8th annual
EARTH SYSTEM GRID FEDERATION

The ES-DOC Workflow for CMIP6

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David Hassell (NCAS)

Sciences de l'environnement
Institut Pierre Simon Laplace

December 5th, 2018

Outline
Overview
Experiments
Models
Ensembles
Summary

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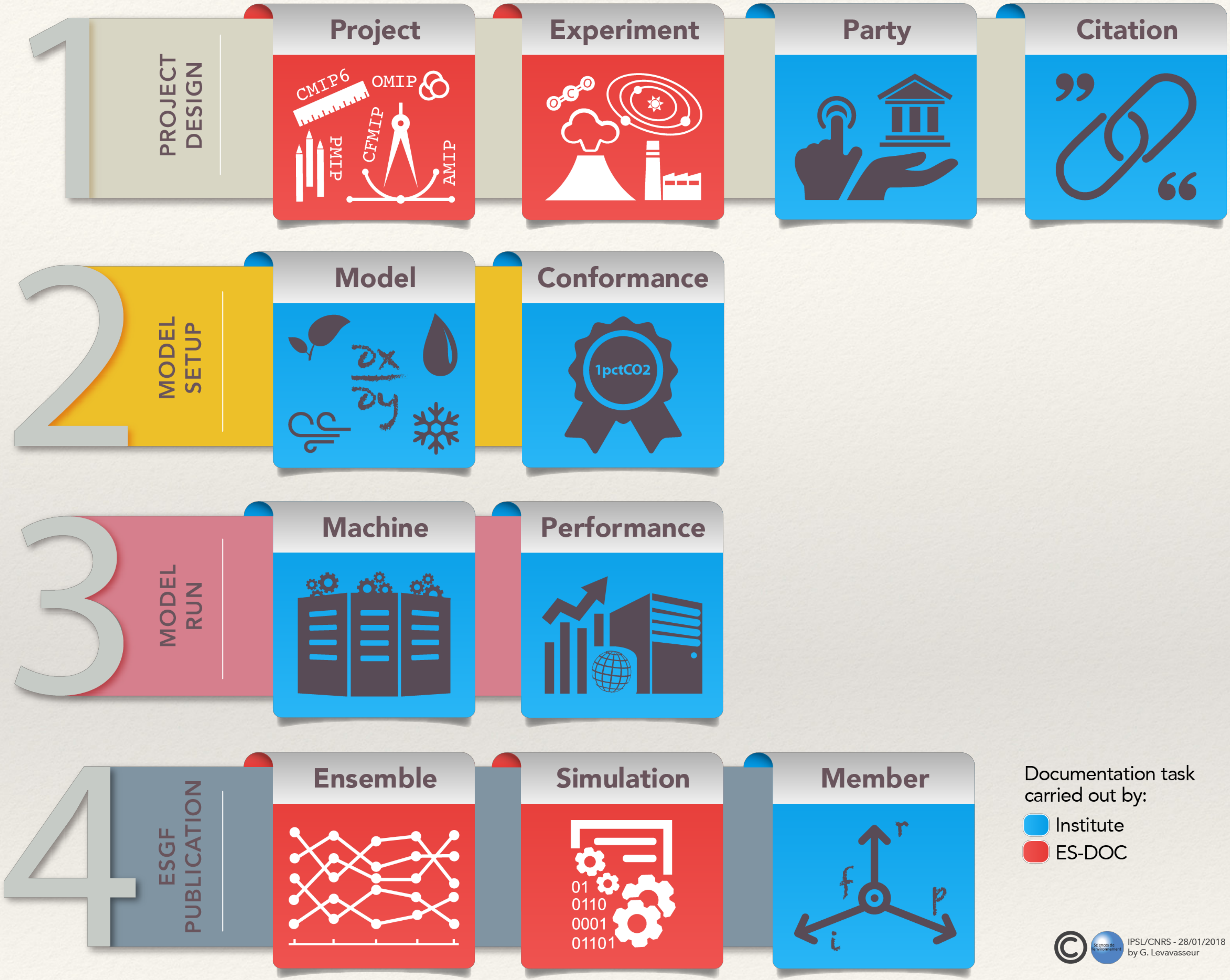
Overview

- **Core**:
  - Eric Guilyardi (FR - IPSL/CNRS)
  - Mark Greenslade (FR - IPSL/CNRS)
  - David Hassell (UK - NCAS)
  - Charlotte Pascoe (UK - STFC)

- **Contributions**:
  - Atef Ben Nasser (FR - IPSL)
  - Chris Blanton (US - GFDL)
  - Mark Elkington (UK - MOHC)
  - Ruth Petrie (UK - NCAS)
  - Ag Stephens (UK - STFC)
  - Allyn Treshansky (US - NOAA)
  - Martina Stockhausen (DE - DKRZ)

- **PI's**:
  - Balaji (US - GFDL)
  - Sébastien Denvil (FR - IPSL/CNRS)
  - Bryan Lawrence (UK - NCAS)
  - Cecelia De Luca (US - NOAA)
  - Karl Taylor (US - PCMDI)


1
PROJECT DESIGN
Project
CMIP6
OMIP
PMIP
CFMIP
AMIP
Experiment
Party
Citation
2
MODEL SETUP
Model
Conformance
1pctCO2
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MODEL RUN
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ESGF PUBLICATION
Ensemble
Simulation
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Documentation task carried out by:
Institute
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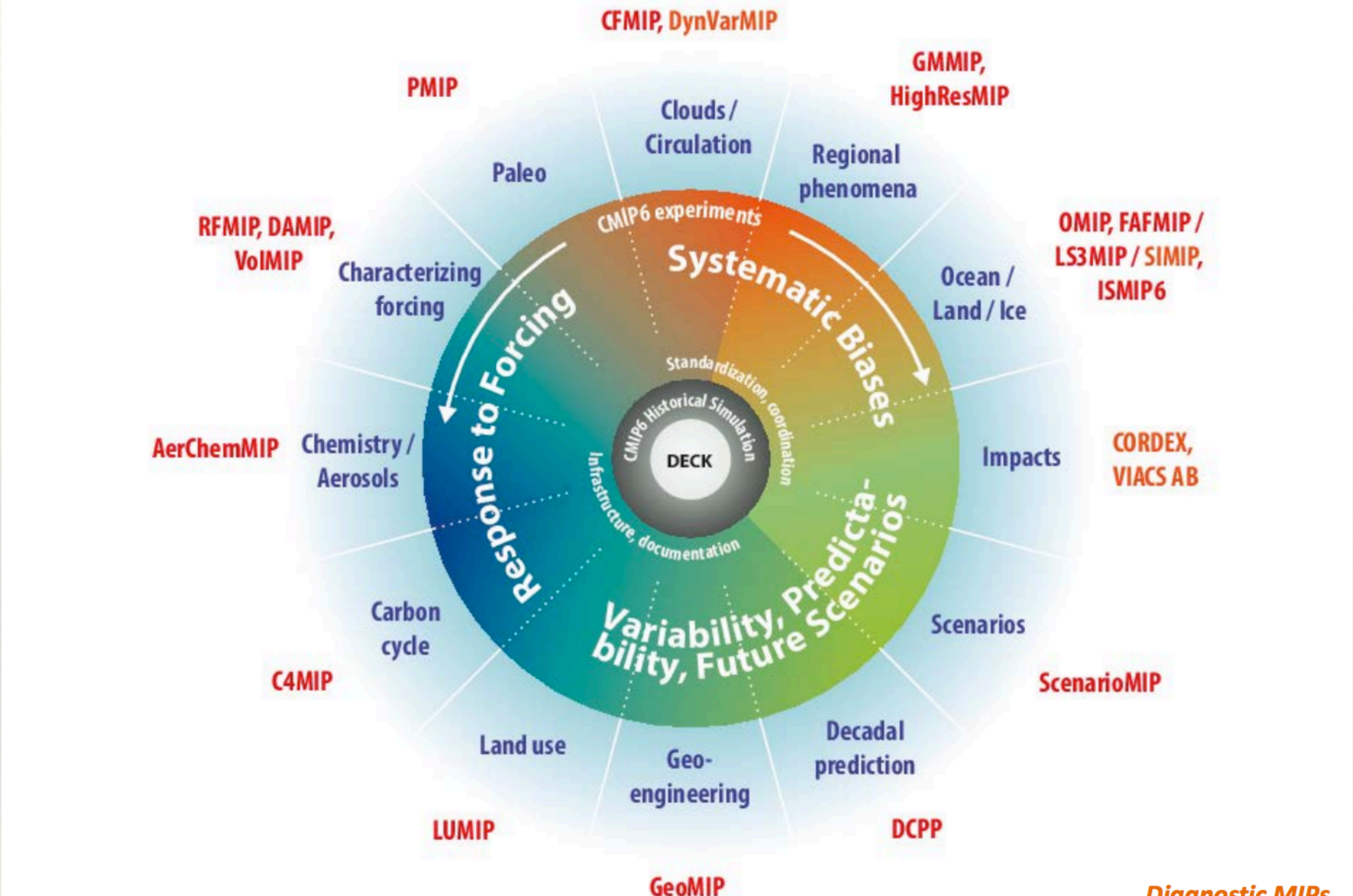
Experiments



Eyring et al., GMD, 2016

project | experiment | requirement | ForcingConstraint | TemporalConstraint | EnsembleRequirement | MultiEnsemble | StartDateEnsemble | references | party | url

name	long_name	canonical_name	keywords	description	rationale	responsible_party				references					
						role	parties								
CMIP6	Climate Model Intercomparison Project Number 6	cmip6	climate, modelling, climate change, intercomparison	Climate Model Intercomparison Project phase six.	The objective of CMIP is to better understand past, present and future climate change in a multi-model context. By coordinating the design and distribution of global climate model simulations of the past, current and future climate, the Coupled Model Intercomparison Project (CMIP) has become one of the foundational elements of climate science.	point of contact:	Veronika Eyring	Karl Taylor		Eyring, V., S. Bony, G. A. Meehl, C. Senior, B. Stevens, R. J. Stouffer, and K. E. Taylor (2016), Overview of the Coupled Model Intercomparison Project Phase 6 (CMIP6) experimental design and organization, Geosci. Model Dev., 9, 1937-1958	Meehl, G. A., R. Moss, K. E. Taylor, V. Eyring, R. J. Stouffer, S. Bony, B. Stevens, 2014: Climate Model Intercomparisons: Preparing for the Next Phase, Eos Trans. AGU, 95(9), 77.	Overview CMIP6-Endorsed MIPs			
CMIP	Climate Model Intercomparison Project	cmip	climate sensitivity, historical reference, control simulations, unforced variability, DECK	Core experiments for the Climate Model Intercomparison Project. CMIP includes the DECK (Diagnosis, Evaluation, and Characterization of Klima (Climate)) experiments: 1pctCO2, abrupt-4xCO2, amip, piControl and esm-piControl. CMIP also includes the historical experiments: historical, esm-hist, historical-ext, esm-hist-ext.	To maintain continuity and help document basic characteristics of models across different phases of CMIP.	point of contact:	Veronika Eyring			Meehl, G. A., R. Moss, K. E. Taylor, V. Eyring, R. J. Stouffer, S. Bony, B. Stevens, 2014: Climate Model Intercomparisons: Preparing for the Next Phase, Eos Trans. AGU, 95(9), 77.	Eyring, V., S. Bony, G. A. Meehl, C. Senior, B. Stevens, R. J. Stouffer, and K. E. Taylor (2016), Overview of the Coupled Model Intercomparison Project Phase 6 (CMIP6) experimental design and organization, Geosci. Model Dev., 9, 1937-1958				
DECK	Diagnosis, Evaluation, and Characterization of Klima (Climate)	deck	climate sensitivity, historical reference, control simulations, unforced variability, DECK	Core simulations for climate model intercomparison.	To maintain continuity and help document basic characteristics of models across different phases of CMIP.	point of contact:	Veronika Eyring			Meehl, G. A., R. Moss, K. E. Taylor, V. Eyring, R. J. Stouffer, S. Bony, B. Stevens, 2014: Climate Model Intercomparisons: Preparing for the Next Phase, Eos Trans. AGU, 95(9), 77.	Eyring, V., S. Bony, G. A. Meehl, C. Senior, B. Stevens, R. J. Stouffer, and K. E. Taylor (2016), Overview of the Coupled Model Intercomparison Project Phase 6 (CMIP6) experimental design and organization, Geosci. Model Dev., 9, 1937-1958				
ScenarioMIP	Scenario Model Intercomparison Project	scenariomip	climate, modelling, climate change, future, scenario, high forcing, low forcing, medium forcing, overshoot scenarios, 1.5˚C, Paris COP21 Agreement	ScenarioMIP simulates climate outcomes based on alternative plausible future scenarios.	(a) Facilitating integrated research on the impact of plausible future scenarios over physical and human systems, and on mitigation and adaptation options; (b) addressing targeted studies on the effects of particular forcings in collaboration with other MIPs; (c) help quantifying projection uncertainties based on multi-model ensembles and emergent constraints.	point of contact:	Brian O'Neill	Claudia Tebaldi	Detlef van Vuuren	Meehl, G. A., R. Moss, K. E. Taylor, V. Eyring, R. J. Stouffer, S. Bony, B. Stevens, 2014: Climate Model Intercomparisons: Preparing for the Next Phase, Eos Trans. AGU, 95(9), 77.	O'Neill, B., Kriegler, E., Riahi, K., Ebi, K.L., Hallegatte, S., Carter, T.R., Mathur, R. and D.P. van Vuuren, 2014: A new scenario framework for climate change research: the concept of shared socioeconomic pathways. Climate change, Special Issue, Nakicenovic N, Lempert R, Janetos A (eds) A Framework for the Development of New Socioeconomic Scenarios for Climate Change Research.	van Vuuren DP, Kriegler E, O'Neill BC, Ebi KL, Riahi K, Carter TR, Edmonds J, Hallegatte S, Kram T, Mathur R, Winkler H (2014), A new scenario framework for Climate Change Research: scenario matrix architecture. Climatic Change, Special Issue, Nakicenovic N, Lempert R, Janetos A (eds) A Framework for the Development of New Socioeconomic Scenarios for Climate Change Research.	O'Neill, B. C., C. Tebaldi, D. van Vuuren, V. Eyring, P. Fridelingstein, G. Hurtt, R. Knutti, E. Kriegler, J.-F. Lamarque, J. Lowe, J. Meehl, R. Moss, K. Riahi, B. M. Sanderson (2016), The Scenario Model Intercomparison Project (ScenarioMIP) for CMIP6, Geosci. Model Dev., 9, 3461-3482	ScenarioMIP experimental protocols web site	Overview CMIP6-Endorsed MIPs
AerChemMIP	Aerosols and Chemistry MIP	aerchemmip	chemistry, aerosols, NTCF, ERF, WMGHG, forcings and feedbacks	The Aerosol Chemistry Model Intercomparison Project (AerChemMIP) is endorsed by the Coupled-Model Intercomparison Project 6 (CMIP6) and is designed to quantify the climate and air quality impacts of aerosols and chemically-reactive gases. These are specifically near-term climate forcers (NTCFs: methane, tropospheric ozone and aerosols, and their precursors), nitrous oxide and ozone-depleting halocarbons.	The aim of AerChemMIP is to answer four scientific questions: 1. How have anthropogenic emissions contributed to global radiative forcing and affected regional climate over the historical period? 2. How might future policies (on climate, air quality and land use) affect the abundances of NTCFs and their climate impacts? 3. How do uncertainties in historical NTCF emissions affect radiative forcing estimates? 4. How important are climate feedbacks	point of contact:	William Collins	Jean-François Lamarque	Michael Schulz	Collins, W. J., J.-F. Lamarque, M. Schulz, O. Boucher, V. Eyring, M. I. Hegglin, A. Maycock, G. Myhre, M. Prather, D. Shindell, S. J. Smith (2016), AerChemMIP: Quantifying the effects of chemistry and aerosols in CMIP6, Geosci. Model Dev. Discuss., Published 12 July 2016	Overview CMIP6-Endorsed MIPs				
C4MIP	Coupled Climate Carbon Cycle MIP	c4mip	carbon cycle, earth system model, biogeochemical effects, century-scale change	C4MIP is a suite of idealised, historical and future scenario experiments that investigate the radiative and biogeochemical effects of changing carbon dioxide concentrations.	Understanding and quantifying future century-scale changes in the global carbon cycle and its feedback on the climate system, making the link between CO2 emissions and climate change.	point of contact:	Vivek Arora	Pierre Friedlingstein	Chris Jones	Jones, C. D., V. Arora, P. Friedlingstein, L. Bopp, V. Brovkin, J. Dunne, H. Graven, F. Hoffman, T. Ilyina, J. G. John, M. Jung, M. Kawamiya, C. Koven, J. Pongratz, T. Raddatz, J. Randerson, S. Zaehle (2016), C4MIP – The Coupled Climate-Carbon Cycle Model Intercomparison Project: experimental protocol for CMIP6, Geosci. Model Dev.,	C4MIP homepage	C4MIP mailing list	Overview CMIP6-Endorsed MIPs		
CFMIP	Cloud Feedback Model Intercomparison Project	cfmip	clouds, feedback, regional-scale precipitation, non-linear	CFMIP is a suite of experiments that investigate the response to idealised perturbations to SSTs, CO2 and Solar Irradiance in AMIP, aquaplanet (no land) and ESM	Improving assessments of cloud feedback via (a) improved understanding of cloud-climate feedback mechanisms and (b) better evaluation of clouds and cloud feedback in climate models. Also improving understanding of	point of contact:	Mark Webb	Chris Bretherton		Webb, M. J., T. Andrews, A. Bodas-Salcedo, S. Bony, C. S. Bretherton, R. Chadwick, H. Chepfer, H. Douville, P. Good, J. E.	CFMIP project home page	Karl E. Taylor, Ronald J. Stouffer and Gerald A. Meehl (2009) A Summary of the CMIP5 Experiment Design	McAvaney BJ, Le Treut H (2003), The cloud feedback intercomparison project: (CFMIP). In: CLIVAR Exchanges - supplementary	Overview CMIP6-Endorsed MIPs	

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Earth System Documentation

Documentation Search v0.11.0.0 Support

Project / MIP Era: CMIP6 | Document Type: MIP | Document Version: Latest

Total Documents = 22. Filtered Documents = 22.

<< < Page 1 of 1 > >> 25 / page

Name	Description	Version
AerChemMIP	Aerosols and Chemistry MIP	1
C4MIP	Coupled Climate Carbon Cycle MIP	1
CDRMIP	The Carbon Dioxide Removal Model Intercomparison Project	1
CFMIP	Cloud Feedback Model Intercomparison Project	1
CMIP	Climate Model Intercomparison Project	1
CMIP6	Climate Model Intercomparison Project Number 6	1
DAMIP	Detection and Attribution Model Intercomparison Project	1
DCPP	Decadal Climate Prediction Project	1
DECK	Diagnosis, Evaluation, and Characterization of Klima (Climate)	1
FAFMIP	Flux-Anomaly-Forced Model Intercomparison Project	1
GeoMIP	The Geoengineering Model intercomparison Project	1
GMMIP	Global Monsoons Modeling Inter-comparison Project	1
HighResMIP	High Resolution Model Intercomparison Project	1
ISMIP6	Ice Sheet Model Intercomparison Project for CMIP6	1
LS3MIP	Land Surface, Snow and Soil Moisture MIP	1
LUMIP	Land-Use Model Intercomparison Project	1
OMIP	Ocean Model Inter-comparison Project	1
PAMIP	Polar Amplification Model Intercomparison Project	1
PMIP	Paleoclimate Modeling Intercomparison Project	1
RFMIP	Radiative Forcing Model Intercomparison Project	1
ScenarioMIP	Scenario Model Intercomparison Project	1
VolMIP	Model Intercomparison Project on the climatic response to Volcanic forcing	1

Total Documents = 22. Filtered Documents = 22.

https://**documentation**.es-doc.org/**cmip6**

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CMIP6 Sub MIP : DAMIP

Overview

Name	DAMIP
Long Name	Detection and Attribution Model Intercomparison Project
Homepage	http://www.wcrp-climate.org/modelling-wgcm-mip-catalogue/modelling-wgcm-mips/475-modelling-wgcm-damip
Description	DAMIP is a suite of historical and scenario experiments using individual and subsets of forcings.
Rationale	(a) Estimating the contribution of external forcings to observed global and regional climate changes; (b) observationally constraining future climate change projections by scaling future GHG and other anthropogenic responses using regression coefficients derived for the historical period.
Objectives	• Da: Attempt to understand past climate change and constrain future projections with observations of past climates.
Keywords	climate change detection | climate change attribution | detection | attribution | anthropogenic | natural

Experiments

Tier 1	hist-nat | hist-GHG | hist-aer
Tier 2	ssp245-GHG | hist-stratO3 | ssp245-stratO3
Tier 3	hist-sol | hist-volc | hist-CO2 | ssp245-aer | ssp245-nat | hist-all-aer2 | hist-all-nat2
Other	piControl | historical | ssp245

Citations

The Detection And Attribution Model Intercomparison Project (DAMIP V1.0) Contribution To CMIP6

DOI	10.5194/gmd-9-3685-2016
Title	Gillett, N. P., H. Shiogama, B. Funke, G. Hegerl, R. Knutti, K. Matthes, B. D. Santer, D. Stone, C. Tebaldi (2016), The Detection and Attribution Model Intercomparison Project (DAMIP v1.0) contribution to CMIP6, Geosci. Model Dev., 9, 3685-3697
Context	Research into the detection and attribution (D&A) of climate change is concerned with diagnosing the existence of forced changes in the observed climate record and assessing the roles of various possible contributors to those observed changes.
Abstract	Detection and attribution (D&A) simulations were important components of CMIP5 and underpinned the climate change detection and attribution assessments of the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. The primary goals of the Detection and Attribution Model Intercomparison Project (DAMIP) are to

https://documentation.es-doc.org/cmip6/**mips/damip**

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CMIP6 Tier 1 Experiment: hist-nat

Overview

MIP Era	cmip6
Related MIPs	DAMIP
Canonical Name	hist-nat
Alternative Names	histNat
Long Name	historical natural-only runs
Tier	1
Description	Historical natural-only simulations resemble the historical simulations but instead are forced with only solar and volcanic forcing from the historical simulations. Report what sets of emissions and boundary conditions are used.
Rationale	Combinations of CMIP6 historical, histNat and histGHG will allow the attribution of observed climate changes to contributions from GHG, other anthropogenic factors and natural forcing. CMIP6 historical and histNAT will be used for event attribution analyses of recent extreme weather and climate events, and can be used for analyses of impact assessments.
Keywords	DAMIP | Tier 1 | histNat | cmip6historical | natural forcing

Relationships

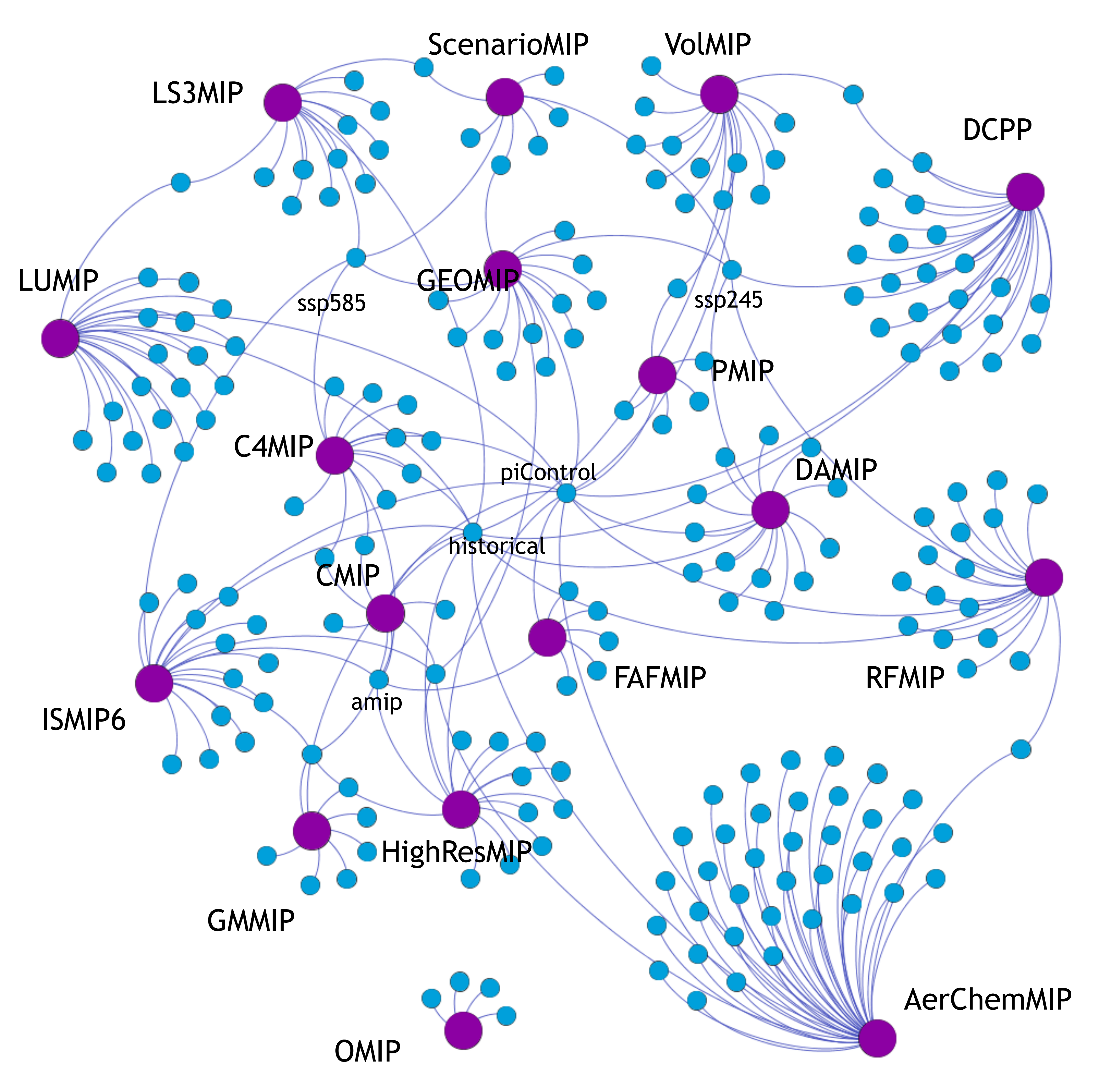
Parent	piControl
Siblings	hist-GHG | hist-sol | hist-volc | historical | ssp245
Children	ssp245-nat
Control	historical
Provides Control To	hist-sol | hist-volc

Temporal Constraints

1850/01/01-2021/01/01

Start Date	1850-01-01
Required Duration	171 years
Description	Historical, pre-industrial to present and near future
Keywords	1850-2020 | Historical | RCP45

https://documentation.es-doc.org/cmip6/**experiments/hist-nat**

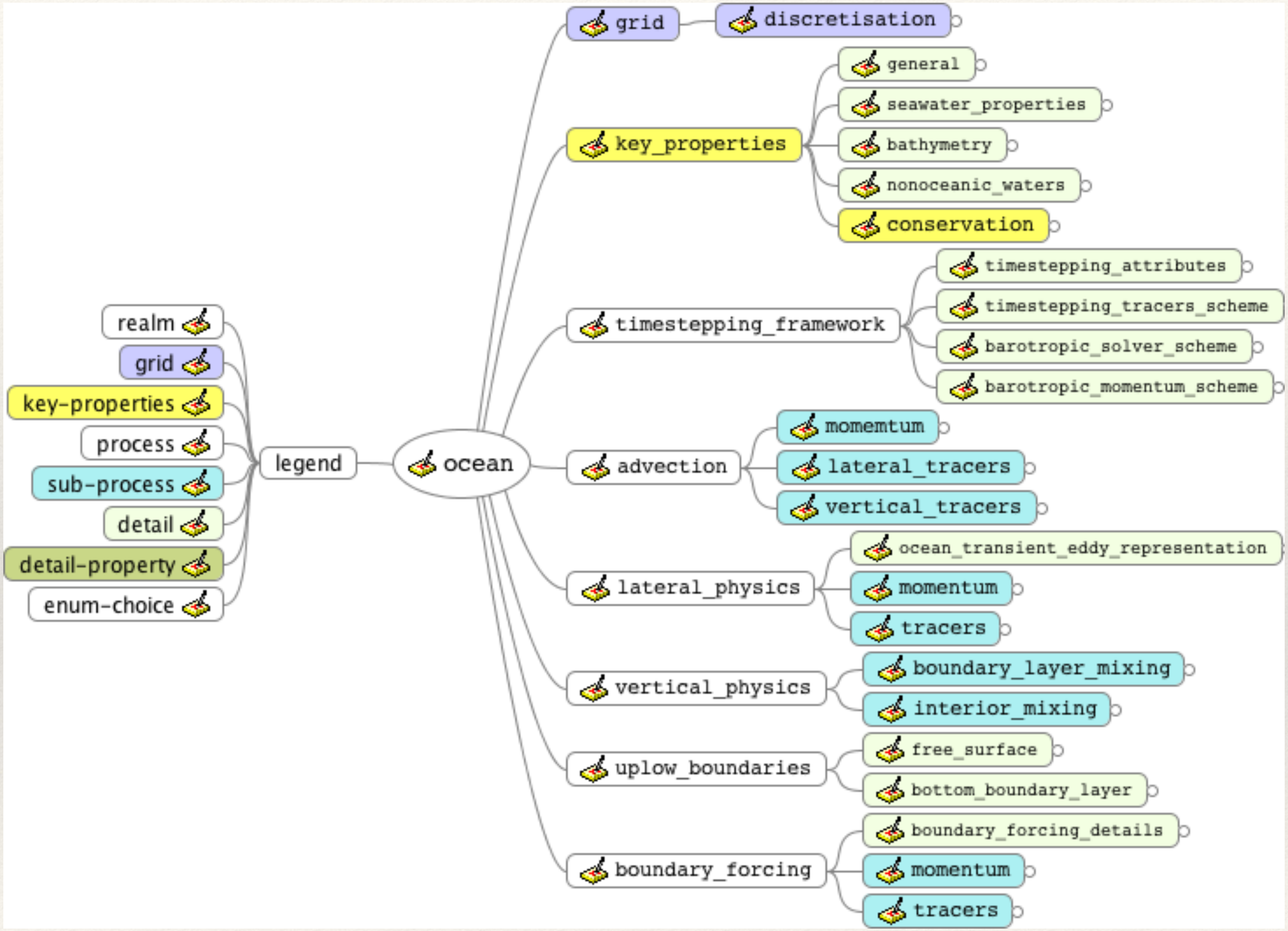

ScenarioMIP
VolMIP
LS3MIP
DCPP
LUMIP
ssp585
GEOMIP
ssp245
PMIP
C4MIP
piControl
DAMIP
historical
CMIP
FAFMIP
RFMIP
ISMIP6
amip
HighResMIP
GMMIP
AerChemMIP
OMIP

Models

Models: **Specialisations**

```python
# ----------------------------------------------------------------------
# DESCRIPTION: Short description of the specialization.
# ----------------------------------------------------------------------
DESCRIPTION = 'Ocean Timestepping Framework'

# ----------------------------------------------------------------------
# PROCESS: top level
# ----------------------------------------------------------------------

DETAILS['toplevel'] = {
    'description': 'Properties of time stepping in ocean',
    'properties': [
        ('diurnal_cycle', 'ENUM:diurnal_cycle_types', '1.1',
            'Diurnal cycle type'),
        ]
    }

# Tracers time stepping
DETAILS['toplevel:tracers'] = {
    'description': 'Properties of tracers time stepping in ocean',
    'properties': [
        ('scheme', 'ENUM:ocean_timestepping_types', '1.1',
            'Tracers time stepping scheme'),
        ('time_step', 'int', '1.1',
            'Tracers time step (in seconds)'),
        ]
    }

# Baroclinic dynamics
DETAILS['toplevel:baroclinic_dynamics'] = {
    'description': 'Baroclinic dynamics in ocean',
    'properties': [
        ('type', 'ENUM:baroclinic_types', '1.1',
            'Baroclinic dynamics type'),
        ('scheme', 'ENUM:ocean_timestepping_types', '1.1',
            'Baroclinic dynamics scheme'),
        ('time_step', 'int', '0.1',
            'Baroclinic time step (in seconds)'),
        ]
    }
```

- **Experts** define specialisations around a topic
- **Driven** by scientists
- One specialisation **per** CMIP6 realm + top-level
- Tooling **validates** specialisations
- Tooling generates downstream **artefacts**
- WGCM **short-table** subsets


realm
grid
key-properties
process
sub-process
detail
detail-property
enum-choice
legend
ocean
grid
discretisation
key_properties
general
seawater_properties
bathymetry
nonoceanic_waters
conservation
timestepping_framework
timestepping_attributes
timestepping_tracers_scheme
barotropic_solver_scheme
barotropic_momentum_scheme
advection
momemtum
lateral_tracers
vertical_tracers
lateral_physics
ocean_transient_eddy_representation
momentum
tracers
vertical_physics
boundary_layer_mixing
interior_mixing
uplow_boundaries
free_surface
bottom_boundary_layer
boundary_forcing
boundary_forcing_details
momentum
tracers

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CMIP6 Specializations Viewer v0.11.0.0 Support

Realm: ? Ocean
Process: Timestepping Framework
Short Table: --

CMIP6 > Ocean > Timestepping Framework

Name		
Description	Commonly used name for the timestepping framework in ocean model.	
Type | Cardinality	str | 0.1	
Spec. ID	cmip6.ocean.timestepping_framework.name	

Overview		
Description	Overview of ocean timestepping framework in ocean model.	
Type | Cardinality	l-str | 0.1	
Spec. ID	cmip6.ocean.timestepping_framework.overview	

Diurnal Cycle		
Description	Diurnal cycle type	
Type | Cardinality	enum | 1.1	
Spec. ID	cmip6.ocean.timestepping_framework.diurnal_cycle	
Allowed Options	None	No diurnal cycle in ocean
	Via coupling	Diurnal cycle via coupling frequency
	Specific treatment	Specific treament
	Other	User Defined

Tracers > Scheme		
Description	Tracers time stepping scheme	
Type | Cardinality	enum | 1.1	
Spec. ID	cmip6.ocean.timestepping_framework.tracers.scheme	
Allowed Options	Leap-frog + Asselin filter	Leap-frog scheme with Asselin filter
	Leap-frog + Periodic Euler	Leap-frog scheme with Periodic Euler
	Predictor-corrector	Predictor-corrector scheme
	Runge-Kutta 2	Runge-Kutta 2 scheme
	AM3-LF	AM3-LF such as used in ROMS
	Forward-backward	Forward-backward scheme
	Forward operator	Forward operator scheme
	Other	User Defined

Tracers > Time Step		
Description	Tracers time step (in seconds)	
Type | Cardinality	int | 1.1	
Spec. ID	cmip6.ocean.timestepping_framework.tracers.time_step	

Baroclinic Dynamics > Type		
Description	Baroclinic dynamics type	
Type | Cardinality	enum | 1.1	

https://**specializations**.es-doc.org/**cmip6**

Models: **Documenting**

Frontis | 1. Parties & Citations | 2. Key Properties | 3. Grid | 4. Timestepping Framework | 5. Advection | 6. Lateral Physics | 7. Vertical Physics | 8. Uplow Boundaries | 9. Bo

A	B
2.1	**Key Properties**
	Ocean key properties
2.1.1 *	**Name**
STRING	**Name of ocean model code**
	NEMO : Nucleus for European Modelling of the Ocean version 3.2 (OPZ)
2.1.2 *	**Keywords**
STRING	**Keywords associated with ocean model code**
	NOTE: Please enter a comma seperated list
2.1.3 *	**Overview**
STRING	**Overview of ocean model.**
	NOTE: Double click to expand if text is too long for cell
	The ocean and sea-ice component is based on NEMOv3.2 (Nucleus for European Modelling of the Ocean, Madec, 2008), which includes OPA for the dynamics of the ocean, PISCES for ocean biochemistry, and LIM for sea-ice dynamics and thermodynamics. The configuration is ORCA2 (Madec and Imbard, 1996) which is a tri-polar global grid and its associated physics. South of 40°N, the grid is an isotropic Mercator with a nominal resolution of 2°. A latitudinal grid refinement of 1/2° is used in the tropics. North of 40°N, the grid is no more Mercator and quasi-isotropic, the North Pole singularity being mapped onto a line between points in Canada and Siberia. In the vertical, 31 depth levels are used (from 10m thick near the surface to 500m thick at 5000m). NEMOv3.2 uses a partial step formulation (Barnier et al, 2006), which ensures a better representation of bottom bathymetry and thus stream flow and friction at the bottom of the ocean. Advection of temperature and salinity is done using a total variance dissipation scheme (Lévy et al, 2001; Cravatte et al, 2007). In the momentum equation, an energy and enstrophy conserving scheme is used (Arakawa and Lamb, 1981; Le Sommer et al, 2009). The mixed layer dynamics is parameterized using the Turbulent Kinetic Energy (TKE)
2.1.4 *	**Model Family**
ENUM	**Type of ocean model.**
	OGCM
2.1.5 *	**Basic Approximations**
ENUM	**Basic approximations made in the ocean.**
	NOTE: Multiple entries are allowed, please insert a new row per entry.
	Boussinesq
	Primitive equations

A spreadsheet per institute | source-ID | realm permutation

Ocean > Key Properties

Name	
Description	Name of ocean model code
Value	NEMO : Nucleus for European Modelling of the Ocean version 3.2 (OPA)
Keywords	
Description	Keywords associated with ocean model code
Value	--
Overview	
Description	Overview of ocean model.
Value	The ocean and sea-ice component is based on NEMOv3.2 (Nucleus for European Modelling of the Ocean, Madec, 2008), which includes OPA for the dynamics of the ocean, PISCES for ocean biochemistry, and LIM for sea-ice dynamics and thermodynamics. The configuration is ORCA2 (Madec and Imbard, 1996) which is a tri-polar global grid and its associated physics. South of 40°N, the grid is an isotropic Mercator with a nominal resolution of 2°. A latitudinal grid refinement of 1/2° is used in the tropics. North of 40°N, the grid is no more Mercator and quasi-isotropic, the North Pole singularity being mapped onto a line between points in Canada and Siberia. In the vertical, 31 depth levels are used (from 10m thick near the surface to 500m thick at 5000m)._x000D_ _x000D_ NEMOv3.2 uses a partial step formulation (Barnier et al, 2006), which ensures a better representation of bottom bathymetry and thus stream flow and friction at the bottom of the ocean. Advection of temperature and salinity is done using a total variance dissipation scheme (Lévy et al, 2001; Cravatte et al, 2007). In the momentum equation, an energy and enstrophy conserving scheme is used (Arakawa and Lamb, 1981; Le Sommer et al, 2009). The mixed layer dynamics is parameterized using the Turbulent Kinetic Energy (TKE) closure scheme of Blanke and Delecluse (1993) improved by Madec (2008). The improvements include a double diffusion process (Merryfield et al, 1999), Langmuir cells (Axell, 2002) and the contribution of surface wave breaking (Mellor and Blumberg, 2004; Burchard and Rennau, 2008). A parametrization of bottom intensified tidal-driven mixing similar to Simmons et al (2004) is used in combination with a specific tidal mixing parametrization in the Indonesian area (Koch-Larrouy et al, 2007, 2010). NEMOv3.2 also includes prognostic interaction between incoming shortwave radiation into the ocean and the phytoplankton (Lengaigne et al, 2009)._x000D_ _x000D_ The horizontal eddy viscosity coefficient (ahm) value is 4.104 m2.s−1 and the lateral eddy diffusivity coefficient (aht) value is 103 m2.s−1. ahm reduces to aht in the tropics, except along western boundaries. The tracer diffusion is along isoneutral surfaces. A Gent and Mcwilliams (1990) term is applied in the advective formulation. Its coefficient is calculated from the local growth rate of baroclinic instability. It decreases in the 20◦S-20◦N band, and vanishes at the Equator. At the ocean floor, there is a linear bottom friction with a coefficient of 4.10−4, and a background bottom turbulent kinetic energy of 2.5 10−3 m2.s−2. The model has a Beckmann and Döscher (1997) diffusive bottom boundary layer scheme with a value of 104 m2.s−1. A spatially varying geothermal flux is applied at the bottom of the ocean (Emile-Geay and Madec, 2009), with a global mean value of 86.4 mW.m−2.
Model Family	
Description	Type of ocean model.
Value	OGCM
Basic Approximations	
Description	Basic approximations made in the ocean.
Values	Boussinesq
	Primitive equations
Prognostic Variables	
Description	List of prognostic variables in the ocean component.
Values	Potential temperature
	SSH

https://documentation.es-doc.org/cmip6/**models**/**ipsl-cm6a-lr**

Ensembles

Ensembles: **Further Info URL**

CMIP6 Further Information v0.5.1.0

Support | Help

Further Info URL: https://furtherinfo.es-doc.org/cmip6.ipsl.ipsl-cm6a-lr.dcppa-hindcast-niff.s2000.r1

ES-DOC Documentation

MIP Era	CMIP6
Institution	IPSL
Model	IPSL-CM6A-LR
Experiment	dcppA-hindcast-niff
Ensemble Description	N/A
Machine Performance	N/A

Dataset Documentation

Dataset ESGF Search	N/A
Dataset Errata	N/A
Dataset Citation(s)	https://cera-www.dkrz.de/WDCC/meta/CMIP6/CMIP6.DCPP.IPSL.IPSL-CM6A-LR.dcppA-hindcast-niff

Other Documentation

WCRP CMIP6 Homepage	https://www.wcrp-climate.org/wgcm-cmip/wgcm-cmip6
ES-DOC CMIP6 Homepage	https://es-doc.org/cmip6

NetCDF headers contain a required attribute: **further_info_url**

https://**furtherinfo**.es-doc.org/<**mip-era**>.<**institute-id**>.<**source-id**>.<**experiment-id**>.<**sub-experiment-id**>.<**variant-label**>

Ensembles: **Dataset Errata**

es-doc
Earth System Documentation

Dataset Errata - Search v0.6.3.0

Support | Docs | PID | Login

Project:	Experiment ID:	Institution ID:	Source ID:	Variable ID:	Severity:	Status:
CMIP6	*	*	*	*	*	*

Total Issues = 20. Filtered Issues = 20.

#	Institute	Title	Created	Updated	Closed	Severity	Status
1	IPSL	200 years extension for piControl	2018-11-29	2018-11-29	--	Low	Resolved
2	IPSL	"Fixed" CMIP6 variables provided by NEMO model are ti ...	2018-11-26	2018-11-27	--	Medium	Resolved
3	NOAA-GFDL	Variable tslsi (3hr,day) has incorrect "comment" vari ...	2018-11-26	--	--	Low	New
4	IPSL	500 years extension for piControl	2018-11-23	2018-11-29	--	Low	Resolved
5	CNRM-CERFACS	Wrong realm ocnBgChem typo	2018-11-14	2018-11-16	--	Low	Resolved
6	NOAA-GFDL	Incorrect some coordinates and cell_methods in piCont ...	2018-11-08	2018-11-08	--	Medium	New
7	NOAA-GFDL	Error in variable "comment" metadata	2018-11-01	2018-11-16	--	Low	New
8	NOAA-GFDL	albisccp erroneous data units	2018-10-29	2018-11-16	--	Low	New
9	IPSL	300 years extension for abrupt-4xCO2	2018-10-22	2018-10-22	--	Low	Resolved
10	IPSL	Irrelevant CFC in experiment other than historical	2018-10-19	2018-10-23	--	Low	Resolved
11	IPSL	Instabilities which lead to erroneous values of tas a ...	2018-10-16	2018-10-16	--	Critical	On Hold
12	IPSL	tas instabilities lead to erroneous values of tasmax	2018-10-05	2018-10-16	--	Critical	On Hold
13	IPSL	Versioning errors for 1pctCO2 and abrupt-4xCO2	2018-07-27	2018-07-27	--	Critical	Resolved
14	IPSL	Wrong realm "ocnBgChm" typo	2018-07-26	2018-08-08	--	Low	Resolved
15	IPSL	Unchanged PIDs for new version	2018-07-20	2018-07-21	--	High	Resolved
16	IPSL	Some sea ice variables in 3D instead of 1D	2018-07-12	2018-07-17	--	Low	Resolved
17	IPSL	Time instantaneous data with time boundaries	2018-07-02	2018-11-29	--	Low	Wont Fix
18	IPSL	Integers instead of PFTs names	2018-07-02	2018-10-12	--	Low	Resolved
19	IPSL	Integers instead of ocean passages names	2018-07-02	2018-07-17	--	Low	Resolved
20	IPSL	"area:coordinates" attribute is missing	2018-07-02	2018-07-17	--	Low	Resolved

Total Issues = 20. Filtered Issues = 20. **v0.6.3.0 © ES-DOC**

https://**errata**.es-doc.org

Ensembles: **Conformances**

How do simulations conform to MIP protocols ?

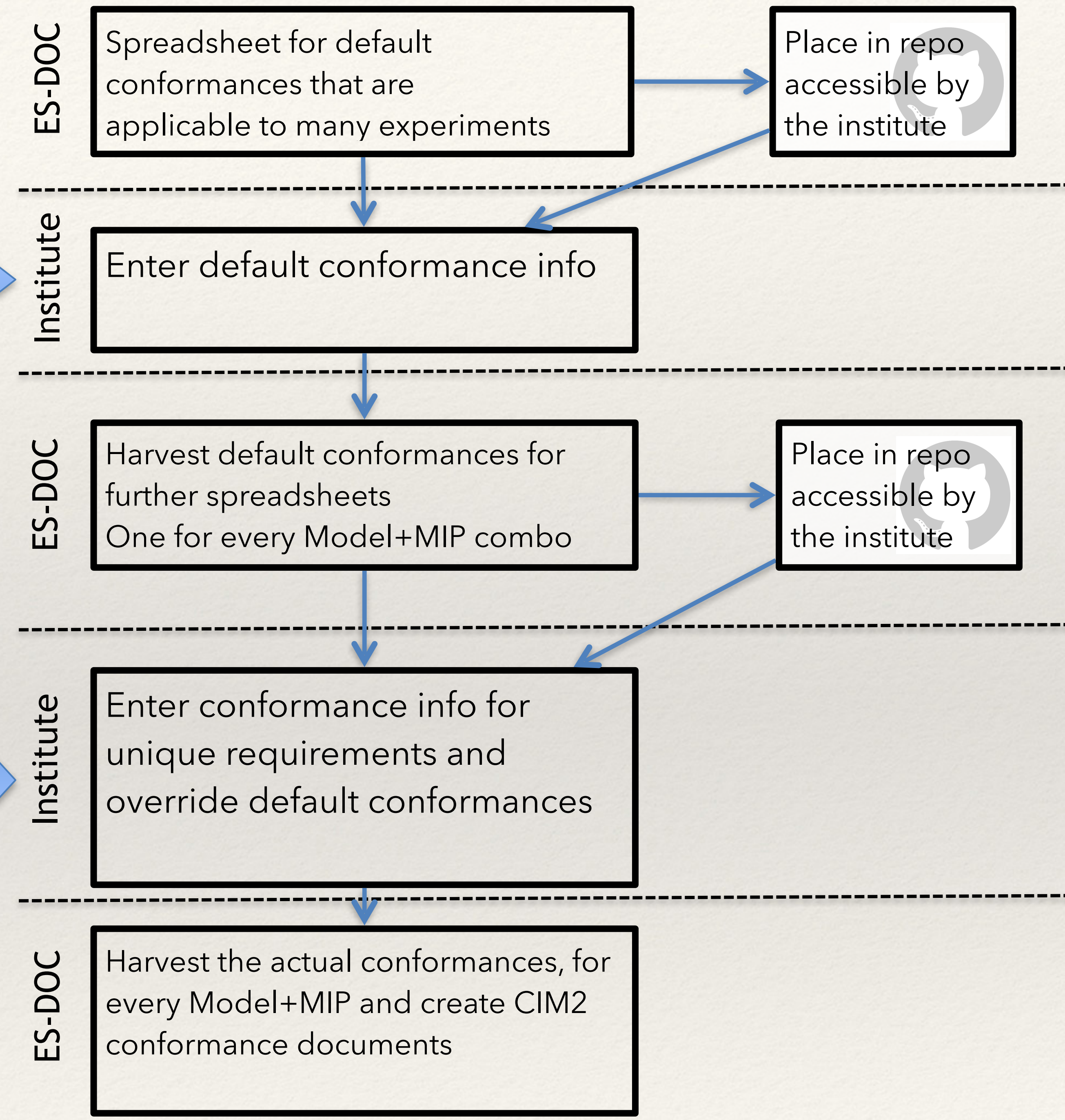
Step 1: **Common** conformances declared within a default spreadsheet

Step 2: Ensemble **specific** conformances declared within **auto**-initialised spreadsheets

N-step process

Step 3: **Merge** common + ensemble specific conformances

Step 4: **Transform** spreadsheets into CIM documents and publish

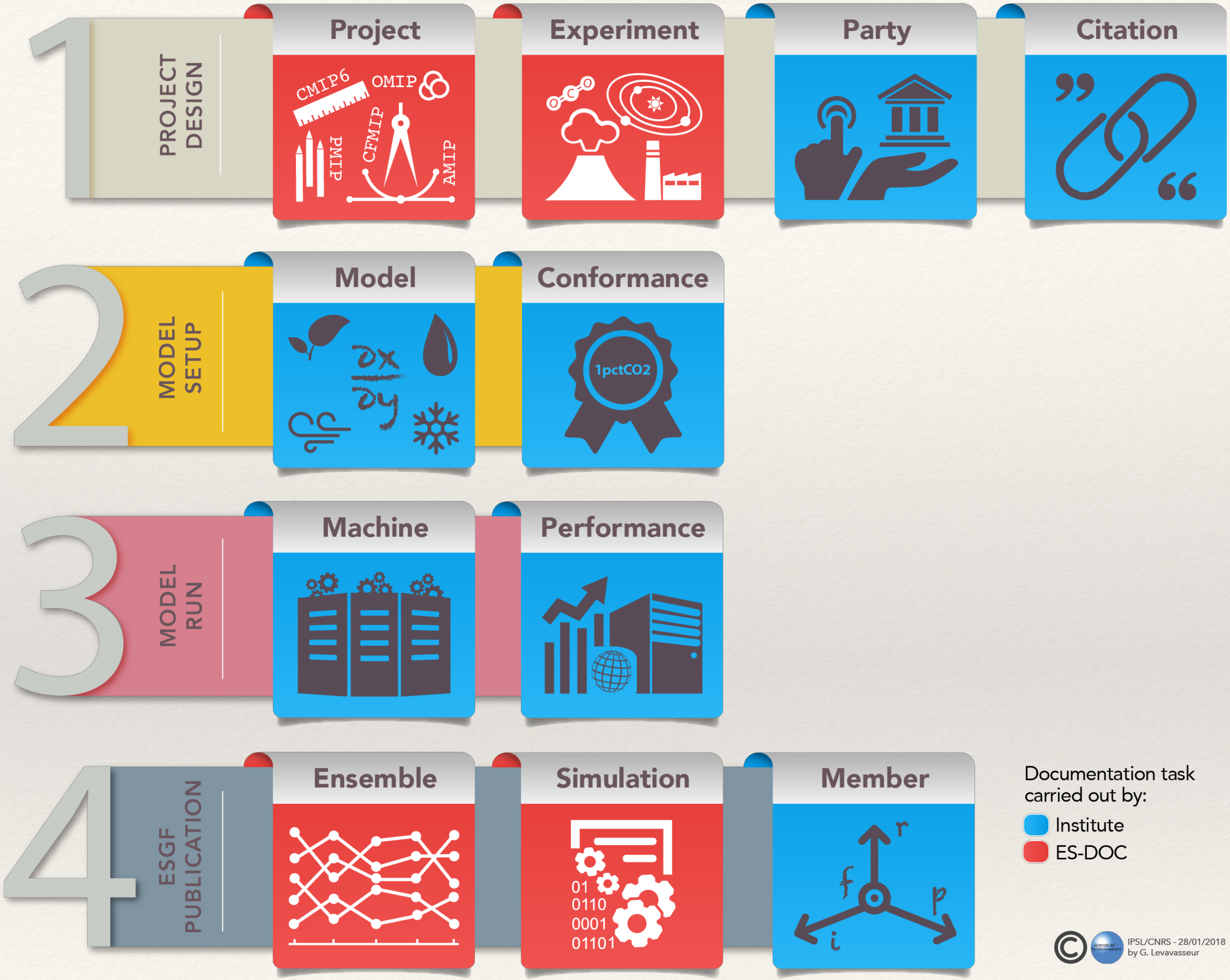


Ensembles: **CDF 2 CIM**

- **cdf2cim client library**:
  - cf-python
  - cdf2cim web-service
- **esg-f publisher integration**:
  - –cdfcim flag
  - scan directory
  - map/reduce netCDF –> JSON
  - write JSON to fs
  - publish JSON to ws
- **security**:
  - GitHub API
  - cdf2cim-publication GitHub team
- **Web-service**:
  - map JSON –> CIM
  - publish to tools: search & view.

Summary

- **Evolutionary**:
  - Building upon CMIP5 documentation
- **Automated**:
  - Where feasible
- **Mandated**:
  - WGCM via WIP
- **Simplified**:
  - Spreadsheets + scripts
- **Sustainable**:
  - EU funding via CNRS/IPSL & ISENES3
- **Great team**:
  - Long term collaboration


1
PROJECT DESIGN
Project
CMIP6
OMIP
PMIP
CFMIP
AMIP
Experiment
Party
Citation
2
MODEL SETUP
Model
Conformance
1pctCO2
3
MODEL RUN
Machine
Performance
4
ESGF PUBLICATION
Ensemble
Simulation
01
0110
0001
01101
Member
r
f
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i
Documentation task carried out by:
Institute
ES-DOC
IPSL/CNRS - 28/01/2018
by G. Levavasseur

8th annual

EARTH SYSTEM GRID FEDERATION

The ES-DOC Workflow for CMIP6

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Institut Pierre Simon Laplace

December 5th, 2018

Outline

Overview
Experiments
Models
Ensembles
Summary

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