3.5.6.4 Special Bureau for Hydrology

The goal of the Special Bureau for Hydrology is to provide internet access to water storage datasets of surface load variations for all land areas of the world. We have made significant progress in posting on the web site both the gridded water load variations from several models, and the earth rotation excitation time series calculated by summation over the land surface grid.

At the moment there are two principal numerical models results that are available. The NCEP (National Center for Environmental Prediction) Reanalysis model represents a fixed data-assimilating global numerical model, designed mainly for atmospheric studies. It has now been run for a period exceeding 50 years, starting in 1948. The hydrologic part of this model is primitive, and reflects a combination of an imposed (non data-assimilating) hydrologic cycle, and some interaction with the atmosphere and climate. We regard the hydrologic time series and load variations as representative of the real Earth variations, but probably not accurate in detail, especially in interannual variability. There are evident flaws in the hydrologic values for Antarctica and Greenland, and we interpret these in part to be estimates of a combination of sea ice and land ice. Sea ice is not significant geodetically, because it is part of the oceans, but its appearance in the gridded files means that we must exclude Antarctica and Greenland from the calculations. We expect hydrology to become more important in causing earth rotation variations at longer periods, so this is probably a serious flaw. Nevertheless, the NCEP results are valuable for their global coverage and long duration. The web site includes daily NCEP water storage in Gaussian gridded form (1979–2001), monthly water storage in 1 x 1 degree gridded format, and daily excitations for polar motion and length of day for 1948–2001.

The ECMWF model (European Center for Medium Range Weather Forecasting) has a data-assimilating reanalysis model, similar to NCEP, also with a surface hydrologic cycle. We find that it appears more realistic than NCEP, showing greater interannual variability. The web site includes gridded values (2.5 degrees) at daily intervals for the period 1979–1993 of the water storage load changes.

At the moment there is no test on a global scale of the accuracy of either NCEP or ECMWF results. The hydrologic load variations are derived from the atmospheric model, and lack primary data (such as river discharge and actual precipitation) to constrain their results. We await the development of more sophisticated land surface models which can assimilate such data to provide better estimates of the hydrologic load variations, and related geodetic predictions.

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