

Off-Earth Sites and Asteroid/Comet Orbital Uncertainties: Extensions to the Horizons On-Line Ephemeris & Data System

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The underlying Horizons computational engine has been generalized to support observing sites on other planets, natural satellites and some asteroids, comets and spacecraft. A searchable database of landing coordinates on other bodies now exists; additional off-Earth sites may be user-defined. Example applications, involving extension to non-Earth sites:

When does Earth rise, seen from a site on Io?

Precise sky circumstances of Mars, seen from a Phobos lander.

When is sun-rise, seen from the Viking 1 landing site?

Azimuth and elevation of Ceres, seen from site on the Moon.

In addition, computations derived from small-body covariance data are now being made publicly available. Users may request orbital uncertainties for a comet or asteroid be mapped to the plane-of-sky, providing error ellipses and RA/DEC uncertainties from any site in the solar system, over some time span. Orbital uncertainties in along-track, cross-track and normal directions are requestable.

Operating since October 1996, the server has provided 220,000 user-customized ephemerides, parameter search results, and object summaries to 150,000 connections. 25000+ asteroids & comets, 63 natural satellites, 9 planets, the Sun, spacecraft, and some dynamical points are included.

Ephemeris, search, or data requests are sent to the same underlying engine by telnet or web browser interfaces, or by e-mailing commands. Customized tables of up to 70 dynamic, geometric and sky circumstance quantities are returned. Binary file generation is available.

Computations are based on physical models used at JPL for spacecraft navigation, mission planning and radar astronomy. System data are updated as necessary; comets and asteroids almost daily. Documentation: <http://ssd.jpl.nasa.gov/horizons.doc.html>

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