FORECASTING SHORT-TERM CHANGES IN THE EARTH'S ROTATION

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SUMMARY OF POSTER. It has long been appreciated that atmospheric motions must contribute to the excitation of fluctuations in the Earth's rotation (Munk and MacDonald 1960, Lambeck 1980, Rochester 1984) but the exploitation of modern meteorological data, collected largely to meet the demands of daily global weather forecasting, in the routine evaluation of angular momentum exchange between the atmosphere and the solid Earth was not initiated until comparatively recently (Hide et al. 1980). This procedure constitutes a necessary step towards the accurate separation of these features of the observed non-tidal changes in the length of day and polar motion and that are of meteorological origin from those that must be attributed to other geophysical processes, such as angular momentum transfer between the solid Earth and other fluid regions of the Earth (liquid metallic core, oceans, etc.), and to changes in the inertia tensor of the solid Earth associated with earthquakes, melting of ice, etc.

One of the main findings of this work to date is the demonstration that angular momentum transfer between the atmosphere and the solid Earth accounts for the observed short-term changes in the length of the day and also makes a considerable contribution to polar motion. Changes in the axial component of atmospheric angular momentum (AAM) are associated with fluctuations in the length of the day, whilst those in the equatorial components are associated with polar motion. The data provide good evidence that angular momentum transfer between the atmosphere and the solid Earth makes a considerable contribution not only to short-term changes in the Earth's rate of rotation but also to movements of the pole (Chao 1985 and Hide 1986).

In principle, therefore, forecasts of changes in atmospheric angular momentum (AAM) from global numerical weather prediction (GNWP) models employed by meteorologists for routine weather forecasting could also be used to forecast short-term changes in the Earth's rotation rate and the meteorological contribution to polar motion. The Special Study Group 5-98 (on "Atmospheric excitation of changes in the Earth's rotation") set up in 1983 by the International Association of Geodesy

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is therefore encouraging those with access to GNWP models to initiate the routine production of such forecasts in time for the inauguration of the International Earth Rotation Service on 1 January 1988.

GNWP models exhibit skill, but they are far from being perfect and their improvement is the object of a great deal of research and development work by meteorologists. The inadquate representation of dynamical effects due to surface orography was for many years one of the principal sources of uncertainty in all GNWP models (and also in general atmospheric circulation numerical models, which have yet to simulate satisfactorily the observed seasonal, intra-seasonal and interannual changes in AAM). Several years ago, research in Canada and the U.K. on the drag associated with internal gravity waves produced by the interaction of surface winds with orography led to new proposals for improving the representation of surface orography in GNWP models. Two meteorological centres have now implemented these improvements (the U.K. Meteorological Office in December 1984 and the European Centre for Medium Range Weather Forecasts (ECMWF) in July 1986) and other leading centres in various countries are expected to follow suit. So it is likely that time-dependent biases and other errors in AAM forecasts from GNWP models will soon have been reduced to levels acceptable to the IERS.

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