3.5.6.8 Special Bureau for Loading

The Special Bureau for Loading (SBL) is tasked with providing in near real-time a consistent global solution data set describing the surface deformation, gravity signal and geocenter variations due to various surface loading processes, in reference frames relevant for direct comparison with existing geodetic observing techniques.

Currently, historical predictions of 3-dimensional surface displacements are available on the web site from the years 1990 to 2003. The data are north, east and up surface displacements determined in a Center of Earth reference frame (Farrell's Green's functions). The global deformation data have been calculated on a 2.5 degree x 2.5 degree grid using the National Center for Environmental Prediction's (NCEP) Reanalysis data set. A reference pressure field, defined as the 10-year average pressure has been removed. A modified inverted barometer ocean (*van Dam and Wahr*, 1987) is assumed with a 2.5 degree land-ocean mask.

Time series are also available for 355 ITRF sites. The 3-d deformations for the time series are calculated in the same way as for the global results. The time series start in 1990 and continue through to 2003.

The near real-time aspect of the SBL is still currently under development, however significant progress has been made. We are currently successfully downloading the European Center for Medium Range Weather Forecast's (ECMWF) sea-level pressure data set twice per day (the 00 and 06 hour data sets in the first download and the 12 and 18 hour data sets in the second download) with approximately 11 hours of latency. The ECMWF sea-level data are at 0.5 degree x 0.5 degree global sampling. We will test the data set at 2.5 degree sampling. Then we will optimize the code to handle the higher spatial resolution. We will need to compare the ECMWF data with the NCEP reanalysis data.

Upgrades to the current products are planned for the very near future:

- upgrade the land-ocean mask to 0.25 degrees (*Petrov and Boy*, 2004)
- recalculate deformations using Green's functions determined in a Center of Figure and/or Center of Mass reference frame (*Blewitt*, 2003)
- reference pressure field defined as a function of station geopotential height

In the immediate future, global deformations and IERS time series with these upgrades will be available on the web. The older files will remain on the web for comparison.

In the original SBL position paper, we stated that we would investigate the effect of topography on predicted deformations (*van Dam*,

2004 in review). The issue is that we are currently using pressure defined at 2.5 degree x 2.5 degree latitude and longitude spacing. However, we know that in many regions on the Earth, the topography, and hence the surface pressure, varies significantly over this spatial wavelength. We have estimated the effect of short wavelength topographic variability on predicted loading effects. Using Grasse, France and Lhasa, China and topography defined on a 0.125 degree grid spacing to model the change in surface pressure with height, we find that estimates of the vertical loading effect at these sites, differs by up to 0.04 and 0.1 mm peak-to-peak for Grasse and Lhasa respectively. In Fig. 1 we plot the difference between the vertical displacement calculated assuming 1) the pressure is constant and 2) the pressure varies with topography. The calculated deformations are not significantly affected by the dependence of temperature on altitude (i.e. isothermal atmosphere or lapse rate for the temperature dependence).

References

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Fig. 1: The effect of topography on predicted deformations

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