

COMPARISONS OF EPHEMERIDES

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ABSTRACT.

The objectives of IAU Division A Commission 4 - Ephemerides include

- Promote improvements to the usability and accuracy of astronomical ephemerides, and provide information comparing computational methods, models, and results to ensure the accuracy of data provided.
- Promote the development of explanatory material that fosters better understanding of the use and bases of ephemerides and related data.

As part of this remit work has been carried out to produce a new webpage that provides tools for comparing three ephemerides, in particular EPM2011/m, DE430/LE430 and INPOP10e. These ephemerides are from expert groups around the world; Russia's Institute for Applied Astronomy, USA's Jet Propulsion Laboratory and France's IMCCE and Paris Observatory. Here we describe some of the aspects of this webpage and the comparisons being carried out.

1. COMMISSION 4

Commission 4 - Ephemerides is an IAU commission under Division A and its aims are as follows

- Maintain cooperation and collaboration between the national offices providing ephemerides, prediction of phenomena, astronomical reference data, and navigational almanacs.
- Encourage agreement on the bases (reference systems, time scales, models, and constants) of astronomical ephemerides and reference data in the various countries. Promote improvements to the usability and accuracy of astronomical ephemerides, and provide information comparing computational methods, models, and results to ensure the accuracy of data provided.
- Maintain databases, available on the Internet to the national ephemeris offices and qualified researchers, containing observations of all types on which the ephemerides are based. Promote the continued importance of observations needed to improve the ephemerides, and encourage prompt availability of these observations, especially those from space missions, to the science community.
- Encourage the development of software and websites that provide astronomical ephemerides, prediction of phenomena, and astronomical reference data to the scientific community and public.
- Promote the development of explanatory material that fosters better understanding of the use and bases of ephemerides and related data.

2. THE COMMISSION 4 WEBPAGE FOR COMPARISON OF EPHEMERIDES

To help achieve the aims detailed above Commission 4 has produced a new webpage that provides various ways of comparing three ephemerides, in particular EPM2011/m (produced by Russia's Institute for Applied Astronomy), DE430/LE430 (produced by USA's Jet Propulsion Laboratory) and INPOP10e (produced by France's IMCCE and Paris Observatory). This webpage will allow users, who use ephemerides in a variety of ways and are faced with a choice of which one to use, to access a comparison that informs them of the strengths, weaknesses, similarities and differences of the available options.

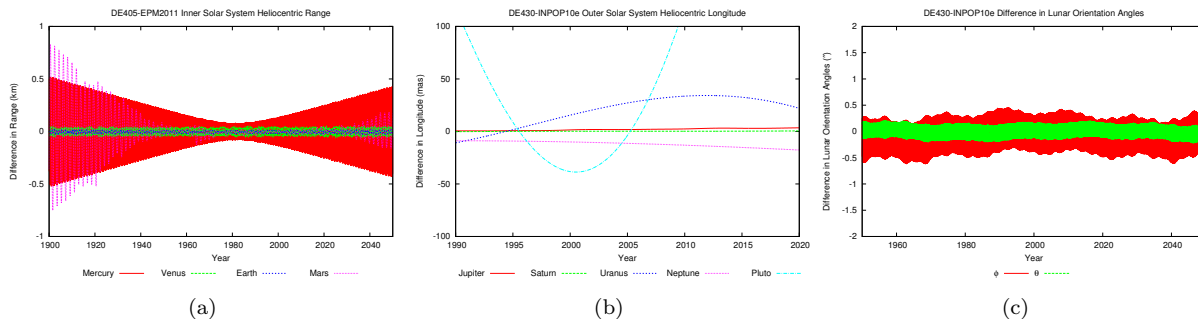


Figure 1: Examples of the visual comparisons available on the webpage.

The webpage makes no claim as to which ephemerides should be used in any particular circumstance. Instead it just provides some tools to help the user make an informed decision about their choice of ephemerides.

3. VISUAL COMPARISONS

One set of tools on the webpage is a series of plots that have been produced comparing the three ephemerides. Examples are shown in figure 1. The values compared are the differences between the ephemerides in

- The heliocentric longitude and latitude of the planets.
- The barycentric and heliocentric distances of the planets.
- The geocentric range, longitude, latitude, right ascension and declination of the Moon.
- The lunar orientation and rotation angles.

The plots are produced over both long (1900 or 1950 to 2050) and short (1990 to 2020) time periods.

4. INFORMATION

Another tool provided is a table of information about each of the ephemerides. Information has been requested from each of the ephemerides providers and a summary is shown on the webpage in an easy to compare format. The table includes, among other items, a comparison of which solar system objects are included, the type of coordinates and the reference system used, the dates covered and also details on the file structure of the ephemerides and how they may be read. There are various links to more detailed information and documentation located on the providers' websites, as well as download links.

5. STILL TO COME

More information is still to be added to the website to aid ephemerides comparisons including details on initial assumptions, how asteroids and TNOs are included and other parameters used.

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6. REFERENCES

Commission 4 Website <http://www.iaucom4.org/>