A Comparison List of Ephemeris Results: Does it Matter?

Date of re-calculations: 2024-03-31

When comparing the ephemeris results of **JPL Horizons** and other sources, it's important to know HOW and WHAT to look for in order to decide what is appropriate or better for use. We will do our comparison with the **Swiss Ephemeris** (SE) upon which most astrology programs are based today. In the 13 examples below, we use the **swetest** online utility, of which purports to access the SE-stand-alone NASA JPL full ephemeris DE441 (the actual "currently newest version" at JPL Horizons despite this erroneous claim **here**.)

We also consider that most astrologers generally use civil or wall-clock time as input to erect natal and mundane charts. This time input, based upon reliable records or not, is the starting point of HOW to do these comparisons. Civil or wall-clock time is, however, not based upon the real local time of an observer unless these two things are operating:

1) the clock is set for the local mean time (LMT) of the observer's meridian, and
2) the observer is standing on that meridian.

In all other cases, the clocks are reflecting an unreal local time. In practice, however, this time input, if it's the same as that of the standard meridian, is regarded as the real local time when, in fact, it is a convenient but arbitrary time only implemented to eliminate chaos that would result if the LMT of the observer were used in this modern age. The real time (LMT) of the observer is related to the **Universal Time** (UT1) scale, of which is rotational by definition. To treat the arbitrary or fictional time as if it is real requires that one MUST deny that real time (LMT) is rotational (i.e., related to UT1), and that the fictional time is subsequently to be used to calculate the UT from which the coordinates of celestial objects are determined. We know that this fictional UT is being used when we see that standard astrology charts are using it. Where is the chart that recognizes the real local time of the observer? It doesn't exist unless those two things mentioned above are operating. If all or most observers within a time zone have clocks reflecting wall-clock time, then the generated charts reflect a fictional UT result that is the same for all observers within a time zone - in other words, inaccurate charts!

To put differently, the truth that UT is essentially in its basic form (UT1) rotational is ignored in practice, or worse, denied. The adoption of time zones "supersedes," most astrologers and astronomers say, the former reality that existed for millennia, and because of this adoption, it is now (post-1883) the law because "they [time zones] actually are [the law], as adopted by national statutes and international agreement" (Jon Giorgini, author of JPL Horizons, personal email). The astronomical law that UT1 is rotational was abrogated by the willful adoption of time zones, and because of this "lawful" replacement of meridians and their relationship to the Prime Meridian, we argue that it was an insidious plot from the start and should be strongly condemned. The adopted standard equation is: local time = UTC + time-zone offset + DST. Since UTC is adjusted to UT1 and not vice versa, we've concluded that the rotational UT1 prima facie remains predominant and is still related to the observer's longitude. The proper equation then becomes: **local time = UTC + (if east) time-zone offset + distance in time from the standard meridian (i.e., LMT variation) + DST**.

We also do NOT make the following comparisons using Terrestrial Time (TT) input, formerly Ephemeris

Time (ET). No astrologer calibrates his clock using this time scale, and no event is recorded from which this time is used to erect a chart. We all use civil or wall-clock time for this, of which is then converted to UTC. Then, why the big differences shown in the SE results below? Good question!

The next question is: WHAT do we look for to make these comparisons? It should be obvious that the calculated UT of an event should first be considered, not to mention if it's a proper conversion from a fictitious wall-clock time. You might ask yourself, "Is that UT based upon a fictional clock time?" If so, the planetary structure calculated from that UT will be incorrect. At **Astro Precise Services** (APS), we give the option to use a properly calculated UT (i.e., APS Time Conversion) or to use the fictional one (i.e., Standard Time Conversion). We recommend the proper one, of course. And, if the choice is to use a proper UT to analyze WHAT to look for, we've selected a few examples here for comparing ephemeris results between these two sources. We could list many others, but this small list should give an idea of the differences one might expect doing these legitimate comparisons.

Note: Even if one prefers the Standard method of converting wall-clock time to UT (the default with all astrological software), the differences seen here will still be the SAME, if the calculated UT is used as the input, with the exception of the Moon example (see #11, the only example not comparing the two sources), the difference there indicating the due respect for the observer's longitude within that large eastern time zone. As can be seen, our APS method respectfully and properly places the Moon in another Sign than what the Standard method calculates, and the difference is equivalent to the LMT variation, the part that is lacking in the standard equation above.

As the celestial mechanics expert Jon Giorgini has also said:

1) Delta-T is the TDB-UTC time-scale difference.
2) TDB is the relativistic coordinate time in the solar system barycentric frame that emerges from the spacetime metric tensor as the independent variable in the 3-dimensional differential equations of motion.
3) UTC is the relativistic proper time measured by atomic clocks for at a fixed geopotential (TAI) periodically adjusted with leap-seconds to remain approximately descriptive of position of Sun, but not defined by that.

As mentioned above, the Delta-T values used in the Swiss Ephemeris are different from that used at JPL Horizons. The proper Delta-T is not precisely TT-UTC, as stated **here** in Sec. 7, if TT is assumed to be the same as the now-deprecated ET. It is also not TDT-UTC, as stated **here**. As any celestial mechanics expert will tell us, "ephemeris time (ET) is obsolete, a non-relativistic thus not-physically realized timescale." The calculated value is ALWAYS different in an SE result, even for the current and previous dates, compared to JPL Horizons. The **SE documentation** says that "If the input date is in the current or a future year, there also may be considerable differences in Delta T values used by JPL and Swiss Ephemeris" (p. 74, or you may search for this exact quote). The implication here is that the Delta-T values that both sources use are the same for dates prior to the current year. We know this is false just from comparing the two sources, as we've done in our examples below.

To reiterate, if using UTC or UT1 input in either of these sources, the calculated results will ALWAYS be different from each other. The current SE (v. 2.10.03) accessed by the **swetest** online utility DOES allow UTC input; therefore, we can and should use UTC input after 1962 (see examples #7 and #8) rather than TT input as furtively suggested in the documentation. At JPL Horizons UT1 input is the default prior to 1962, according to their documentation, so no need to differentiate there. And, no need to use TT input with the SE prior to 1962 either, since UT1 is used for both (cf. the rest of the examples).

Now, depending on the date in question, the difference can be quite large, as we show in example #11 where the Delta-T difference is 15,109.581482s seconds or 4h11m49.581s. You might wonder about a more recent date, arguing that no one calculates charts for 9999 BCE. How about 1200-01-01.0 then? Are you comfortable or satisfied with a Moon difference of 0°00’55.3460” **EARLIER** (see example #12)? And, with a clearly incorrect Delta-T difference of 111.452738s, according to Jon Giorgini at Horizons! What about a more recent date, e.g., the birth chart of King James I of England (see example #13)? With these ostensible differences, we say this is unacceptable, and that any claim or suggestion of extremely precise calculations, e.g., to 0.001”, by the SE developers, is a misrepresentation!

Let’s also say, for example, you use the USA chart in your work, especially if you’re a mundane astrologer. You also have an interest in the TNO Sila-Nunam and would like to include this in the chart. Using UT input, the SE difference is as shown in example #1. Of the named TNOs this one has the largest SE difference from Horizons in Ecliptic Longitude. We compared ALL of the IAU-named TNOs in the USA chart. Altjira is the next most divergent (see example #2), followed by Mbabamwanawaresa (see example #3). Pluto has the least difference at just under an arc second.

If you consider the geocentric nodes of objects to be astrologically significant, as we do here at APS, compare the results. Pluto is calculated by the SE as 9m41s **EARLIER** at his South Node on 2018-10-24 (see example #7), and his station on 2025-10-14 is 1h06m37m **EARLIER** (see example #8). The SE authors’ statements like “The advantage of the 'true' nodes against the mean ones is that when the Moon is in exact conjunction with them, it has indeed a zero latitude” and “The osculating apogee is 'true' twice a month: when it is in exact conjunction with the Moon, the Moon is most distant from the Earth” are simply misrepresentations, as we undisputedly show here and in all our products.

What about the Moon being in a different Zodiacal Sign if we calculate her position using the proper UT? (see example #10). Big difference between an anaretic Aries Moon and one in Taurus!

At APS we are happy to offer the customer a much better choice of calculating celestial objects, their celestial coordinates, stations, nodes and apsides, etc., with an accuracy and precision unparalleled in the industry. Why settle for less?

Astro Precise Services (APS) - Home of the world’s most accurate chart!

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13 Examples

1) **USA chart**, 1776-07-04, 7:17:57 UT (1776-07-04.304131945)
79360 Sila-Nunam
JPL Horizons: 17° Lib 41’22.3382” (197.6895384)
SE: 17° Lib 35’47.3392” (197.5964831)
SE Difference: 0°05’34.9991” **EARLIER**

JPL Horizons

https://ssd.jpl.nasa.gov/horizons_batch.cgi?batch=1&COMMAND=%27DES=2079360%27&MAKE_EPHEM=%27YES%27&TABLE_TYPE=%27OBSERVER%27&CAL_FORMAT=%27BOTH%27&START_TIME=%271776-07-04.304131945%27&STOP_TIME=%271776-07-05.304131945%27&CENTER=%27geo%27&STEP_SIZE=%271d%27&QUANTITIES=%272,13,19,20,31,33%27&EXTRA_PREC=%27YES%27&ANG_FORMAT=%27DEG%27&CSV_FORMAT=%27YES%27

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*****************************************************************************************************************************************************************************************
 Date__(UT)__HR:MN:SS, Date_________JDUT, , , R.A.__(a-app), DEC___(a-app),  Ang-diam,              r,       rdot,             delta,     deldot,     ObsEcLon,   ObsEcLat,      GlxLon,    GlxLat,
*****************************************************************************************************************************************************************************************
$$SOE
 1776-Jul-04 07:17:57, 2369915.804131945, , , 195.462252814,  -8.967940706,      n.a.,   43.43215088098, 0.0362685,  43.3326443362778, 29.0810973,  197.6895384, -2.1847240,  311.858441, 52.327447,
 1776-Jul-05 07:17:57, 2369916.804131945, , , 195.464151798,  -8.967840279,      n.a.,   43.43217182763, 0.0362750,  43.3494521063236, 29.1214867,  197.6912336, -2.1839057,  311.861449, 52.327321,
$$EOE
*****************************************************************************************************************************************************************************************
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SE

https://www.astro.com/cgi/swetest.cgi?b=&n=1&s=1&p=s+-xs79360+-b4.7.1776+-ut7%3A17%3A57+-g+-jplhora+-fPZlbda&e=-ejplde441.eph

```
/ulb/swetest -b -n1 -s1 -f -ps -xs79360 -b4.7.1776 -ut7:17:57 -g -jplhora -fPZlbda -ejplde441.eph
date (dmy) 4.7.1776 greg.   7:17:57 UT          version 2.10.03
UT:  2369915.804131945     delta t: 22.445398 sec
TT:  2369915.804391729
Epsilon (t/m)      23°27'59.9227   23°28' 6.0313
Nutation           -0° 0'12.9603   -0° 0' 6.1086
Sila-Nunam      17 li 35'47.3390        197.5964831     -2.1839781      -8.9315297      195.3756324
```

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2) **USA chart**, 1776-07-04, 7:17:57 UT (1776-07-04.304131945)

148780 Altjira

JPL Horizons: 5° Leo 49’48.6808” (125.8301891)

SE: 5° Leo 45’00.2894” (125.7500804)

SE Difference: 0°04’48.3913” **EARLIER**

JPL Horizons

https://ssd.jpl.nasa.gov/horizons_batch.cgi?batch=1&COMMAND=%27DES=2148780%27&MAKE_EPHEM=%27YES%27&TABLE_TYPE=%27OBSERVER%27&CAL_FORMAT=%27BOTH%27&START_TIME=%271776-07-04.304131945%27&STOP_TIME=%271776-07-05.304131945%27&CENTER=%27geo%27&STEP_SIZE=%271d%27&QUANTITIES=%272,13,19,20,31,33%27&EXTRA_PREC=%27YES%27&ANG_FORMAT=%27DEG%27&CSV_FORMAT=%27YES%27

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*****************************************************************************************************************************************************************************************
 Date__(UT)__HR:MN:SS, Date_________JDUT, , , R.A.__(a-app), DEC___(a-app),  Ang-diam,              r,       rdot,             delta,     deldot,     ObsEcLon,   ObsEcLat,      GlxLon,    GlxLat,
*****************************************************************************************************************************************************************************************
$$SOE
 1776-Jul-04 07:17:57, 2369915.804131945, , , 129.280938503,  22.732480323,      n.a.,   46.96079217894, -0.0352901, 47.8919790916466, 11.3647910,  125.8301891,  4.0239626,  204.270562, 35.377227,
 1776-Jul-05 07:17:57, 2369916.804131945, , , 129.303407836,  22.726346011,      n.a.,   46.96077178958, -0.0353191, 47.8984153773754, 10.9229671,  125.8518437,  4.0232529,  204.286127, 35.394669,
$$EOE
*****************************************************************************************************************************************************************************************
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SE

https://www.astro.com/cgi/swetest.cgi?b=&n=1&s=1&p=s+-xs148780+-b4.7.1776+-ut7%3A17%3A57+-g+-jplhora+-fPZlbda&e=-ejplde441.eph

```
/ulb/swetest -b -n1 -s1 -f -ps -xs148780 -b4.7.1776 -ut7:17:57 -g -jplhora -fPZlbda -ejplde441.eph
date (dmy) 4.7.1776 greg.   7:17:57 UT          version 2.10.03
UT:  2369915.804131945     delta t: 22.445398 sec
TT:  2369915.804391729
Epsilon (t/m)      23°27'59.9227   23°28' 6.0313
Nutation           -0° 0'12.9603   -0° 0' 6.1086
Altjira           5 le 45' 0.2895        125.7500804      4.0280229      22.7565881      129.1982094
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3) **USA chart**, 1776-07-04, 7:17:57 UT (1776-07-04.304131945)
184314 Mbabamwanawaresa
JPL Horizons: 8° Aqu 22’32.3602”℞ (308.3756556)
SE: 8° Aqu 26’51.2956”℞ (308.4475821)
SE Difference: 0°04’18.9354” **LATER**

JPL Horizons
https://ssd.jpl.nasa.gov/horizons_batch.cgi?batch=1&COMMAND=%27DES=2184314%27&MAKE_EPHEM=%27YES%27&TABLE_TYPE=%27OBSERVER%27&CAL_FORMAT=%27BOTH%27&START_TIME=%271776-07-04.304131945%27&STOP_TIME=%271776-07-05.304131945%27&CENTER=%27geo%27&STEP_SIZE=%271d%27&QUANTITIES=%272,13,19,20,31,33%27&EXTRA_PREC=%27YES%27&ANG_FORMAT=%27DEG%27&CSV_FORMAT=%27YES%27

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****************************************************************************************************************************************************************
 Date__(UT)__HR:MN:SS, Date_________JDUT, , , R.A.__(a-app), DEC___(a-app),  Ang-diam,              r,       rdot,           delta,     deldot,     ObsEcLon,   ObsEcLat,       GlxLon,    GlxLat,
****************************************************************************************************************************************************************
$$SOE
 1776-Jul-04 07:17:57, 2369915.804131945, , , 312.065253577, -22.513599610,      n.a.,   40.02159479363,  0.4028432,  39.1052434254513,-12.1492594,  308.3756556, -4.4814278,   25.588327,-37.729434,
 1776-Jul-05 07:17:57, 2369916.804131945, , , 312.046449204, -22.519011435,      n.a.,   40.02182747813,  0.4028911,  39.0983566573459,-11.6984042,  308.3574134, -4.4819812,   25.574619,-37.714769,
$$EOE
****************************************************************************************************************************************************************
```

SE
https://www.astro.com/cgi/swetest.cgi?b=&n=1&s=1&p=s+-xs184314+-b4.7.1776+-ut7%3A17%3A57+-g+-jplhora+-fPZlbda&e=-ejplde441.eph

```
/ulb/swetest -b -n1 -s1 -f -ps -xs184314 -b4.7.1776 -ut7:17:57 -g -jplhora -fPZlbda -ejplde441.eph
date (dmy) 4.7.1776 greg.   7:17:57 UT          version 2.10.03
UT:  2369915.804131945     delta t: 22.445398 sec
TT:  2369915.804391729
Epsilon (t/m)      23°27'59.9227   23°28' 6.0313
Nutation           -0° 0'12.9603   -0° 0' 6.1086
Mbabamwanawaresa         8 aq 26'51.2954         308.4475821      -4.4767338      -22.4898738       312.1386738
```

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4) **50000 Quaoar Natural NN**
JPL Horizons: 1951-Aug-28, 11:30:00 UT - 7° Lib 31’13.0915” (187.5203032)
SE: 1951-Aug-28, 11:25:36 UT - 7° Lib 31’12.2329” (187.5200647)
SE Difference: 0h03m54s **EARLIER**

JPL Horizons
https://ssd.jpl.nasa.gov/horizons_batch.cgi?batch=1&COMMAND=%2750000%27&MAKE_EPHEM=%27YES%27&TABLE_TYPE=%27OBSERVER%27&CAL_FORMAT=%27BOTH%27&START_TIME=%271951-08-28%2011:30%27&STOP_TIME=%271951-Aug-

30%27&CENTER=%27geo%27&STEP_SIZE=%271d%27&QUANTITIES=%272,13,19,20,31,33%27&EXTRA_PREC=%27YES%27&ANG_FORMAT=%27DEG%27&CSV_FORMAT=%27YES%27

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****************************************************************************************************************************************************************
 Date__(UT)__HR:MN, Date_________JDUT, , , R.A.__(a-app), DEC___(a-app), Ang-diam,                r,       rdot,            delta,     deldot,    ObsEcLon,   ObsEcLat,      GlxLon,    GlxLat,
****************************************************************************************************************************************************************
$$SOE
 1951-Aug-28 11:30, 2433886.979166667, , , 186.905548452,  -2.985223808,      n.a.,    44.80393893475, -0.0633277,  45.6460699655756, 15.6942314,  187.5203032,  0.0000000,  292.492038, 59.187316,
 1951-Aug-29 11:30, 2433887.979166667, , , 186.925293574,  -2.993224731,      n.a.,    44.80390236526, -0.0633158,  45.6550151847583, 15.2814459,  187.5415784,  0.0004407,  292.532460, 59.182625,
$$EOE
****************************************************************************************************************************************************************
```

SE
https://www.astro.com/cgi/swetest.cgi?b=&n=1&s=1&p=s+-xs50000+-b28.8.1951+-ut11%3A25%3A36+-g+-jplhora+-fPZlbda&e=-ejplde441.eph

```
/ulb/swetest -b -n1 -s1 -f -ps -xs50000 -b28.8.1951 -ut11:25:36 -g -jplhora -fPZlbda -ejplde441.eph
date (dmy) 28.8.1951 greg.   11:25:36 UT              version 2.10.03
UT:  2433886.976111111     delta t: 29.574110 sec
TT:  2433886.976453404
Epsilon (t/m)      23°26'52.9381   23°26'44.0804
Nutation            0° 0' 6.8279    0° 0' 8.8577
Quaoar             7 li 31'12.2330        187.5200647      0.0000000       -2.9851296      186.9053290
```

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5) **486958 Arrokoth Natural NN**
JPL Horizons: 1912-02-23, 23:31:00 UT - 7° Vir 59’43.4418” (157.9954005)
SE: 1912-02-21, 23:50:22 UT - 8° Vir 02’32.7174” ℞ (158.0424215)
SE Difference: 1d23h40m38s **EARLIER**

JPL Horizons
https://ssd.jpl.nasa.gov/horizons_batch.cgi?batch=1&COMMAND=%27DES=2486958%27&MAKE_EPHEM=%27YES%27&TABLE_TYPE=%27OBSERVER%27&CAL_FORMAT=%27BOTH%27&START_TIME=%271912-02-23%2023:31%27&STOP_TIME=%271912-02-25%27&CENTER=%27geo%27&STEP_SIZE=%271d%27&QUANTITIES=%272,13,19,20,31,33%27&EXTRA_PREC=%27YES%27&ANG_FORMAT=%27DEG%27&CSV_FORMAT=%27YES%27

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****************************************************************************************************************************************************************
 Date__(UT)__HR:MN, Date_________JDUT, , , R.A.__(a-app), DEC___(a-app), Ang-diam,                r,       rdot,            delta,     deldot,    ObsEcLon,   ObsEcLat,      GlxLon,    GlxLat,
****************************************************************************************************************************************************************
$$SOE
 1912-Feb-23 23:31, 2419456.479861111, , , 159.658562230,   8.576084075,  0.000676,    45.88079554423,  0.0033161,  44.8934523394657, -2.4599439,  157.9954005,  0.0000000,  238.999438, 54.208318,
 1912-Feb-24 23:31, 2419457.479861111, , , 159.640878686,   8.583260693,  0.000676,    45.88079745625,  0.0033050,  44.8921850445881, -1.9286354,  157.9764998,  0.0001373,  238.971795, 54.198458,
$$EOE
****************************************************************************************************************************************************************
```

SE
https://www.astro.com/cgi/swetest.cgi?b=&n=1&s=1&p=s+-xs486958+-b21.2.1912+-ut23%3A50%3A22+-g+-jplhora+-fPZlbda&e=-ejplde441.eph

```
/ulb/swetest -b -n1 -s1 -f -ps -xs486958 -b21.2.1912 -ut23:50:22 -g -jplhora -fPZlbda -ejplde441.eph
date (dmy) 21.2.1912 greg.   23:50:22 UT              version 2.10.03
UT:  2419454.493310185     delta t: 13.954839 sec
TT:  2419454.493471699
Epsilon (t/m)      23°27'11.3345   23°27' 2.5775
Nutation           -0° 0' 5.8512    0° 0' 8.7570
Arrokoth          8 vi  2'32.7173        158.0424215      0.0000000        8.5585388       159.7026795
```

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6) **486958 Arrokoth Natural SN**

JPL Horizons: 1765-10-16, 19:16:30 UT - 4° Pis 59’38.5199” ℞ (334.9940333)

SE: 1765-10-16, 16:59:20 UT - 4° Pis 59’54.9290” ℞ (334.9985914)

SE Difference: 2h17m10s **EARLIER**

JPL Horizons

https://ssd.jpl.nasa.gov/horizons_batch.cgi?batch=1&COMMAND=%27486958%27&MAKE_EPHEM=%27YES%27&TABLE_TYPE=%27OBSERVER%27&CAL_FORMAT=%27BOTH%27&START_TIME=%271765-10-16 19:16:30%27&STOP_TIME=%271765-10-18%27&CENTER=%27geo%27&STEP_SIZE=%271d%27&QUANTITIES=%272,13,19,20,31,33%27&EXTRA_PREC=%27YES%27&ANG_FORMAT=%27DEG%27&CSV_FORMAT=%27YES%27

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*******************************************************************************************************************************************************************************************
 Date__(UT)__HR:MN:SS, Date_________JDUT, , , R.A.__(a-app), DEC___(a-app), Ang-diam,                r,        rdot,              delta,      deldot,      ObsEcLon,   ObsEcLat,       GlxLon,    GlxLat,
*******************************************************************************************************************************************************************************************
$$SOE
 1765-Oct-16 19:16:30, 2366002.303125000, , , 336.836880673,  -9.692926993,  0.000724,   42.56444404733, -0.0202547,  41.9007009706432, 22.7013450,  334.9940333,  0.0000000,   57.613493,-53.698703,
 1765-Oct-17 19:16:30, 2366003.303125000, , , 336.826070781,  -9.697281713,  0.000724,   42.56443235666, -0.0202322,  41.9139109290327, 23.0423139,  334.9825233, -0.0001589,   57.596940,-53.692555,
$$EOE
*******************************************************************************************************************************************************************************************
```

SE

https://www.astro.com/cgi/swetest.cgi?b=&n=1&s=1&p=s+-xs486958+-b16.10.1765+-ut16%3A59%3A20+-g+-jplhora+-fPZlbda&e=-ejplde441.eph

```
/ulb/swetest -b -n1 -s1 -f -ps -xs486958 -b16.10.1765 -ut16:59:20 -g -jplhora -fPZlbda -ejplde441.eph
date (dmy) 16.10.1765 greg.   16:59:20 UT              version 2.10.03
UT:  2366002.207870370     delta t: 20.720232 sec
TT:  2366002.208110188
Epsilon (t/m)      23°28'19.6791   23°28'11.0431
Nutation            0° 0' 5.7722    0° 0' 8.6360
Arrokoth          4 pi 59'54.9290        334.9985914     -0.0000000      -9.6912586      336.8411838
```

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7) **134340 Pluto Natural SN**

JPL Horizons: 2018-10-24, 10:39:06 UTC - 18° Cap 53’30.3821” (288.8917728)

SE: 2018-10-24, 10:29:25 UTC - 18° Cap 53’30.1924” (288.8917201)

SE Difference: 0h09m41s **EARLIER**

JPL Horizons (Pluto COB)

https://ssd.jpl.nasa.gov/horizons_batch.cgi?batch=1&COMMAND=%27DES=2134340%27&MAKE_EPHEM=%27YES%27&TABLE_TYPE=%27OBSERVER%27&CAL_FORMAT=%27BOTH%27&START_TIME=%272018-10-24.4438194444%27&STOP_TIME=%272018-10-25.4438194444%27&CENTER=%27geo%27&STEP_SIZE=%271d%27&QUANTITIES=%272,13,19,20,31,33%27&EXTRA_PREC=%27YES%27&ANG_FORMAT=%27DEG%27&CSV_FORMAT=%27YES%27

```
*******************************************************************************************************************************************************************************************
 Date__(UT)__HR:MN:SS, Date_________JDUT, , , R.A.__(a-app), DEC___(a-app), Ang-diam,                r,        rdot,              delta,      deldot,      ObsEcLon,   ObsEcLat,       GlxLon,    GlxLat,
*******************************************************************************************************************************************************************************************
$$SOE
 2018-Oct-24 10:39:06, 2458415.943819445, , , 290.454736520, -22.104313270,  0.097318,   33.66717253715,  1.1111442,  33.8612444726292, 30.1275292,  288.8917728,  0.0000000,   15.889643,-16.074034,
 2018-Oct-25 10:39:06, 2458416.943819445, , , 290.467602870, -22.104184290,  0.097268,   33.66781422039,  1.1133248,  33.8786130405603, 30.0194298,  288.9035956, -0.0015420,   15.894627,-16.084935,
$$EOE
*******************************************************************************************************************************************************************************************
```

SE (Pluto barycentric)
https://www.astro.com/cgi/swetest.cgi?b=&n=1&s=1&p=9+-b24.10.2018+-utc10%3A29%3A25+-g+-jplhora+-fPZlbda&e=-ejplde441.eph

```
/ulb/swetest -b -n1 -s1 -f -p9 -b24.10.2018 -utc10:29:25 -g -jplhora -fPZlbda -ejplde441.eph
date (dmy) 24.10.2018 greg.   10:29:25.002 UT          version 2.10.03
UT:  2458415.937094935     delta t: 69.181596 sec
TT:  2458415.937895648
Epsilon (t/m)      23°26' 8.2304   23°26'12.6307
Nutation           -0° 0'16.4424   -0° 0' 4.4002
Pluto          18 cp 53'30.1924        288.8917201     -0.0000000     -22.1043208      290.4546803
```

____

8) **134130 Pluto SD**
JPL Horizons: 2025-10-14, 3:59:30 UTC - 1° Aqu 22’01.2497” (301.3670138)
SE: 2025-10-14, 2:52:53 UTC - 1° Aqu 22’01.2925” (301.3670257)
SE Difference: 1h06m37s **EARLIER**

JPL Horizons (Pluto COB)
https://ssd.jpl.nasa.gov/horizons_batch.cgi?batch=1&COMMAND=%27DES=2134340%27&MAKE_EPHEM=%27YES%27&TABLE_TYPE=%27OBSERVER%27&CAL_FORMAT=%27BOTH%27&START_TIME=%272025-10-14%203:59:30%27&STOP_TIME=%272025-10-16%27&CENTER=%27geo%27&STEP_SIZE=%271d%27&QUANTITIES=%272,13,19,20,31,33%27&EXTRA_PREC=%27YES%27&ANG_FORMAT=%27DEG%27&CSV_FORMAT=%27YES%27

```
****************************************************************************************************************************************************************************
 Date__(UT)__HR:MN:SS, Date_________JDUT, , , R.A.__(a-app), DEC___(a-app),  Ang-diam,              r,       rdot,            delta,     deldot,     ObsEcLon,  ObsEcLat,      GlxLon,    GlxLat,
****************************************************************************************************************************************************************************
$$SOE
 2025-Oct-14 03:59:30, 2460962.666319444, , , 304.508378874, -23.538760307,  0.093157,    35.36702823307,  1.1919254,  35.1755502567587, 30.4532467,  301.3670138, -3.7794188,   19.429354,-28.582990,
 2025-Oct-15 03:59:30, 2460963.666319444, , , 304.508522737, -23.538280891,  0.093110,    35.36771325879,  1.1811949,  35.1931614077627, 30.5320213,  301.3672507, -3.7789733,   19.429898,-28.582913,
$$EOE
****************************************************************************************************************************************************************************
```

SE (Pluto barycentric)
https://www.astro.com/cgi/swetest.cgi?b=&n=1&s=1&p=9+-b14.10.2025+-ut2%3A52%3A53+-s1s+-g+-jplhora+-fTPZlbda&e=-ejplde441.eph

```
/ulb/swetest -b -n1 -s1 -f -p9 -b14.10.2025 -ut2:52:53 -s1s -g -jplhora -fTPZlbda -ejplde441.eph
date (dmy) 14.10.2025 greg.   2:52:53 UT               version 2.10.03
UT:  2460962.620057870     delta t: 68.922094 sec
TT:  2460962.620855580
Epsilon (t/m)      23°26'18.5752   23°26' 9.3650
Nutation            0° 0' 3.2314    0° 0' 9.2102
14.10.2025 2:52:53 UT   Pluto           1 aq 22' 1.2924        301.3670257     -3.7794177     -23.5387564      304.5083912
```

To find midpoint of Pluto station to hh:mm:ss (2:52:53 UT):
https://www.astro.com/cgi/swetest.cgi?b=&n=1&s=1&p=9+-b14.10.2025+-ut2%3A48%3A20+-s1s+-g+-n586+-jplhora+-fTPZlbda&e=-ejplde441.eph

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9) **79360 Sila-Nunam Natural NN**
JPL Horizons: 1858-04-26, 7:44:10 UT - 3° Aqu 20’27.3793” (303.3409387)

SE: 1858-05-12, 20:19:00 UT - 3° Aqu 16’58.4112” (303.2828920)
SE Difference: 16d 12h34m50s **LATER**

JPL Horizons
https://ssd.jpl.nasa.gov/horizons_batch.cgi?batch=1&COMMAND=%2779360%27&MAKE_EPHEM=%27YES%27&TABLE_TYPE=%27OBSERVER%27&CAL_FORMAT=%27BOTH%27&START_TIME=%271858-04-26%207:44:10%27&STOP_TIME=%271858-04-28%27&CENTER=%27geo%27&STEP_SIZE=%271d%27&QUANTITIES=%272,13,19,20,31,33%27&EXTRA_PREC=%27YES%27&ANG_FORMAT=%27DEG%27&CSV_FORMAT=%27YES%27

```
*******************************************************************************************************************************************************
 Date__(UT)__HR:MN:SS, Date_________JDUT, , , R.A.__(a-app), DEC___(a-app), Ang-diam,              r,       rdot,            delta,     deldot,     ObsEcLon,   ObsEcLat,       GlxLon,    GlxLat,
*******************************************************************************************************************************************************
$$SOE
 1858-Apr-26 07:44:10, 2399795.822337963, , , 305.647544974, -19.426007152,      n.a.,   44.15683571383,  0.0253423,  44.1027211130035,-29.4301252,  303.3409387,  0.0000000,   25.759633,-30.096281,
 1858-Apr-27 07:44:10, 2399796.822337963, , , 305.650254735, -19.425250464,      n.a.,   44.15685035420,  0.0253511,  44.0857309633819,-29.4040086,  303.3436001,  0.0001300,   25.761514,-30.098372,
$$EOE
*******************************************************************************************************************************************************
```

SE
https://www.astro.com/cgi/swetest.cgi?b=&n=1&s=1&p=s+-xs79360+-b12.5.1858+-ut20%3A19%3A00+-g+-jplhora+-fPZlbda&e=-ejplde441.eph

```
/ulb/swetest -b -n1 -s1 -f -ps -xs79360 -b12.5.1858 -ut20:19:00 -g -jplhora -fPZlbda -ejplde441.eph
date (dmy) 12.5.1858 greg.   20:19:00 UT            version 2.10.03
UT:  2399812.346527778     delta t: 9.503295 sec
TT:  2399812.346637770
Epsilon (t/m)     23°27'36.4087   23°27'27.7487
Nutation           0° 0' 3.0683    0° 0' 8.6600
Sila-Nunam       3 aq 16'58.4113       303.2828920      0.0000000     -19.4393584      305.5876420
```

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10) **Moon** - Ari or Tau? We believe Tau!
1983-05-11, 1:24 pm DT, Zone: 6:00 E
Location: Dustlik, Uzbekistan, 68°E02’08”, 40°N31’28”
Standard: 29° Ari 37’49”
w/Astrolog 7.6 macro calculating proper UT: 0° Tau 26’52”
Difference: 0°49’03”

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11) **Moon**
JPL Horizons: bc9999-03-16.0, 0hr UT (JD = -1930637.5) - 7° Ari 40’16.4309” (7.6712308)
SE: -9998-03-16, 0hr UT (JD = -1930637.5) - 10° Ari 00’29.5592” (10.0082109)
SE Difference: 2°16’42.6961” **LATER**
JPL Delta-T: 439805.26720s
SE “Delta-T”:   454914.848682s
SE Difference: 15,109.581482s (or, 4h11m49.581s)

JPL Horizons
https://ssd.jpl.nasa.gov/horizons_batch.cgi?batch=1&COMMAND=%27301%27&MAKE_EPHEM=%27YES%27&TABLE_TYPE=%27OBSERVER%27&CAL_FORMAT=%27BOTH%27&START_TIME=%27bc9999-03-16.0%27&STOP_TIME=%27bc9999-03-17.0%27&CENTER=%27geo%27&STEP_SIZE=%271d%27&QUANTITIES=%272,13,19,20,30,31,33%27&EX

TRA_PREC=%27YES%27&ANG_FORMAT=%27DEG%27&CSV_FORMAT=%27YES%27

```
***************************************************************************************************************************************************
 Date__(UT)__HR:MN, Date_________JDUT, , , R.A.__(a-app), DEC___(a-app), Ang-diam,               r,       rdot,            delta,     deldot,       TDB-UT,     ObsEcLon,   ObsEcLat,      GlxLon,    GlxLat,
***************************************************************************************************************************************************
$$SOE
b9999-Mar-16 00:00, -1930637.50000000, , ,  6.776317788,  3.648069042, 1889.077,  1.018416900232, 0.7473222, 0.00253618734823, 0.0637937, 439805.26720,   7.6712308, 0.5647037, 259.963072, 60.632219,
b9999-Mar-17 00:00, -1930636.50000000, , , 18.527165248,  9.954643619, 1862.596,  1.018844659902, 0.7269010, 0.00257224502589, 0.0605333, 439805.06354,  20.8833183, 1.6975161, 287.645248, 61.969813,
$$EOE
***************************************************************************************************************************************************
```

SE
https://www.astro.com/cgi/swetest.cgi?b=&n=1&s=1&p=1+-b16.3.-9998+-ut+-g+-jplhora+-fPZlbda&e=-ejplde441.eph

```
/ulb/swetest -b -n1 -s1 -f -p1 -b16.3.-9998 -ut -g -jplhora -fPZlbda -ejplde441.eph
date (dmy) 16.3.-9998 jul.   0:00:00 UT          version 2.10.03
UT:  -1930637.500000000     delta t: 454914.848682 sec
TT:  -1930632.234781844
Epsilon (t/m)      24° 9'41.1828   24° 9'32.6133
Nutation           -0° 0' 0.4290    0° 0' 8.5695
Moon            10 ar  0'29.5592        10.0082109       0.7690700       4.7825113       8.8350988
```

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12) **Moon**
JPL Horizons: 1200-01-01, 0hr UT (JD = 2159357.5) - 23° Gem 11’56.6160” (83.1990600)
SE: 1200-01-01, 0hr UT (JD = 2159357.5) - 23° Gem 11’01.2700” (83.1836861)
SE Difference: 0°00’55.3460” **EARLIER**
JPL Delta-T: 920.642482s
SE “Delta-T”: 809.189744s
SE Difference: 111.452738s

JPL Horizons
https://ssd.jpl.nasa.gov/horizons_batch.cgi?batch=1&COMMAND=%27301%27&MAKE_EPHEM=%27YES%27&TABLE_TYPE=%27OBSERVER%27&CAL_FORMAT=%27BOTH%27&START_TIME=%271200-01-01.0%27&STOP_TIME=%271200-01-02.02%27&CENTER=%27geo%27&STEP_SIZE=%271d%27&QUANTITIES=%272,19,20,30,31,33%27&EXTRA_PREC=%27YES%27&ANG_FORMAT=%27DEG%27&CSV_FORMAT=%27YES%27

```
***************************************************************************************************************************************************
 Date__(UT)__HR:MN, Date_________JDUT, , , R.A.__(a-app), DEC___(a-app),               r,       rdot,            delta,     deldot,       TDB-UT,     ObsEcLon,   ObsEcLat,      GlxLon,    GlxLat,
***************************************************************************************************************************************************
$$SOE
 1200-Jan-01 00:00, 2159357.500000000, , , 82.750271788, 20.421048440,  0.986198152645, 0.5357208, 0.00270306971570, 0.0185847,    920.642482, 83.1990600, -2.9489485, 191.010507,  2.339795,
 1200-Jan-02 00:00, 2159358.500000000, , , 95.452337137, 21.464787865,  0.986462911646, 0.3795755, 0.00271157336827, 0.0109424,    920.635223, 95.0761889, -1.9804869, 196.267052, 13.048910,
$$EOE
***************************************************************************************************************************************************
```

SE
https://www.astro.com/cgi/swetest.cgi?b=&n=1&s=1&p=1+-b1.1.1200+-ut+-g+-jplhora+-fPZlbda&e=-ejplde441.eph

```
/ulb/swetest -b -n1 -s1 -f -p1 -b1.1.1200 -ut -g -jplhora -fPZlbda -ejplde441.eph
date (dmy) 1.1.1200 jul.   0:00:00 UT          version 2.10.03
UT:  2159357.500000000     delta t: 809.189744 sec
TT:  2159357.509365622
Epsilon (t/m)     23°32'30.0905   23°32'34.8475
Nutation          -0° 0'14.4539   -0° 0' 4.7570
Moon            23 ge 11' 1.2701        83.1836861      -2.9501273      20.4190953      82.7339732
```

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13) **Moon**

Birth chart of King James I of England (cf. **Astro-Databank**)

JPL Horizons: 1566-06-19, 9:22:52 UT (JD = 2293208.890879630) - 3° Leo 19’42.3689” (123.3284358)

SE: 1566-06-19, 9:22:52 UT (JD = 2293208.890879630) - 3° Leo 19’29.8376” (123.3249549)

SE Difference: 0°00’12.5312” **EARLIER**

JPL Delta-T: 167.589260s

SE “Delta-T”: 147.360383s

SE Difference: 20.228877s

JPL Horizons

https://ssd.jpl.nasa.gov/horizons_batch.cgi?batch=1&COMMAND=%27301%27&MAKE_EPHEM=%27YES%27&TABLE_TYPE=%27OBSERVER%27&CAL_FORMAT=%27BOTH%27&START_TIME=%271566-06-19,%209:22:52%27&STOP_TIME=%271566-06-20,%209:22:52%27&CENTER=%27geo%27&STEP_SIZE=%271d%27&QUANTITIES=%272,19,20,30,31,33%27&EXTRA_PREC=%27YES%27&ANG_FORMAT=%27DEG%27&CSV_FORMAT=%27YES%27

```
****************************************************************************************************************************************************************
 Date__(UT)__HR:MN:SS, Date_________JDUT, , , R.A.__(a-app), DEC___(a-app),              r,       rdot,            delta,     deldot,        TDB-UT,     ObsEcLon,   ObsEcLat,       GlxLon,    GlxLat,
****************************************************************************************************************************************************************
$$SOE
 1566-Jun-19 09:22:52, 2293208.890879630, , , 124.466232545,  14.686796689,   1.014761526099,  0.3957357,  0.0024224627O103,  0.0468502,    167.589260,  123.3284358, -4.8998302,  213.085580, 30.400613,
 1566-Jun-20 09:22:52, 2293209.890879630, , , 138.857181725,  10.576383869,   1.015042455409,  0.5712321,  0.00245384384118,  0.0609029,    167.584306,  138.0099396, -5.1348576,  225.630885, 40.934048,
$$EOE
****************************************************************************************************************************************************************
```

SE

https://www.astro.com/cgi/swetest.cgi?b=&n=1&s=1&p=1+-b19.6.1566+-ut9:22:52%20+-g+-jplhora+-fPZlbda&e=-ejplde441.eph

```
/ulb/swetest -b -n1 -s1 -f -p1 -b19.6.1566 -ut9:22:52 -g -jplhora -fPZlbda -ejplde441.eph
date (dmy) 19.6.1566 jul.   9:22:52 UT          version 2.10.03
UT:  2293208.890879630     delta t: 147.360383 sec
TT:  2293208.892585190
Epsilon (t/m)     23°29'37.6571   23°29'44.1876
Nutation            0° 0'13.8542  -0° 0' 6.5305
Moon              3 le 19'29.8376       123.3249549     -4.8997352      14.6876743      124.4627625
```