410 (8): Angular Velocities and other Data for the Planets

Planet	$\Delta\phi_T$ (radians)	$\Delta\phi_R$ (radians)	v_N^2 $(ms^{-1})^2$	v_T^2 $(ms^{-1})^2$	v_R^2 $(ms^{-1})^2$
Mercury	2.778×10^{-4}	2.090×10^{-6}	2.247×10^{9}	7.95×10^{12}	5.98×10^{11}
Venus	9.939×10^{-5}	4.072×10^{-7}	1.225×10^{9}	2.84×10^{12}	1.165×10^{10}
Earth	5.551×10^{-4}	2.424×10^{-7}	8.88×10^{8}	1.58×10^{13}	6.93×10^{9}
Mars'	7.893×10^{-4}	6.553×10^{-8}	5.81×10^{8}	2.26×10^{13}	1.87×10^{9}
Jupiter'	3.078×10^{-4}	3.024×10^{-9}	1.72×10^{8}	8.80×10^{12}	8.65×10^{7}
Saturn'	9.454×10^{-4}	6.647×10^{-10}	8.65×10^{7}	2.70×10^{13}	1.90×10^{7}
Uranus'	1.619×10^{-4}	1.156×10^{-10}	4.60×10^{7}	4.63×10^{12}	3.306×10^{6}
Neptune'	1.745×10^{-5}	3.758×10^{-11}	2.93×10^{7}	4.99×10^{11}	1.075×10^{6}
Pluto'	—	2.020×10^{-11}	2.21×10^{7}	—	5.78×10^{5}
Hulse Taylor Binary Pulsar	0.0738	—	1.56×10^{12}	—	—
S2 star	2.281×10^{-4}	—	6.00×10^{13}	—	—

1) $\Delta\phi_R = \Delta\phi_E$

Planet	$\langle r\rangle$ (metres)	Total ω_+ (radians s^{-1})	Reduced ω_+ (radians s^{-1})	Reduced ω_- (radians s^{-1})
Mercury	5.79×10^{10}	1.62×10^{-5}	2.39×10^{-6}	—
Venus	1.08×10^{11}	9.00×10^{-6}	5.45×10^{-7}	—
Earth	1.50×10^{11}	1.53×10^{-5}	2.99×10^{-7}	—
Mars	2.28×10^{11}	1.20×10^{-5}	2.90×10^{-8}	—
Jupiter	7.79×10^{11}	2.20×10^{-6}	—	1.19×10^{-8}
Saturn	1.43×10^{12}	2.10×10^{-6}	—	5.75×10^{-9}
Uranus	2.87×10^{12}	4.32×10^{-7}	—	2.28×10^{-9}
Neptune	4.50×10^{12}	9.04×10^{-8}	—	1.18×10^{-9}
Pluto	5.91×10^{12}	—	—	7.85×10^{-11}
Hulse Taylor Binary Pulsar	$\alpha=5.37\times10^{8}$	5.65×10^{-3}	—	—
S2 Star	$a=1.43\times10^{14}$	—	—	4.48×10^{-7}

) In these tables the mean Newtonian velocity is defined from NASA tables of mean orbital velocity. The mean distance $\langle r \rangle$ from the sun to the planet is derived from the same source. The total observed precession is denoted $\Delta\phi_T$ in radians per earth year. The reduced precession $\Delta\phi_R$ is that derived from the traditional method of "removing the influence of other planets". It is now known that this is a very dubious procedure (see previous notes and papers). Marion and Thornton give $\Delta\phi_R$ only for the first three planets. For Mars to Pluto, $\Delta\phi_R$ is assumed to be equal to $\Delta\phi_E$ just for the sake of argument. It is now known that the claim:

$$\Delta\phi_R =? \Delta\phi_E \quad -(1)$$

has been refuted entirely. Here:

$$\Delta\phi_E = \frac{6\pi MG}{c^2 a(1-\epsilon^2)} \quad -(2)$$

is the obsolete claim from the Einstein field equation. Here

$$\alpha = a(1-\epsilon^2) \quad -(3)$$

is the half right latitude, a the semi major axis, and ϵ is the eccentricity.

For positive frame rotation

$$\phi' = \phi + \omega_+ t \quad -(4)$$

the universal law of precession of ECE2 unified field theory is:

$$\Delta\phi = \frac{2\pi}{c^2}\left(v_N^2 + 3\omega_+^2 r^2\right) \quad -(5)$$

$$:= \frac{2\pi}{c^2} v^2$$

For negative frame rotation:

$$\phi' = \phi - \omega_- t \quad -(6)$$

the universal law of precession is:

$$\Delta\phi = \frac{2\pi}{c^2}\left(v_N^2 - \omega_-^2 r^2\right) \quad -(7)$$

3) For each planet there are two precessions, $\Delta\phi_T$ and $\Delta\phi_R$, so there are two quantities:

$$V_T^2 = \frac{c^2}{2\pi} \Delta\phi_T \quad -(8)$$

and

$$V_R^2 = \frac{c^2}{2\pi} \Delta\phi_R \quad -(9)$$

These are given in the first table along with V_N^2. The second table gives the results for ω_+ and ω_- for the total and reduced precessions. Data for the Hulse Taylor binary pulsar and S2 star are included in both tables.

Deductions

1) It is seen that ω_+ decreases approximately monotonically for the observed total precession of the planets. This can become orders of magnitude larger than the precession remaining after "planetary effects have been removed". This is referred to as the reduced precession $\Delta\phi_R$. The second table shows that $\Delta\phi_R$ decreases monotonically from Mercury to Pluto. The first four planets have ω_+ and the remaining five planets have ω_-.

2) The only observable planetary precessions are $\Delta\phi_T$, and for this quantity, all the planets have positive ω_+.

3) The Hulse Taylor binary pulsar has positive ω_+ and the S2 star has negative ω_-.