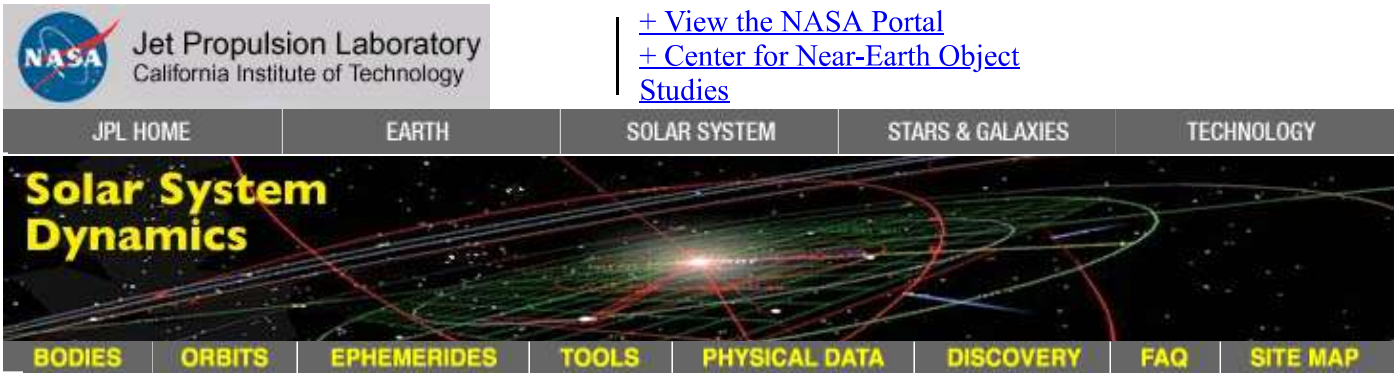

HORIZONS Web-Interface

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] : **1 Ceres**
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

```
JPL/HORIZONS                         1 Ceres                  2020-Feb-07 17:14:16
Rec #:       1 (+COV) Soln.date: 2019-Jun-05_16:22:15   # obs: 1002 (1995-2019)

IAU76/J2000 helio. ecliptic osc. elements (au, days, deg., period=Julian yrs):

  EPOCH=  2454033.5 ! 2006-Oct-25.00 (TDB)         Residual RMS= .22345
   EC= .07987906346370539  QR= 2.544709153978707   TP= 2453193.6614275328
   OM= 80.40846590069125   W=  73.1893463033331    IN= 10.58671483589909
   A= 2.76562466186023     MA= 179.9741090118086   ADIST= 2.986540169741752
   PER= 4.59937            N= .214296068           ANGMOM= .028515965
   DAN= 2.68593            DDN= 2.81296            L= 153.3235262
   B= 10.1294158           MOID= 1.57962           TP= 2004-Jul-07.1614275328

Asteroid physical parameters (km, seconds, rotational period in hours):
   GM= 62.6284             RAD= 469.7              ROTPER= 9.07417
   H= 3.4                  G= .120                 B-V= .713
                           ALBEDO= .090            STYP= C

ASTEROID comments:
1: soln ref.= JPL#46, OCC=0          radar(60 delay, 0 Dop.)
2: source=ORB
```

Results

```
*******************************************************************************
```

```
Ephemeris / WWW_USER Fri Feb  7 17:14:16 2020 Pasadena, USA      / Horizons
*******************************************************************************
Target body name: 1 Ceres                         {source: JPL#46}
Center body name: Solar System Barycenter (0)     {source: DE431}
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)
Small perturbers: Yes                             {source: SB431-N16}
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
*******************************************************************************
Initial IAU76/J2000 heliocentric ecliptic osculating elements (au, days, deg.):
  EPOCH=  2454033.5 ! 2006-Oct-25.00 (TDB)         Residual RMS= .22345
   EC= .07987906346370539  QR= 2.544709153978707   TP= 2453193.6614275328
   OM= 80.40846590069125   W=  73.1893463033331    IN= 10.58671483589909
  Equivalent ICRF heliocentric equatorial cartesian coordinates (au, au/d):
   X= 2.626536679271237E+00  Y=-1.003038764756320E+00  Z=-1.007293591158815E+00
  VX= 4.202952273775981E-03 VY= 8.054172339518143E-03 VZ= 2.938175156440994E-03
Asteroid physical parameters (km, seconds, rotational period in hours):
   GM= 62.6284             RAD= 469.7              ROTPER= 9.07417
   H= 3.4                  G= .120                 B-V= .713
                           ALBEDO= .090            STYP= C
*******************************************************************************
JDTDB
   X     Y     Z
   VX    VY    VZ
   LT    RG    RR
*******************************************************************************
$$SOE
2458600.500000000 = A.D. 2019-Apr-27 00:00:00.0000 TDB
 X =-1.358266736250873E+00 Y =-2.365068287734591E+00 Z = 1.753434815502372E-01
 VX= 8.456717136811134E-03 VY=-5.875569170947257E-03 VZ=-1.745541318980191E-03
 LT= 1.578437840197355E-02 RG= 2.732980400400923E+00 RR= 7.697001564360725E-04
$$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 ...
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                  http://ssd.jpl.nasa.gov/?horizons
                  telnet ssd.jpl.nasa.gov 6775    (via command-line)
     Author     : Jon.D.Giorgini@jpl.nasa.gov
*******************************************************************************
```