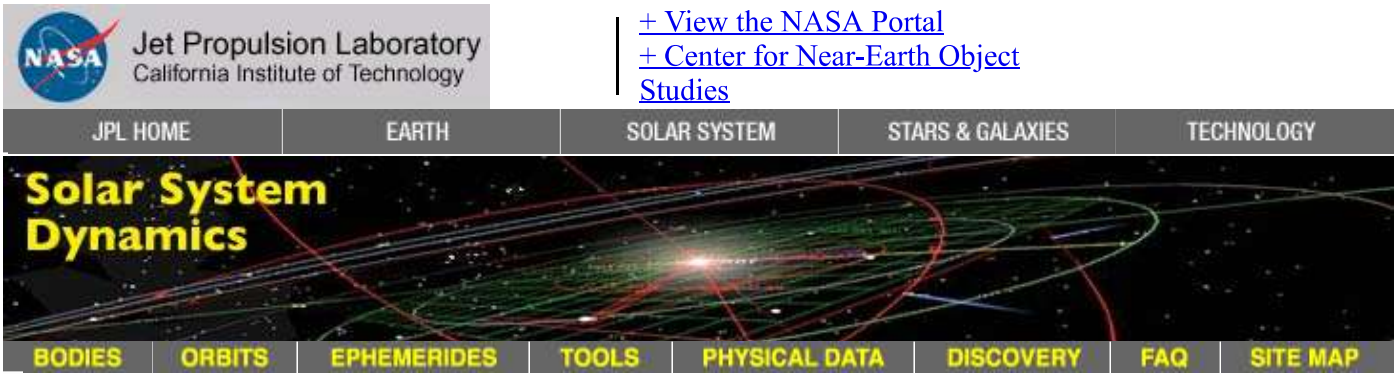

HORIZONS Web-Interface

This tool provides a web-based *limited* interface to JPL's HORIZONS system which can be used to generate ephemerides for solar-system bodies. Full access to HORIZONS features is available via the primary telnet interface. HORIZONS system news shows recent changes and improvements. A web-interface tutorial is available to assist new users.

Current Settings

Ephemeris Type [change] : **VECTORS**
Target Body [change] : **Earth [Geocenter]** [399]
Coordinate Origin [change] : **Solar System Barycenter (SSB)** [500@0]
Time Span [change] : Start=**2019-04-27 00:00**, Stop=**2019-04-27 12:00**, Step=**1 d**
Table Settings [change] : *defaults*
Display/Output [change] : *default* (formatted HTML)

Object Data Page

```
Revised: July 31, 2013                 Earth                              399

GEOPHYSICAL PROPERTIES (revised Aug 15, 2018):
 Vol. Mean Radius (km)    = 6371.01+-0.02   Mass x10^24 (kg)= 5.97219+-0.0006
 Equ. radius, km          = 6378.137        Mass layers:
 Polar axis, km           = 6356.752          Atmos          = 5.1   x 10^18 kg
 Flattening               = 1/298.257223563   oceans         = 1.4   x 10^21 kg
 Density, g/cm^3          = 5.51              crust          = 2.6   x 10^22 kg
 J2 (IERS 2010)           = 0.00108262545     mantle         = 4.043 x 10^24 kg
 g_p, m/s^2  (polar)      = 9.8321863685      outer core     = 1.835 x 10^24 kg
 g_e, m/s^2  (equatorial) = 9.7803267715      inner core     = 9.675 x 10^22 kg
 g_o, m/s^2               = 9.82022         Fluid core rad  = 3480 km
 GM, km^3/s^2             = 398600.435436   Inner core rad  = 1215 km
 GM 1-sigma, km^3/s^2     =      0.0014     Escape velocity = 11.186 km/s
 Rot. Rate (rad/s)        = 0.00007292115   Surface area:
 Mean sidereal day, hr    = 23.9344695944     land           = 1.48 x 10^8 km
 Mean solar day 2000.0, s = 86400.002         sea            = 3.62 x 10^8 km
 Mean solar day 1820.0, s = 86400.0         Love no., k2    = 0.299
 Moment of inertia        = 0.3308          Atm. pressure   = 1.0 bar
 Mean temperature, K      = 270             Volume, km^3    = 1.08321 x 10^12
 Mean effect. IR temp, K  = 255             Magnetic moment = 0.61 gauss Rp^3
 Geometric albedo         = 0.367           Vis. mag. V(1,0)= -3.86
 Solar Constant (W/m^2)   = 1367.6 (mean), 1414 (perihelion), 1322 (aphelion)
HELIOCENTRIC ORBIT CHARACTERISTICS:
 Obliquity to orbit, deg  = 23.4392911  Sidereal orb period  = 1.0000174 y
 Orbital speed, km/s      = 29.79       Sidereal orb period  = 365.25636 d
 Mean daily motion, deg/d = 0.9856474   Hill's sphere radius = 234.9
```

Results

```
*******************************************************************************
Ephemeris / WWW_USER Fri Feb  7 17:15:23 2020 Pasadena, USA      / Horizons
*******************************************************************************
Target body name: Earth (399)                     {source: DE431mx}
Center body name: Solar System Barycenter (0)     {source: DE431mx}
Center-site name: BODY CENTER
*******************************************************************************
Start time      : A.D. 2019-Apr-27 00:00:00.0000 TDB
Stop  time      : A.D. 2019-Apr-27 12:00:00.0000 TDB
Step-size       : 1440 minutes
*******************************************************************************
Center geodetic : 0.00000000,0.00000000,0.0000000 {E-lon(deg),Lat(deg),Alt(km)}
Center cylindric: 0.00000000,0.00000000,0.0000000 {E-lon(deg),Dxy(km),Dz(km)}
Center radii    : (undefined)
Output units    : AU-D
Output type     : GEOMETRIC cartesian states
Output format   : 3 (position, velocity, LT, range, range-rate)
Reference frame : ICRF/J2000.0
Coordinate systm: Ecliptic and Mean Equinox of Reference Epoch
*******************************************************************************
JDTDB
   X     Y     Z
   VX    VY    VZ
   LT    RG    RR
*******************************************************************************
$$SOE
2458600.500000000 = A.D. 2019-Apr-27 00:00:00.0000 TDB
 X =-8.137850649885880E-01 Y =-5.867610927308373E-01 Z =-2.837047450366285E-06
 VX= 9.867406393541108E-03 VY=-1.395096307916507E-02 VZ= 1.404197076481182E-06
 LT= 5.794358277476926E-03 RG= 1.003262035536686E+00 RR= 1.554273741402127E-04
$$EOE
*******************************************************************************
Coordinate system description:

  Ecliptic and Mean Equinox of Reference Epoch

    Reference epoch: J2000.0
    XY-plane: plane of the Earth's orbit at the reference epoch
              Note: obliquity of 84381.448 arcseconds wrt ICRF equator (IAU76)
    X-axis  : out along ascending node of instantaneous plane of the Earth's
              orbit and the Earth's mean equator at the reference epoch
    Z-axis  : perpendicular to the xy-plane in the directional (+ or -) sense
              of Earth's north pole at the reference epoch.

  Symbol meaning [1 au= 149597870.700 km, 1 day= 86400.0 s]:

    JDTDB    Julian Day Number, Barycentric Dynamical Time
      X      X-component of position vector (au)
      Y      Y-component of position vector (au)
      Z      Z-component of position vector (au)
      VX     X-component of velocity vector (au/day)
      VY     Y-component of velocity vector (au/day)
      VZ     Z-component of velocity vector (au/day)
      LT     One-way down-leg Newtonian light-time (day)
      RG     Range; distance from coordinate center (au)
      RR     Range-rate; radial velocity wrt coord. center (au/day)

Geometric states/elements have no aberrations applied.

 Computations by ...
     Solar System Dynamics Group, Horizons On-Line Ephemeris System
     4800 Oak Grove Drive, Jet Propulsion Laboratory
     Pasadena, CA  91109   USA
     Information: http://ssd.jpl.nasa.gov/
```

```
     Connect    : telnet://ssd.jpl.nasa.gov:6775  (via browser)
                  http://ssd.jpl.nasa.gov/?horizons
                  telnet ssd.jpl.nasa.gov 6775    (via command-line)
     Author     : Jon.D.Giorgini@jpl.nasa.gov
*******************************************************************************
```