# GGFC Special Bureau for Tides

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The IERS Special Bureau for Tides collects datasets related to the effects of tides on Earth rotation and geocenter motions. Like the other special bureaus of the GGFC, the Special Bureau for Tides generates most of its own product datasets by analyzing the results of numerical computer models of the relevant geophysical fluids, in this case of both ocean tides and atmospheric tides. For example, as more realistic numerical hydrodynamic models of ocean tides are developed, the Bureau endeavors to obtain the tidal elevation and current velocity data from these models and to determine and tabulate the implied Earth-rotation effects. Both pure numerical simulations and massive data assimilations (primarily of altimeter data and tide-gauge data) are used in these efforts.

The Bureau also collects tables of spherical harmonic coefficients of the tides. These have been used mainly for studies dealing with satellite orbit determination and (for the degree-2 terms) for studies of tidal energetics. Because of new satellite missions (CHAMP, GRACE, GOCE), very high-degree expansions of tides are soon needed, and the Bureau intends to collect and/or compute and archive such data. The extreme sensitivity of GRACE also requires that we begin considering some minor tides that have been traditionally overlooked; coefficient datasets of these tides must also be generated.

The data archive that the Bureau maintains has slowly grown as individual tidal investigators contribute their modeling results. Although there are many new ocean tide models still appearing in the oceanographic community as a result of the Topex/Poseidon altimeter mission, not all these models are appropriate for the Bureau because not all investigators are able to provide tidal currents, and currents are as necessary as elevations for predicting tidal variations in Earth rotation.

A major area of planned improvement over the near future is the addition of new data related to long-period tides and atmospheric tides. The latter are difficult to determine, because the most accurate simulations seem to be produced by the various national meterological centers, but these centers typically distribute their data at a 6-hour sampling, which is the Nyquist period of the S2 tide. Temporal interpolation procedures are being investigated to partially overcome this difficulty. Such work has already revealed phase lag errors in the tides from the NCEP and ECMWF centers. As more work continues in this area, it will be necessary to cooperate closely with the Special Bureau for the Atmospheres so that the tidal signals are handled consistently. One scenario for doing so has recently been published by Ponte and Ray (Geophysical Research Letters, 29(24), 2002).

Planned improvements in regards to long-period tides (i.e. species “0” tides with periods between a week and 18.6 years) require new estimates of the dynamical components of these near-equilibrium tides. This is, to a large extent, a significant research topic, because empirically determining long-period tides is difficult owing to their small amplitudes and the large, red background of oceanographic noise. Current IERS standards for long-period tides are a hodge-podge of equilibrium tides and incomplete and poorly constrained dynamical tides, a situation that the Special Bureau intends to ad-

dress. The planned improvements, which rely on further research on oceanic dissipation and nonlinear interactions between short-period tides, will be a far more complete accounting of long-period tides. This will be extremely useful in length-of-day studies, in determining mantle anelasticity, and in reduction of GRACE SST data.

Finally, it was decided that the Special Bureau for Tides should maintain an archive of datasets relevant to tidal variations in the geocenter. These would be sets of harmonic coefficients, mostly deduced from ocean tide models. These coefficients could be used as input to the Bureau's web-based "tide prediction machine" if users require predicted time series of such motions.

Nearly all the data archived by the Special Bureau for Tides are relatively small ascii datasets and web-based tables. We expect that this will continue to be true in the future.