Note: The KSM03 development of the Earth TGP transformed into HW95 normalization and format is available in file http://www.eas.slu.edu/GGP/kudryavtsev/ksm03.dat

Description of Data Available in File **tgp_coefficients.dat** (original KSM03 format)

The data are a series of harmonic coefficients C_{nm}, S_{nm} of the Earth tide generating potential (TGP) expansion, named KSM03

$$V(t)=\sum_{n=2}^{\infty}\sum_{m=0}^{n}\left(\frac{r}{R_E}\right)^n \overline{P}_{nm}(\sin\varphi')\left[C_{nm}(t)\cos m\theta^{(A)}(t)+S_{nm}(t)\sin m\theta^{(A)}(t)\right]+$$

$$\frac{r}{R_E}\left\{\overline{P}_{10}(\sin\varphi')C_{10}(t)+\overline{P}_{11}(\sin\varphi')\left[C_{11}(t)\cos\theta^{(A)}(t)+S_{11}(t)\sin\theta^{(A)}(t)\right]\right\}. \qquad (1)$$

where V is the value of the TGP at an arbitrary point P on Earth's surface at epoch t, R_E is the mean Earth equatorial radius (=6378136.3 m), r is the geocentric distance to P, φ' is the geocentric latitude of P, $\theta^{(A)}(t)$ is the local sidereal time at P reckoned along the true geoequator of date from the origin point A - that being the projection of the mean equinox of date (see Fig.1) - so that $\theta^{(A)}(t)$ is related to the Earth fixed east longitude (from Greenwich) λ as

$$\theta^{(A)}(t)=\lambda+GMST \qquad (2)$$

($GMST$ is Greenwich Mean Sidereal Time defined by a well-known expression by Aoki et al. 1982, Astron. Astrophys. 105: 359-361); $\overline{P}_{nm}$ is the normalized associated Legendre function related to the unnormalized one (P_{nm}) as

$$\overline{P}_{nm}=N_{nm}P_{nm} \quad \text{where} \quad N_{nm}=\sqrt{\frac{\delta_m(2n+1)(n-m)!}{(n+m)!}} \quad \text{and} \quad \delta_m=\begin{cases}1 & \text{if } m=0\\ 2 & \text{if } m\neq 0.\end{cases} \qquad (3)$$

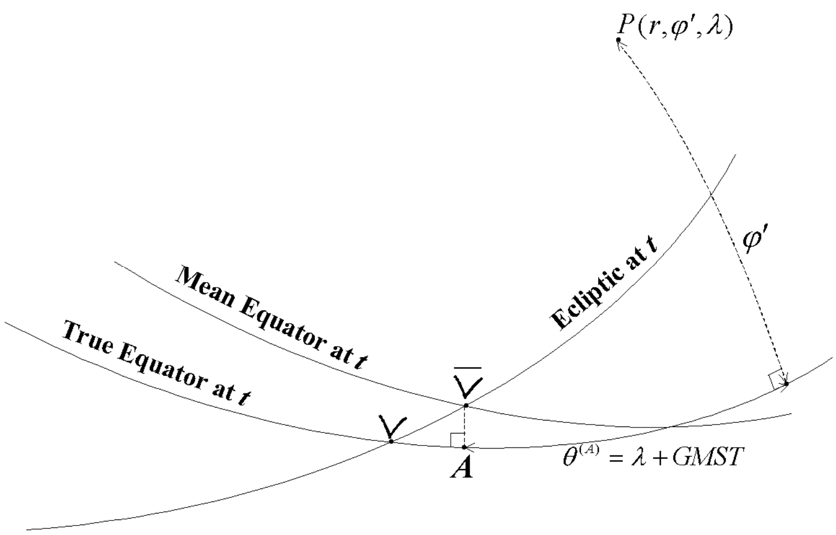

Figure 1. The reference frame used in KSM03 development of the Earth TGP

Every coefficient C_{nm} , S_{nm} is represented by a Poisson series like

$$C(S)_{nm}(t) = \sum_{k=1}^{N} \left\{ \left[A_{k0}^{c} + A_{k1}^{c} t + A_{k2}^{c} t^{2} \right] \cos \omega_{k}(t) + \left[A_{k0}^{s} + A_{k1}^{s} t + A_{k2}^{s} t^{2} \right] \sin \omega_{k}(t) \right\} \qquad (4)$$

where $A_{k0}^{c}, A_{k1}^{c}, ..., A_{k2}^{s}$ are constants and $\omega_k(t)$ are *4^th^*-degree polynomials of time

$$\omega_k(t) = \nu_k t + \nu_{k2} t^2 + \nu_{k3} t^3 + \nu_{k4} t^4 \ . \qquad (5)$$

The file **tgp_coefficients.dat** includes the following data (notations are defined in (1)-(5))

Line 1: N (non-dimensional; format I12)
Lines 2, 9, 16,...,187266: blank
Lines 3, 10, 17,...,187267: k (non-dimensional; format I12)
Lines 4, 11, 18,...,187268: notation of a coefficient (C or S) to which the expansion term relates; n; m; multipliers of six major planets' mean longitudes (Mercury – Saturn), of mean longitude of the lunar ascending node Ω, and of Delaunay variables D, l', l, F used to calculate the 4th-order frequency $\omega_k(t)$ of the expansion term (all non-dimensional; format 1X,A,1X,2I3,1X,11I3)
Lines 5, 12, 19,...,187269: $\sqrt{A_{k0}^{c\ 2} + A_{k0}^{s\ 2}}, \sqrt{A_{k1}^{c\ 2} + A_{k1}^{s\ 2}}, \sqrt{A_{k2}^{c\ 2} + A_{k2}^{s\ 2}}$ (dimension m^2/sec^2, m^2/sec^2/day, $m^2/sec^2/day^2$, respectively; format 3D24.15)
Lines 6, 13, 20,...,187270: $A_{k0}^{c}, A_{k1}^{c}, A_{k2}^{c}$ (dimension m^2/sec^2, m^2/sec^2/day, $m^2/sec^2/day^2$, respectively; format 3D24.15)
Lines 7, 14, 21,...,187271: $A_{k0}^{s}, A_{k1}^{s}, A_{k2}^{s}$ (dimension m^2/sec^2, m^2/sec^2/day, $m^2/sec^2/day^2$, respectively; format 3D24.15)
Lines 8, 15, 22,...,187272: $\nu_k, \nu_{k2}, \nu_{k3}, \nu_{k4}$ (dimension rad/day, rad/day^2, rad/day^3, rad/day^4, respectively; format 4D24.15)

The time t (TDT) has to be counted in Julian days from epoch J2000.0 (JED 2451545).

Details can be found in Kudryavtsev S.M. «Improved Harmonic Development of the Earth Tide Generating Potential», *Journal of Geodesy*, 2004, vol. 77, N 12, pp. 829-838