SOLID TIDE EFFECT ON STATION COORDINATES

The variations of station coordinates caused by solid Earth tides predicted using Wahr's theory are also most efficiently implemented using a two-step procedure. Only the second degree tides are necessary to retain 0.01 m precision. Also terms proportional to y, h+, h-, z, l+, w+, and w- are ignored. The first step uses frequency independent Love and Shida numbers and a computation of the tidal potential in the time domain. A convenient formulation of the displacement is given in the documentation for the GEODYN program. The vector displacement of the station due to tidal deformation for Step 1 can be computed from

$$\Delta\vec{r} = \sum_{j=2}^{3} \left[\frac{GM_j \; r^4}{GM_\oplus \; R_j^3}\right] \{ [3\ell_2(\hat{R}_j \cdot \hat{r})] \hat{R}_j$$

$$+ [3(\frac{h_2}{2} - \ell_2)(\hat{R}_j \cdot \hat{r})^2 - \frac{h_2}{2}] \hat{r} \}, \qquad (6)$$

GM_j = gravitational parameter for the Moon (j=2) or the Sun (j=3),

$GM_\oplus$ = gravitational parameter for the Earth,

$\hat{R}_j, R_j$ = unit vector from the geocenter to Moon or Sun and the magnitude of that vector,

$\hat{r}, r$ = unit vector from the geocenter to the station and the magnitude of that vector,

h_2 = nominal second degree Love number,

ℓ_2 = nominal Shida number.

If nominal values for h_2 and ℓ_2 of 0.6090 and 0.0852 respectively are used with a cutoff of 0.005m of radial displacement, only one term needs to be corrected in Step 2. This is the K_1 frequency where h from Wahr's theory is 0.5203. Only the radial displacement needs to be corrected and to sufficient accuracy this can be implemented as a periodic change in station