.

References jeod::GravitySource::mu, jeod::GravitySource::name, and jeod::SphericalHarmonicsGravitySource::radius.

The documentation for this class was generated from the following files:

- sun_spherical.hh
- sun_spherical.cc

8.23 jeod::SphericalHarmonicsSolidBodyTides Class Reference

Models solid body tidal effects.

```
#include <spherical_harmonics_solid_body_tides.hh>
```

Inheritance diagram for jeod::SphericalHarmonicsSolidBodyTides:
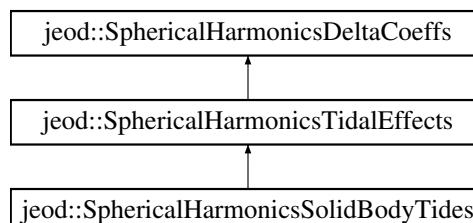
```
┌────────────────────────────────────────┐
│      jeod::SphericalHarmonicsDeltaCoeffs │
└────────────────────────────────────────┘
                     ▲
                     │
┌────────────────────────────────────────┐
│      jeod::SphericalHarmonicsTidalEffects │
└────────────────────────────────────────┘
                     ▲
                     │
┌────────────────────────────────────────┐
│    jeod::SphericalHarmonicsSolidBodyTides │
└────────────────────────────────────────┘
```

Public Member Functions

- SphericalHarmonicsSolidBodyTides ()

  SphericalHarmonicsSolidBodyTides constructor.

- virtual ∼SphericalHarmonicsSolidBodyTides ()

  SphericalHarmonicsSolidBodyTides destructor.
- virtual void initialize (SphericalHarmonicsDeltaCoeffsInit &var_init, BaseDynManager &dyn_manager)

  Initialize the solid body tidal model.
- virtual void update (SphericalHarmonicsGravityControls &controls)

  Update the solid-body tidal delta-coefficients.

Friends

- class InputProcessor
- void init_attrjeod__SphericalHarmonicsSolidBodyTides ()

Additional Inherited Members

8.23.1   Detailed Description

Models solid body tidal effects.

Definition at line 63 of file spherical_harmonics_solid_body_tides.hh.

8.23.2   Constructor & Destructor Documentation

8.23.2.1   jeod::SphericalHarmonicsSolidBodyTides::SphericalHarmonicsSolidBodyTides (void)

SphericalHarmonicsSolidBodyTides constructor.

Definition at line 69 of file spherical_harmonics_solid_body_tides.cc.

8.23.2.2   jeod::SphericalHarmonicsSolidBodyTides::∼SphericalHarmonicsSolidBodyTides (void) [virtual]

SphericalHarmonicsSolidBodyTides destructor.

Definition at line 79 of file spherical_harmonics_solid_body_tides.cc.

8.23.3   Member Function Documentation

8.23.3.1   void jeod::SphericalHarmonicsSolidBodyTides::initialize (SphericalHarmonicsDeltaCoeffsInit & *var_init,* BaseDynManager & *dyn_manager*) [virtual]

Initialize the solid body tidal model.

Parameters

in	*var_init*	Effect init structure
in	*dyn_manager*	Dynamics manager

Reimplemented from jeod::SphericalHarmonicsTidalEffects.

Definition at line 93 of file spherical_harmonics_solid_body_tides.cc.

References jeod::SphericalHarmonicsTidalEffects::initialize().

8.23.3.2   void jeod::SphericalHarmonicsSolidBodyTides::update (SphericalHarmonicsGravityControls & *controls*) [virtual]

Update the solid-body tidal delta-coefficients.

in		*controls*	Gravity controls for planet

Reimplemented from [jeod::SphericalHarmonicsTidalEffects](#).

Definition at line 109 of file spherical_harmonics_solid_body_tides.cc.

References jeod::SphericalHarmonicsDeltaCoeffs::dC20, jeod::SphericalHarmonicsDeltaCoeffs::grav_source, jeod::SphericalHarmonicsTidalEffects::k2, jeod::GravitySource::mu, jeod::SphericalHarmonicsTidalEffects::num-_tidal_bodies, jeod::SphericalHarmonicsTidalEffects::pfix, jeod::SphericalHarmonicsGravitySource::radius, jeod::-SphericalHarmonicsTidalEffects::tidal_bodies, and jeod::SphericalHarmonicsTidalEffects::tidal_bodies_inertial.

8.23.4 Friends And Related Function Documentation

8.23.4.1 void init_attrjeod__SphericalHarmonicsSolidBodyTides ( ) `[friend]`

8.23.4.2 friend class InputProcessor `[friend]`

Definition at line 65 of file spherical_harmonics_solid_body_tides.hh.

The documentation for this class was generated from the following files:

- [spherical_harmonics_solid_body_tides.hh](#)
- [spherical_harmonics_solid_body_tides.cc](#)

8.24 jeod::SphericalHarmonicsSolidBodyTidesInit Class Reference

Initializes a solid body tides model.

`#include <spherical_harmonics_solid_body_tides_init.hh>`

Inheritance diagram for jeod::SphericalHarmonicsSolidBodyTidesInit:
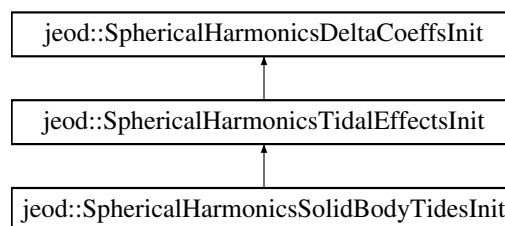
Public Member Functions

- [SphericalHarmonicsSolidBodyTidesInit](#) ()

    [SphericalHarmonicsSolidBodyTidesInit](#) constructor.
- virtual [~SphericalHarmonicsSolidBodyTidesInit](#) ()

    [SphericalHarmonicsSolidBodyTidesInit](#) destructor.

Friends

- class [InputProcessor](#)
- void [init_attrjeod__SphericalHarmonicsSolidBodyTidesInit](#) ()

Additional Inherited Members

8.24.1 Detailed Description

Initializes a solid body tides model.

Definition at line 56 of file spherical_harmonics_solid_body_tides_init.hh.

8.24.2 Constructor & Destructor Documentation

8.24.2.1 jeod::SphericalHarmonicsSolidBodyTidesInit::SphericalHarmonicsSolidBodyTidesInit (void)

SphericalHarmonicsSolidBodyTidesInit constructor.

Definition at line 51 of file spherical_harmonics_solid_body_tides_init.cc.

8.24.2.2 jeod::SphericalHarmonicsSolidBodyTidesInit::∼SphericalHarmonicsSolidBodyTidesInit (void) `[virtual]`

SphericalHarmonicsSolidBodyTidesInit destructor.

Definition at line 61 of file spherical_harmonics_solid_body_tides_init.cc.

References jeod::SphericalHarmonicsTidalEffectsInit::num_tidal_bodies, and jeod::SphericalHarmonicsTidalEffectsInit::tidal_body_names.

8.24.3 Friends And Related Function Documentation

8.24.3.1 void init_attrjeod__SphericalHarmonicsSolidBodyTidesInit ( ) `[friend]`

8.24.3.2 friend class InputProcessor `[friend]`

Definition at line 59 of file spherical_harmonics_solid_body_tides_init.hh.

The documentation for this class was generated from the following files:

- spherical_harmonics_solid_body_tides_init.hh
- spherical_harmonics_solid_body_tides_init.cc

8.25 jeod::SphericalHarmonicsSolidBodyTidesInit_earth_solid_tides_default_data Class Reference

```
#include <earth_solid_tides.hh>
```

Public Member Functions

- void initialize (SphericalHarmonicsSolidBodyTidesInit ∗)

8.25.1 Detailed Description

Definition at line 18 of file earth_solid_tides.hh.

8.25.2 Member Function Documentation

8.25.2.1 void jeod::SphericalHarmonicsSolidBodyTidesInit_earth_solid_tides_default_data::initialize (SphericalHarmonicsSolidBodyTidesInit ∗ *SphericalHarmonicsSolidBodyTidesInit_ptr*)

Definition at line 46 of file earth_solid_tides.cc.

References jeod::SphericalHarmonicsTidalEffectsInit::k2, jeod::SphericalHarmonicsTidalEffectsInit::num_tidal_-bodies, and jeod::SphericalHarmonicsTidalEffectsInit::tidal_body_names.

The documentation for this class was generated from the following files:

- earth_solid_tides.hh
- earth_solid_tides.cc

8.26 jeod::SphericalHarmonicsTidalEffects Class Reference

Models tidal effects as a delta on top of a gravity model.

```
#include <spherical_harmonics_tidal_effects.hh>
```
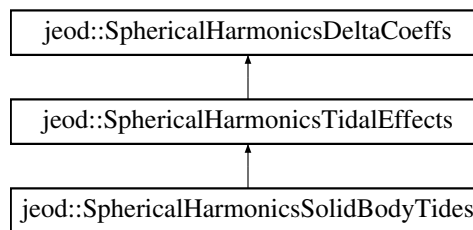
Inheritance diagram for jeod::SphericalHarmonicsTidalEffects:

```
┌─────────────────────────────────────┐
│   jeod::SphericalHarmonicsDeltaCoeffs │
└─────────────────────────────────────┘
                  ▲
┌─────────────────────────────────────┐
│   jeod::SphericalHarmonicsTidalEffects │
└─────────────────────────────────────┘
                  ▲
┌─────────────────────────────────────────┐
│ jeod::SphericalHarmonicsSolidBodyTides   │
└─────────────────────────────────────────┘
```

Public Member Functions

- SphericalHarmonicsTidalEffects ()

    SphericalHarmonicsTidalEffects constructor.
- virtual ∼SphericalHarmonicsTidalEffects ()

    SphericalHarmonicsTidalEffects destructor.
- virtual void initialize (SphericalHarmonicsDeltaCoeffsInit &var_init, BaseDynManager &dyn_manager)

    Initialize a SphericalHarmonicsTidalEffects object.
- virtual void update (SphericalHarmonicsGravityControls &controls)

    Pure virtual update method.

Data Fields

- double xp

    Copy of polar motion coefficient xp (from polar motion class).
- double yp

    Copy of polar motion coefficient yp (from polar motion class).
- double k2

    The love number.
- double ∗∗ Knm

    A matrix of love numbers.
- unsigned int num_tidal_bodies

    The number of tidal bodies named in tidal_bodies.

Protected Attributes

- Planet ∗∗ tidal_bodies

    The tidal bodies.
- RefFrame ∗∗ tidal_bodies_inertial

    Pointers to the tidal_bodies inertial reference frames.
- RefFrame ∗ pfix

    The planet fixed reference frame of the subject body.

Friends

- class InputProcessor
- void init_attrjeod__SphericalHarmonicsTidalEffects ()

8.26.1 Detailed Description

Models tidal effects as a delta on top of a gravity model.

Definition at line 65 of file spherical_harmonics_tidal_effects.hh.

8.26.2 Constructor & Destructor Documentation

8.26.2.1 jeod::SphericalHarmonicsTidalEffects::SphericalHarmonicsTidalEffects (void)

SphericalHarmonicsTidalEffects constructor.

Definition at line 77 of file spherical_harmonics_tidal_effects.cc.

8.26.2.2 jeod::SphericalHarmonicsTidalEffects::∼SphericalHarmonicsTidalEffects (void) `[virtual]`

SphericalHarmonicsTidalEffects destructor.

Definition at line 94 of file spherical_harmonics_tidal_effects.cc.

References jeod::SphericalHarmonicsDeltaCoeffs::degree, Knm, tidal_bodies, and tidal_bodies_inertial.

8.26.3 Member Function Documentation

8.26.3.1 void jeod::SphericalHarmonicsTidalEffects::initialize (SphericalHarmonicsDeltaCoeffsInit & *gen_var_init,* BaseDynManager & *dyn_manager*) `[virtual]`

Initialize a SphericalHarmonicsTidalEffects object.

This method overrides and calls the base class initialize method.

Parameters

in	*gen_var_init*	Effect init structure
in	*dyn_manager*	Dynamics manager

Reimplemented from jeod::SphericalHarmonicsDeltaCoeffs.

Reimplemented in jeod::SphericalHarmonicsSolidBodyTides.

Definition at line 125 of file spherical_harmonics_tidal_effects.cc.

References jeod::SphericalHarmonicsDeltaCoeffs::degree, jeod::SphericalHarmonicsDeltaCoeffs::grav_source, jeod::SphericalHarmonicsDeltaCoeffs::initialize(), jeod::GravityMessages::invalid_name, jeod::GravityMessages-::invalid_object, jeod::SphericalHarmonicsTidalEffectsInit::k2, k2, jeod::SphericalHarmonicsTidalEffectsInit::Knm,

Knm, jeod::SphericalHarmonicsTidalEffectsInit::num_tidal_bodies, num_tidal_bodies, jeod::SphericalHarmonics-
DeltaCoeffs::order, jeod::GravitySource::pfix, pfix, tidal_bodies, tidal_bodies_inertial, jeod::SphericalHarmonics-
TidalEffectsInit::tidal_body_names, jeod::SphericalHarmonicsTidalEffectsInit::xp, xp, jeod::SphericalHarmonics-
TidalEffectsInit::yp, and yp.

Referenced by jeod::SphericalHarmonicsSolidBodyTides::initialize().

8.26.3.2   void jeod::SphericalHarmonicsTidalEffects::update (SphericalHarmonicsGravityControls & *controls* **)**
`[virtual]`

Pure virtual update method.

Parameters

in	*controls*	Gravity controls for planet

Reimplemented from [jeod::SphericalHarmonicsDeltaCoeffs](#).

Reimplemented in [jeod::SphericalHarmonicsSolidBodyTides](#).

Definition at line 232 of file spherical_harmonics_tidal_effects.cc.

8.26.4   Friends And Related Function Documentation

8.26.4.1   void init_attrjeod__SphericalHarmonicsTidalEffects ( ) `[friend]`

8.26.4.2   friend class InputProcessor `[friend]`

Definition at line 67 of file spherical_harmonics_tidal_effects.hh.

8.26.5   Field Documentation

8.26.5.1   double jeod::SphericalHarmonicsTidalEffects::k2

The love number.

Only used for a first order tidal effect model.trick_units(−)

Definition at line 86 of file spherical_harmonics_tidal_effects.hh.

Referenced by initialize(), and jeod::SphericalHarmonicsSolidBodyTides::update().

8.26.5.2   double∗∗ jeod::SphericalHarmonicsTidalEffects::Knm

A matrix of love numbers.

Used for higher order (not first-order) tidal effects.trick_units(−)

Definition at line 92 of file spherical_harmonics_tidal_effects.hh.

Referenced by initialize(), and ∼SphericalHarmonicsTidalEffects().

8.26.5.3   unsigned int jeod::SphericalHarmonicsTidalEffects::num_tidal_bodies

The number of tidal bodies named in tidal_bodies.

trick_units(count)

Definition at line 97 of file spherical_harmonics_tidal_effects.hh.

Referenced by initialize(), and jeod::SphericalHarmonicsSolidBodyTides::update().

8.26.5.4 **RefFrame∗ jeod::SphericalHarmonicsTidalEffects::pfix** `[protected]`

The planet fixed reference frame of the subject body.

trick_units(–)

Definition at line 115 of file spherical_harmonics_tidal_effects.hh.

Referenced by initialize(), and jeod::SphericalHarmonicsSolidBodyTides::update().

8.26.5.5 **Planet∗∗ jeod::SphericalHarmonicsTidalEffects::tidal_bodies** `[protected]`

The tidal bodies.

Filled out at initialization. Length after init is num_tidal_bodies.trick_units(–)

Definition at line 105 of file spherical_harmonics_tidal_effects.hh.

Referenced by initialize(), jeod::SphericalHarmonicsSolidBodyTides::update(), and ∼SphericalHarmonicsTidal-Effects().

8.26.5.6 **RefFrame∗∗ jeod::SphericalHarmonicsTidalEffects::tidal_bodies_inertial** `[protected]`

Pointers to the tidal_bodies inertial reference frames.

trick_units(–)

Definition at line 110 of file spherical_harmonics_tidal_effects.hh.

Referenced by initialize(), jeod::SphericalHarmonicsSolidBodyTides::update(), and ∼SphericalHarmonicsTidal-Effects().

8.26.5.7 **double jeod::SphericalHarmonicsTidalEffects::xp**

Copy of polar motion coefficient xp (from polar motion class).

trick_units(–)

Definition at line 76 of file spherical_harmonics_tidal_effects.hh.

Referenced by initialize().

8.26.5.8 **double jeod::SphericalHarmonicsTidalEffects::yp**

Copy of polar motion coefficient yp (from polar motion class).

trick_units(–)

Definition at line 81 of file spherical_harmonics_tidal_effects.hh.

Referenced by initialize().

The documentation for this class was generated from the following files:

- spherical_harmonics_tidal_effects.hh
- spherical_harmonics_tidal_effects.cc

8.27 jeod::SphericalHarmonicsTidalEffectsInit Class Reference

Initializes a tidal gravity model.

```
#include <spherical_harmonics_tidal_effects_init.hh>
```

Inheritance diagram for jeod::SphericalHarmonicsTidalEffectsInit:

```
┌─────────────────────────────────────────┐
│   jeod::SphericalHarmonicsDeltaCoeffsInit │
└─────────────────────────────────────────┘
                    ▲
┌─────────────────────────────────────────┐
│   jeod::SphericalHarmonicsTidalEffectsInit│
└─────────────────────────────────────────┘
                    ▲
┌─────────────────────────────────────────┐
│  jeod::SphericalHarmonicsSolidBodyTidesInit│
└─────────────────────────────────────────┘
```

Public Member Functions

- SphericalHarmonicsTidalEffectsInit ()

    SphericalHarmonicsTidalEffectsInit constructor.
- virtual ∼SphericalHarmonicsTidalEffectsInit ()

    SphericalHarmonicsTidalEffectsInit destructor.

Data Fields

- double xp

    Copy of polar motion coefficient xp (from polar motion class).
- double yp

    Copy of polar motion coefficient yp (from polar motion class).
- double k2

    The love number.
- double ∗∗ Knm

    A matrix of love numbers.
- char ∗∗ tidal_body_names

    A named list of gravitational bodies contributing to this tidal efffect.
- unsigned int num_tidal_bodies

    The number of tidal bodies named in tidal_body_names.

Friends

- class InputProcessor
- void init_attrjeod__SphericalHarmonicsTidalEffectsInit ()

8.27.1 Detailed Description

Initializes a tidal gravity model.

Definition at line 56 of file spherical_harmonics_tidal_effects_init.hh.

8.27.2 Constructor & Destructor Documentation

8.27.2.1 jeod::SphericalHarmonicsTidalEffectsInit::SphericalHarmonicsTidalEffectsInit (void)

SphericalHarmonicsTidalEffectsInit constructor.

Definition at line 50 of file spherical_harmonics_tidal_effects_init.cc.

References k2, Knm, num_tidal_bodies, tidal_body_names, xp, and yp.

8.27.2.2 jeod::SphericalHarmonicsTidalEffectsInit::∼SphericalHarmonicsTidalEffectsInit (void) `[virtual]`

[SphericalHarmonicsTidalEffectsInit](#) destructor.

Definition at line 65 of file spherical_harmonics_tidal_effects_init.cc.

8.27.3 Friends And Related Function Documentation

8.27.3.1 void init_attrjeod__SphericalHarmonicsTidalEffectsInit ( ) `[friend]`

8.27.3.2 friend class InputProcessor `[friend]`

Definition at line 59 of file spherical_harmonics_tidal_effects_init.hh.

8.27.4 Field Documentation

8.27.4.1 double jeod::SphericalHarmonicsTidalEffectsInit::k2

The love number.

Only used for a first order tidal effect modeltrick_units(–)

Definition at line 78 of file spherical_harmonics_tidal_effects_init.hh.

Referenced by jeod::SphericalHarmonicsSolidBodyTidesInit_earth_solid_tides_default_data::initialize(), jeod::-SphericalHarmonicsTidalEffects::initialize(), and SphericalHarmonicsTidalEffectsInit().

8.27.4.2 double∗∗ jeod::SphericalHarmonicsTidalEffectsInit::Knm

A matrix of love numbers.

Used for higher order (not first) tidal effectstrick_units(–)

Definition at line 83 of file spherical_harmonics_tidal_effects_init.hh.

Referenced by jeod::SphericalHarmonicsTidalEffects::initialize(), and SphericalHarmonicsTidalEffectsInit().

8.27.4.3 unsigned int jeod::SphericalHarmonicsTidalEffectsInit::num_tidal_bodies

The number of tidal bodies named in tidal_body_names.

trick_units(count)

Definition at line 93 of file spherical_harmonics_tidal_effects_init.hh.

Referenced by jeod::SphericalHarmonicsSolidBodyTidesInit_earth_solid_tides_default_data::initialize(), jeod::-SphericalHarmonicsTidalEffects::initialize(), SphericalHarmonicsTidalEffectsInit(), and jeod::SphericalHarmonics-SolidBodyTidesInit::∼SphericalHarmonicsSolidBodyTidesInit().

8.27.4.4 char∗∗ jeod::SphericalHarmonicsTidalEffectsInit::tidal_body_names

A named list of gravitational bodies contributing to this tidal efffect.

trick_units(–)

Definition at line 88 of file spherical_harmonics_tidal_effects_init.hh.

Referenced by jeod::SphericalHarmonicsSolidBodyTidesInit_earth_solid_tides_default_data::initialize(), jeod::-SphericalHarmonicsTidalEffects::initialize(), SphericalHarmonicsTidalEffectsInit(), and jeod::SphericalHarmonics-SolidBodyTidesInit::∼SphericalHarmonicsSolidBodyTidesInit().

8.27.4.5   double jeod::SphericalHarmonicsTidalEffectsInit::xp

Copy of polar motion coefficient xp (from polar motion class).

trick_units(–)

Definition at line 68 of file spherical_harmonics_tidal_effects_init.hh.

Referenced by jeod::SphericalHarmonicsTidalEffects::initialize(), and SphericalHarmonicsTidalEffectsInit().

8.27.4.6   double jeod::SphericalHarmonicsTidalEffectsInit::yp

Copy of polar motion coefficient yp (from polar motion class).

trick_units(–)

Definition at line 73 of file spherical_harmonics_tidal_effects_init.hh.

Referenced by jeod::SphericalHarmonicsTidalEffects::initialize(), and SphericalHarmonicsTidalEffectsInit().

The documentation for this class was generated from the following files:

- spherical_harmonics_tidal_effects_init.hh
- spherical_harmonics_tidal_effects_init.cc

Chapter 9

File Documentation

9.1 class_declarations.hh File Reference

Forward declarations of classes defined for the gravity model.

Namespaces

- jeod

    Namespace jeod.

9.1.1 Detailed Description

Forward declarations of classes defined for the gravity model.

Definition in file class_declarations.hh.

9.2 earth_GEMT1.cc File Reference

```
#include "environment/gravity/include/gravity_source.hh"
#include "environment/gravity/include/spherical_harmonics_gravity_source.-
hh"
#include "utils/memory/include/jeod_alloc.hh"
#include "utils/named_item/include/named_item.hh"
#include "../include/earth_GEMT1.hh"
```

Namespaces

- jeod

    Namespace jeod.

Macros

- #define JEOD_FRIEND_CLASS SphericalHarmonicsGravitySource_earth_GEMT1_default_data

9.2.1 Macro Definition Documentation

9.2.1.1 #define JEOD_FRIEND_CLASS SphericalHarmonicsGravitySource_earth_GEMT1_default_data

Definition at line 53 of file earth_GEMT1.cc.

9.3 earth_GEMT1.hh File Reference

```
#include "spherical_harmonics_gravity_source_default_data.hh"
```

Data Structures

- class jeod::SphericalHarmonicsGravitySource_earth_GEMT1_default_data

Namespaces

- jeod

  Namespace jeod.

9.4 earth_GGM02C.cc File Reference

```
#include "environment/gravity/include/gravity_source.hh"
#include "environment/gravity/include/spherical_harmonics_gravity_source.-
hh"
#include "utils/memory/include/jeod_alloc.hh"
#include "utils/named_item/include/named_item.hh"
#include "../include/earth_GGM02C.hh"
```

Namespaces

- jeod

  Namespace jeod.

Macros

- #define JEOD_FRIEND_CLASS SphericalHarmonicsGravitySource_earth_GGM02C_default_data

9.4.1 Macro Definition Documentation

9.4.1.1 #define JEOD_FRIEND_CLASS SphericalHarmonicsGravitySource_earth_GGM02C_default_data

Definition at line 47 of file earth_GGM02C.cc.

9.5 earth_GGM02C.hh File Reference

```
#include "spherical_harmonics_gravity_source_default_data.hh"
```

Data Structures

- class [jeod::SphericalHarmonicsGravitySource_earth_GGM02C_default_data](#)

Namespaces

- [jeod](#)

    Namespace jeod.

9.6 earth_GGM05C.cc File Reference

```
#include "environment/gravity/include/gravity_source.hh"
#include "environment/gravity/include/spherical_harmonics_gravity_source.-
hh"
#include "utils/memory/include/jeod_alloc.hh"
#include "utils/named_item/include/named_item.hh"
#include "../include/earth_GGM05C.hh"
```

Namespaces

- [jeod](#)

    Namespace jeod.

Macros

- #define [JEOD_FRIEND_CLASS](#) SphericalHarmonicsGravitySource_earth_GGM05C_default_data

9.6.1 Macro Definition Documentation

9.6.1.1 #define JEOD_FRIEND_CLASS SphericalHarmonicsGravitySource_earth_GGM05C_default_data

Definition at line 16 of file earth_GGM05C.cc.

9.7 earth_GGM05C.hh File Reference

```
#include "spherical_harmonics_gravity_source_default_data.hh"
```

Data Structures

- class [jeod::SphericalHarmonicsGravitySource_earth_GGM05C_default_data](#)

Namespaces

- [jeod](#)

    Namespace jeod.

9.8 earth_solid_tides.cc File Reference

```
#include "environment/gravity/include/spherical_harmonics_delta_coeffs_-
init.hh"
#include "environment/gravity/include/spherical_harmonics_solid_body_tides-
_init.hh"
#include "environment/gravity/include/spherical_harmonics_tidal_effects_-
init.hh"
#include "utils/memory/include/jeod_alloc.hh"
#include "utils/named_item/include/named_item.hh"
#include "../include/earth_solid_tides.hh"
```

Namespaces

- jeod

    Namespace jeod.

Macros

- #define JEOD_FRIEND_CLASS SphericalHarmonicsSolidBodyTidesInit_earth_solid_tides_default_data

9.8.1 Macro Definition Documentation

9.8.1.1 #define JEOD_FRIEND_CLASS SphericalHarmonicsSolidBodyTidesInit_earth_solid_tides_default_data

Definition at line 28 of file earth_solid_tides.cc.

9.9 earth_solid_tides.hh File Reference

Data Structures

- class jeod::SphericalHarmonicsSolidBodyTidesInit_earth_solid_tides_default_data

Namespaces

- jeod

    Namespace jeod.

9.10 earth_spherical.cc File Reference

```
#include "environment/gravity/include/gravity_source.hh"
#include "environment/gravity/include/spherical_harmonics_gravity_source.-
hh"
#include "utils/named_item/include/named_item.hh"
#include "../include/earth_spherical.hh"
```

Namespaces

- jeod

    Namespace jeod.

Macros

- #define JEOD_FRIEND_CLASS SphericalHarmonicsGravitySource_earth_spherical_default_data

9.10.1 Macro Definition Documentation

9.10.1.1 #define JEOD_FRIEND_CLASS SphericalHarmonicsGravitySource_earth_spherical_default_data

Definition at line 34 of file earth_spherical.cc.

9.11 earth_spherical.hh File Reference

```
#include "spherical_harmonics_gravity_source_default_data.hh"
```

Data Structures

- class jeod::SphericalHarmonicsGravitySource_earth_spherical_default_data

Namespaces

- jeod

    Namespace jeod.

9.12 gravity_controls.cc File Reference

Define member functions for the GravityControls class.

```
#include <algorithm>
#include <cmath>
#include <cstddef>
#include "dynamics/dyn_manager/include/base_dyn_manager.hh"
#include "environment/ephemerides/ephem_interface/include/ephem_ref_frame.-
hh"
#include "environment/planet/include/planet.hh"
#include "utils/math/include/matrix3x3.hh"
#include "utils/math/include/vector3.hh"
#include "utils/message/include/message_handler.hh"
#include "utils/ref_frames/include/ref_frame.hh"
#include "../include/gravity_controls.hh"
#include "../include/gravity_source.hh"
#include "../include/gravity_integ_frame.hh"
#include "../include/gravity_interaction.hh"
#include "../include/gravity_manager.hh"
#include "../include/gravity_messages.hh"
```

Namespaces

- [jeod](#)

    Namespace jeod.

Variables

- static constexpr double [jeod::speed_of_light_sq](#) = 89875517873681764.0

    The speed of light squared, in m^2/s^2.

9.12.1 Detailed Description

Define member functions for the GravityControls class.

Definition in file [gravity_controls.cc](#).

9.13 gravity_controls.hh File Reference

Define the gravity controls.

```
#include <string>
#include "utils/sim_interface/include/jeod_class.hh"
#include "class_declarations.hh"
#include "gravity_source.hh"
#include "dynamics/dyn_manager/include/base_dyn_manager.hh"
```

Data Structures

- class [jeod::GravityControls](#)

    Specifies whether and how a [GravitySource](#) affects a vehicle.

Namespaces

- [jeod](#)

    Namespace jeod.

9.13.1 Detailed Description

Define the gravity controls.

Definition in file [gravity_controls.hh](#).

9.14 gravity_integ_frame.cc File Reference

Define member functions for the GravityIntegFrame class.

```
#include <cstddef>
#include "environment/ephemerides/ephem_interface/include/ephem_ref_frame.-
hh"
#include "utils/math/include/vector3.hh"
#include "../include/gravity_integ_frame.hh"
```

Namespaces

- [jeod](#)

    Namespace jeod.

9.14.1 Detailed Description

Define member functions for the GravityIntegFrame class.

Definition in file [gravity_integ_frame.cc](#).

9.15 gravity_integ_frame.hh File Reference

Define the gravity integration frame class.

```
#include "utils/sim_interface/include/jeod_class.hh"
#include "class_declarations.hh"
```

Data Structures

- class [jeod::GravityIntegFrame](#)

    Class that aids in determining whether gravity should be applied as a direct effect or a third body effect.

Namespaces

- [jeod](#)

    Namespace jeod.

9.15.1 Detailed Description

Define the gravity integration frame class.

Definition in file [gravity_integ_frame.hh](#).

9.16 gravity_interaction.cc File Reference

Define methods for the GravityInteraction class.

```
#include <cstddef>
#include <algorithm>
#include "dynamics/dyn_body/include/dyn_body.hh"
#include "dynamics/dyn_manager/include/base_dyn_manager.hh"
#include "environment/ephemerides/ephem_interface/include/ephem_ref_frame.-
hh"
#include "environment/planet/include/planet.hh"
#include "utils/math/include/matrix3x3.hh"
#include "utils/math/include/vector3.hh"
#include "utils/memory/include/jeod_alloc.hh"
#include "../include/gravity_interaction.hh"
#include "../include/gravity_source.hh"
#include "../include/gravity_controls.hh"
#include "../include/gravity_manager.hh"
#include "../include/gravity_messages.hh"
```

Namespaces

- jeod

    Namespace jeod.

9.16.1 Detailed Description

Define methods for the GravityInteraction class.

Definition in file gravity_interaction.cc.

9.17 gravity_interaction.hh File Reference

Define the GravityInteraction class, used to represent the gravitational interaction betweens a DynBody and a set of planetary bodies.

```
#include "utils/container/include/pointer_vector.hh"
#include "utils/sim_interface/include/jeod_class.hh"
#include "class_declarations.hh"
```

Data Structures

- class jeod::GravityInteraction

    Specifies interactions between a vehicle and a set of gravitational bodies.

Namespaces

- jeod

    Namespace jeod.

9.17.1 Detailed Description

Define the GravityInteraction class, used to represent the gravitational interaction betweens a DynBody and a set of planetary bodies. Note that while each DynBody instance has a GravityInteraction data member, this class is defined as a part of the gravity model rather than the dyn_body model. This is because the coupling between this class and the other parts of the gravity model is much stronger than the coupling between this class and the dyn_body model.

Definition in file gravity_interaction.hh.

9.18 gravity_manager.cc File Reference

Define member functions for the GravityManager class.

```
#include <string>
#include <cstring>
#include <cstddef>
#include "dynamics/dyn_manager/include/base_dyn_manager.hh"
#include "utils/math/include/matrix3x3.hh"
#include "utils/math/include/vector3.hh"
#include "utils/memory/include/jeod_alloc.hh"
#include "utils/message/include/message_handler.hh"
#include "../include/gravity_manager.hh"
#include "../include/gravity_controls.hh"
#include "../include/gravity_interaction.hh"
#include "../include/gravity_messages.hh"
#include "../include/gravity_source.hh"
```

Namespaces

- [jeod](#)

  Namespace jeod.

9.18.1 Detailed Description

Define member functions for the GravityManager class.

Definition in file [gravity_manager.cc](#).

9.19 gravity_manager.hh File Reference

Define the Gravity Manager.

```
#include "utils/container/include/pointer_vector.hh"
#include "utils/sim_interface/include/jeod_class.hh"
#include "class_declarations.hh"
```

Data Structures

- class [jeod::GravityManager](#)

  The master gravitational model for a simulation.

Namespaces

- [jeod](#)

  Namespace jeod.

9.19.1 Detailed Description

Define the Gravity Manager.

Definition in file [gravity_manager.hh](#).

9.20 gravity_messages.cc File Reference

Implement the class GravityMessages.

```
#include "../include/gravity_messages.hh"
```

Namespaces

- **jeod**

    Namespace jeod.

Macros

- #define PATH "environment/gravity/"

9.20.1 Detailed Description

Implement the class GravityMessages.

Definition in file gravity_messages.cc.

9.21 gravity_messages.hh File Reference

Define the class GravityMessages, the class that specifies the message IDs used in the gravity model.

```
#include "utils/sim_interface/include/jeod_class.hh"
```

Data Structures

- class jeod::GravityMessages

    Specifies the message IDs used in the gravity model.

Namespaces

- **jeod**

    Namespace jeod.

9.21.1 Detailed Description

Define the class GravityMessages, the class that specifies the message IDs used in the gravity model.

Definition in file gravity_messages.hh.

9.22 gravity_source.cc File Reference

Define member functions for the GravitySource class.

```
#include <cstddef>
#include "environment/planet/include/planet.hh"
#include "environment/ephemerides/ephem_interface/include/ephem_ref_frame.-
hh"
#include "utils/math/include/vector3.hh"
#include "utils/memory/include/jeod_alloc.hh"
#include "../include/gravity_source.hh"
#include "../include/gravity_integ_frame.hh"
```

Namespaces

- jeod

    Namespace jeod.

9.22.1   Detailed Description

Define member functions for the GravitySource class.

Definition in file gravity_source.cc.

9.23   gravity_source.hh File Reference

Define the gravity body base (pure virtual) class.

```
#include <vector>
#include <string>
#include "environment/ephemerides/ephem_interface/include/class_declarations.-
hh"
#include "utils/sim_interface/include/jeod_class.hh"
#include "class_declarations.hh"
#include "gravity_integ_frame.hh"
```

Data Structures

- class jeod::GravitySource

    Models the gravity for a specific planet; pure virtual.

Namespaces

- jeod

    Namespace jeod.

9.23.1   Detailed Description

Define the gravity body base (pure virtual) class.

Definition in file gravity_source.hh.

9.24 jupiter_spherical.cc File Reference

```
#include "environment/gravity/include/spherical_harmonics_gravity_source.-
hh"
#include "utils/named_item/include/named_item.hh"
#include "../include/jupiter_spherical.hh"
```

Namespaces

- jeod

    Namespace jeod.

Macros

- #define JEOD_FRIEND_CLASS SphericalHarmonicsGravitySource_jupiter_spherical_default_data

9.24.1 Macro Definition Documentation

9.24.1.1 #define JEOD_FRIEND_CLASS SphericalHarmonicsGravitySource_jupiter_spherical_default_data

Definition at line 26 of file jupiter_spherical.cc.

9.25 jupiter_spherical.hh File Reference

```
#include "spherical_harmonics_gravity_source_default_data.hh"
```

Data Structures

- class jeod::SphericalHarmonicsGravitySource_jupiter_spherical_default_data

Namespaces

- jeod

    Namespace jeod.

9.26 mars_MRO110B2.cc File Reference

```
#include "environment/gravity/include/gravity_source.hh"
#include "environment/gravity/include/spherical_harmonics_gravity_source.-
hh"
#include "utils/memory/include/jeod_alloc.hh"
#include "utils/named_item/include/named_item.hh"
#include "../include/mars_MRO110B2.hh"
```

Namespaces

- [jeod](#)

    Namespace jeod.

Macros

- #define [JEOD_FRIEND_CLASS](#) SphericalHarmonicsGravitySource_mars_MRO110B2_default_data

9.26.1   Macro Definition Documentation

9.26.1.1   #define JEOD_FRIEND_CLASS SphericalHarmonicsGravitySource_mars_MRO110B2_default_data

Definition at line 37 of file mars_MRO110B2.cc.

9.27   mars_MRO110B2.hh File Reference

```
#include "spherical_harmonics_gravity_source_default_data.hh"
```

Data Structures

- class [jeod::SphericalHarmonicsGravitySource_mars_MRO110B2_default_data](#)

Namespaces

- [jeod](#)

    Namespace jeod.

9.28   mars_spherical.cc File Reference

```
#include "environment/gravity/include/gravity_source.hh"
#include "environment/gravity/include/spherical_harmonics_gravity_source.-
hh"
#include "utils/named_item/include/named_item.hh"
#include "../include/mars_spherical.hh"
```

Namespaces

- [jeod](#)

    Namespace jeod.

Macros

- #define [JEOD_FRIEND_CLASS](#) SphericalHarmonicsGravitySource_mars_spherical_default_data

---

9.28.1 Macro Definition Documentation

9.28.1.1 #define JEOD_FRIEND_CLASS SphericalHarmonicsGravitySource_mars_spherical_default_data

Definition at line 28 of file mars_spherical.cc.

9.29 mars_spherical.hh File Reference

```
#include "spherical_harmonics_gravity_source_default_data.hh"
```

Data Structures

- class jeod::SphericalHarmonicsGravitySource_mars_spherical_default_data

Namespaces

- jeod

  Namespace jeod.

9.30 moon_LP150Q.cc File Reference

```
#include "environment/gravity/include/gravity_source.hh"
#include "environment/gravity/include/spherical_harmonics_gravity_source.-
hh"
#include "utils/memory/include/jeod_alloc.hh"
#include "utils/named_item/include/named_item.hh"
#include "../include/moon_LP150Q.hh"
```

Namespaces

- jeod

  Namespace jeod.

Macros

- #define JEOD_FRIEND_CLASS SphericalHarmonicsGravitySource_moon_LP150Q_default_data

9.30.1 Macro Definition Documentation

9.30.1.1 #define JEOD_FRIEND_CLASS SphericalHarmonicsGravitySource_moon_LP150Q_default_data

Definition at line 46 of file moon_LP150Q.cc.

9.31 moon_LP150Q.hh File Reference

```
#include "spherical_harmonics_gravity_source_default_data.hh"
```

Data Structures

- class [jeod::SphericalHarmonicsGravitySource_moon_LP150Q_default_data](#)

Namespaces

- [jeod](#)

    Namespace jeod.

9.32 moon_spherical.cc File Reference

```
#include "environment/gravity/include/gravity_source.hh"
#include "environment/gravity/include/spherical_harmonics_gravity_source.-
hh"
#include "utils/named_item/include/named_item.hh"
#include "../include/moon_spherical.hh"
```

Namespaces

- [jeod](#)

    Namespace jeod.

Macros

- #define [JEOD_FRIEND_CLASS](#) SphericalHarmonicsGravitySource_moon_spherical_default_data

9.32.1 Macro Definition Documentation

9.32.1.1 #define JEOD_FRIEND_CLASS SphericalHarmonicsGravitySource_moon_spherical_default_data

Definition at line 30 of file moon_spherical.cc.

9.33 moon_spherical.hh File Reference

```
#include "spherical_harmonics_gravity_source_default_data.hh"
```

Data Structures

- class [jeod::SphericalHarmonicsGravitySource_moon_spherical_default_data](#)

Namespaces

- [jeod](#)

    Namespace jeod.

9.34 spherical_harmonics_calc_nonspherical.cc File Reference

Define SphericalHarmonicsGravityControl calc_nonspherical method, which computes non-spherical gravitational acceleration of a gravitational body on a given position.

```
#include <cmath>
#include "environment/planet/include/planet.hh"
#include "utils/math/include/vector3.hh"
#include "utils/math/include/matrix3x3.hh"
#include "../include/gravity_messages.hh"
#include "../include/spherical_harmonics_gravity_controls.hh"
#include "../include/spherical_harmonics_delta_controls.hh"
#include "../include/spherical_harmonics_gravity_source.hh"
```

Namespaces

- jeod

    Namespace jeod.

9.34.1 Detailed Description

Define SphericalHarmonicsGravityControl calc_nonspherical method, which computes non-spherical gravitational acceleration of a gravitational body on a given position.

Definition in file spherical_harmonics_calc_nonspherical.cc.

9.35 spherical_harmonics_delta_coeffs.cc File Reference

Define member functions for the SphericalHarmonicsDeltaCoeffs class.

```
#include <cstddef>
#include "dynamics/dyn_manager/include/base_dyn_manager.hh"
#include "utils/memory/include/jeod_alloc.hh"
#include "../include/spherical_harmonics_delta_coeffs.hh"
#include "../include/spherical_harmonics_delta_coeffs_init.hh"
#include "../include/spherical_harmonics_delta_controls.hh"
#include "../include/spherical_harmonics_gravity_source.hh"
```

Namespaces

- jeod

    Namespace jeod.

9.35.1 Detailed Description

Define member functions for the SphericalHarmonicsDeltaCoeffs class.

Definition in file spherical_harmonics_delta_coeffs.cc.

9.36 spherical_harmonics_delta_coeffs.hh File Reference

Define the class SphericalHarmonicsDeltaCoeffs, the base class for tidal effects and temporal gravity sub-models.

```
#include "utils/sim_interface/include/jeod_class.hh"
#include "class_declarations.hh"
```

Data Structures

- class jeod::SphericalHarmonicsDeltaCoeffs

  Base class for tidal and temporal gravity models.

Namespaces

- jeod

  Namespace jeod.

9.36.1 Detailed Description

Define the class SphericalHarmonicsDeltaCoeffs, the base class for tidal effects and temporal gravity sub-models.

Definition in file spherical_harmonics_delta_coeffs.hh.

9.37 spherical_harmonics_delta_coeffs_init.cc File Reference

Define member functions for the SphericalHarmonicsDeltaCoeffsInit class.

```
#include <cstddef>
#include "../include/spherical_harmonics_delta_coeffs_init.hh"
```

Namespaces

- jeod

  Namespace jeod.

9.37.1 Detailed Description

Define member functions for the SphericalHarmonicsDeltaCoeffsInit class.

Definition in file spherical_harmonics_delta_coeffs_init.cc.

9.38 spherical_harmonics_delta_coeffs_init.hh File Reference

Define the class SphericalHarmonicsDeltaCoeffsInit, the base initialization class for tidal effects and temporal gravity sub-models.

```
#include "utils/sim_interface/include/jeod_class.hh"
```

Data Structures

- class jeod::SphericalHarmonicsDeltaCoeffsInit

    Initialization data for a SphericalHarmonicsDeltaCoeffs instance.

Namespaces

- jeod

    Namespace jeod.

9.38.1 Detailed Description

Define the class SphericalHarmonicsDeltaCoeffsInit, the base initialization class for tidal effects and temporal gravity sub-models.

Definition in file spherical_harmonics_delta_coeffs_init.hh.

9.39 spherical_harmonics_delta_controls.cc File Reference

Define member functions for the SphericalHarmonicsDeltaControls class.

```
#include <cstddef>
#include "../include/spherical_harmonics_delta_controls.hh"
#include "../include/spherical_harmonics_delta_coeffs.hh"
#include "../include/spherical_harmonics_gravity_source.hh"
```

Namespaces

- jeod

    Namespace jeod.

9.39.1 Detailed Description

Define member functions for the SphericalHarmonicsDeltaControls class.

Definition in file spherical_harmonics_delta_controls.cc.

9.40 spherical_harmonics_delta_controls.hh File Reference

Define the gravity controls for the variational gravity models such as solid-body tides.

```
#include "utils/sim_interface/include/jeod_class.hh"
#include "class_declarations.hh"
```

Data Structures

- class jeod::SphericalHarmonicsDeltaControls

    Provides controls for how a variational model affects a vehicle.

Namespaces

- jeod

    Namespace jeod.

9.40.1 Detailed Description

Define the gravity controls for the variational gravity models such as solid-body tides.

Definition in file spherical_harmonics_delta_controls.hh.

9.41 spherical_harmonics_gravity_controls.cc File Reference

Define member functions for the SphericalHarmonicsGravityControls class.

```
#include <cmath>
#include <cstddef>
#include "utils/memory/include/jeod_alloc.hh"
#include "utils/message/include/message_handler.hh"
#include "../include/spherical_harmonics_gravity_controls.hh"
#include "../include/spherical_harmonics_delta_coeffs.hh"
#include "../include/spherical_harmonics_delta_controls.hh"
#include "../include/gravity_manager.hh"
#include "../include/gravity_messages.hh"
#include "../include/spherical_harmonics_gravity_source.hh"
```

Namespaces

- jeod

    Namespace jeod.

9.41.1 Detailed Description

Define member functions for the SphericalHarmonicsGravityControls class.

Definition in file spherical_harmonics_gravity_controls.cc.

9.42 spherical_harmonics_gravity_controls.hh File Reference

Define the gravity controls.

```
#include "utils/container/include/pointer_vector.hh"
#include "utils/sim_interface/include/jeod_class.hh"
#include "gravity_controls.hh"
#include "class_declarations.hh"
#include "spherical_harmonics_gravity_source.hh"
```

Data Structures

- class jeod::SphericalHarmonicsGravityControls

    Specifies whether and how a SphericalHarmonicsGravitySource affects a vehicle.

Namespaces

- [jeod](#)

    Namespace jeod.

9.42.1 Detailed Description

Define the gravity controls.

Definition in file [spherical_harmonics_gravity_controls.hh](#).

9.43 spherical_harmonics_gravity_source.cc File Reference

Define member functions for the SphericalHarmonicsGravitySource class.

```
#include <cmath>
#include <cstddef>
#include <cstring>
#include <typeinfo>
#include "dynamics/dyn_manager/include/base_dyn_manager.hh"
#include "environment/ephemerides/ephem_interface/include/ephem_ref_frame.-
hh"
#include "utils/math/include/numerical.hh"
#include "utils/memory/include/jeod_alloc.hh"
#include "utils/message/include/message_handler.hh"
#include "../include/spherical_harmonics_delta_coeffs.hh"
#include "../include/spherical_harmonics_delta_coeffs_init.hh"
#include "../include/gravity_manager.hh"
#include "../include/gravity_messages.hh"
#include "../include/spherical_harmonics_gravity_source.hh"
```

Namespaces

- [jeod](#)

    Namespace jeod.

9.43.1 Detailed Description

Define member functions for the SphericalHarmonicsGravitySource class.

Definition in file [spherical_harmonics_gravity_source.cc](#).

9.44 spherical_harmonics_gravity_source.hh File Reference

Define the spherical harmonics implementation of a gravity body.

```
#include <vector>
#include "utils/container/include/pointer_vector.hh"
#include "utils/sim_interface/include/jeod_class.hh"
#include "class_declarations.hh"
#include "gravity_source.hh"
#include "spherical_harmonics_delta_coeffs.hh"
```

Data Structures

- class [jeod::SphericalHarmonicsGravitySource](#)

  Models the gravity for a specific planet using spherical harmonics.

Namespaces

- [jeod](#)

  Namespace jeod.

9.44.1 Detailed Description

Define the spherical harmonics implementation of a gravity body.

Definition in file [spherical_harmonics_gravity_source.hh](#).

9.45 spherical_harmonics_gravity_source_default_data.hh File Reference

Data Structures

- class [jeod::SphericalHarmonicsGravitySource_default_data](#)

Namespaces

- [jeod](#)

  Namespace jeod.

9.46 spherical_harmonics_solid_body_tides.cc File Reference

Define member functions for the SphericalHarmonicsSolidBodyTides class.

```
#include <cmath>
#include "dynamics/dyn_manager/include/base_dyn_manager.hh"
#include "environment/planet/include/planet.hh"
#include "utils/math/include/vector3.hh"
#include "utils/ref_frames/include/ref_frame.hh"
#include "../include/spherical_harmonics_solid_body_tides.hh"
#include "../include/spherical_harmonics_delta_coeffs_init.hh"
#include "../include/spherical_harmonics_gravity_controls.hh"
#include "../include/spherical_harmonics_gravity_source.hh"
```

Namespaces

- [jeod](#)

  Namespace jeod.

9.46.1 Detailed Description

Define member functions for the SphericalHarmonicsSolidBodyTides class.

Definition in file [spherical_harmonics_solid_body_tides.cc](#).

9.47 spherical_harmonics_solid_body_tides.hh File Reference

Define the SphericalHarmonicsSolidBodyTides class, which models solid-body tidal effects.

```
#include "utils/sim_interface/include/jeod_class.hh"
#include "spherical_harmonics_tidal_effects.hh"
#include "class_declarations.hh"
```

Data Structures

- class jeod::SphericalHarmonicsSolidBodyTides
  Models solid body tidal effects.

Namespaces

- jeod
  Namespace jeod.

9.47.1 Detailed Description

Define the SphericalHarmonicsSolidBodyTides class, which models solid-body tidal effects. SphericalHarmonics-SolidBodyTides inherits directly from the SphericalHarmonicsTidalEffects class.

Definition in file spherical_harmonics_solid_body_tides.hh.

9.48 spherical_harmonics_solid_body_tides_init.cc File Reference

Define member functions for the SphericalHarmonicsSolidBodyTidesInit class.

```
#include "utils/memory/include/jeod_alloc.hh"
#include "../include/spherical_harmonics_solid_body_tides_init.hh"
```

Namespaces

- jeod
  Namespace jeod.

9.48.1 Detailed Description

Define member functions for the SphericalHarmonicsSolidBodyTidesInit class.

Definition in file spherical_harmonics_solid_body_tides_init.cc.

9.49 spherical_harmonics_solid_body_tides_init.hh File Reference

Define the SphericalHarmonicsSolidBodyTidesInit class, which is the initialization class for the solid body tides model.

```
#include "utils/sim_interface/include/jeod_class.hh"
#include "spherical_harmonics_tidal_effects_init.hh"
```

Data Structures

- class jeod::SphericalHarmonicsSolidBodyTidesInit

    Initializes a solid body tides model.

Namespaces

- jeod

    Namespace jeod.

9.49.1 Detailed Description

Define the SphericalHarmonicsSolidBodyTidesInit class, which is the initialization class for the solid body tides model.

Definition in file spherical_harmonics_solid_body_tides_init.hh.

9.50 spherical_harmonics_tidal_effects.cc File Reference

Define member functions for the SphericalHarmonicsTidalEffects class.

```
#include <cstddef>
#include "dynamics/dyn_manager/include/base_dyn_manager.hh"
#include "environment/planet/include/planet.hh"
#include "utils/memory/include/jeod_alloc.hh"
#include "utils/message/include/message_handler.hh"
#include "utils/ref_frames/include/ref_frame.hh"
#include "../include/spherical_harmonics_tidal_effects.hh"
#include "../include/spherical_harmonics_delta_coeffs_init.hh"
#include "../include/spherical_harmonics_tidal_effects_init.hh"
#include "../include/gravity_messages.hh"
#include "../include/spherical_harmonics_gravity_source.hh"
```

Namespaces

- jeod

    Namespace jeod.

9.50.1 Detailed Description

Define member functions for the SphericalHarmonicsTidalEffects class.

Definition in file spherical_harmonics_tidal_effects.cc.

9.51 spherical_harmonics_tidal_effects.hh File Reference

Define the class SphericalHarmonicsTidalEffects, which is the base class for solid-body and ocean tidal effects.

```
#include "environment/planet/include/class_declarations.hh"
#include "utils/ref_frames/include/class_declarations.hh"
#include "utils/sim_interface/include/jeod_class.hh"
#include "spherical_harmonics_delta_coeffs.hh"
#include "class_declarations.hh"
```

Data Structures

- class jeod::SphericalHarmonicsTidalEffects

  Models tidal effects as a delta on top of a gravity model.

Namespaces

- jeod

  Namespace jeod.

9.51.1 Detailed Description

Define the class SphericalHarmonicsTidalEffects, which is the base class for solid-body and ocean tidal effects. SphericalHarmonicsTidalEffects inherits directly from the SphericalHarmonicsDeltaCoeffs class.

Definition in file spherical_harmonics_tidal_effects.hh.

9.52 spherical_harmonics_tidal_effects_init.cc File Reference

Define member functions for the SphericalHarmonicsTidalEffectsInit class.

```
#include <cstddef>
#include "../include/spherical_harmonics_tidal_effects_init.hh"
```

Namespaces

- jeod

  Namespace jeod.

9.52.1 Detailed Description

Define member functions for the SphericalHarmonicsTidalEffectsInit class.

Definition in file spherical_harmonics_tidal_effects_init.cc.

9.53 spherical_harmonics_tidal_effects_init.hh File Reference

Define the SphericalHarmonicsTidalEffectsInit class, the initialization class for tidal effects models.

```
#include "utils/sim_interface/include/jeod_class.hh"
#include "spherical_harmonics_delta_coeffs_init.hh"
```

Data Structures

- class [jeod::SphericalHarmonicsTidalEffectsInit](#)
    Initializes a tidal gravity model.

Namespaces

- [jeod](#)
    Namespace jeod.

9.53.1 Detailed Description

Define the SphericalHarmonicsTidalEffectsInit class, the initialization class for tidal effects models.

Definition in file [spherical_harmonics_tidal_effects_init.hh](#).

9.54 sun_spherical.cc File Reference

```
#include "environment/gravity/include/gravity_source.hh"
#include "environment/gravity/include/spherical_harmonics_gravity_source.-
hh"
#include "utils/named_item/include/named_item.hh"
#include "../include/sun_spherical.hh"
```

Namespaces

- [jeod](#)
    Namespace jeod.

Macros

- #define [JEOD_FRIEND_CLASS](#) SphericalHarmonicsGravitySource_sun_spherical_default_data

9.54.1 Macro Definition Documentation

9.54.1.1 #define JEOD_FRIEND_CLASS SphericalHarmonicsGravitySource_sun_spherical_default_data

Definition at line 31 of file sun_spherical.cc.

9.55 sun_spherical.hh File Reference

```
#include "spherical_harmonics_gravity_source_default_data.hh"
```

Data Structures

- class [jeod::SphericalHarmonicsGravitySource_sun_spherical_default_data](#)

Namespaces

- jeod

  Namespace jeod.

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