Geophysical Research Abstracts, Vol. 7, 10113, 2005
SRef-ID: 1607-7962/gra/EGU05-A-10113
© European Geosciences Union 2005

A proposal for a consistent model of air pressure loading as part of the International Terrestrial Reference System (ITRS) Conventions

H.-P. Plag (1), T. van Dam (2), G. Blewitt (1), H. P. Kierulf (3)

(1) Nevada Bureau of Mines and Geology aned Seismological Laboratory, University of Nevada, Reno, Nevada, USA; (2) European Center for Geodynamics and Seismology, Luxembourg; (3) Norwegian Mapping Authority, Norway (hpplag@unr.edu)

The solid Earth is continuously loaded and deformed by variations in air pressure with the surface displacements reaching a few centimetres at daily time scales and 1 to 2 cm at seasonal time scales. For the determination of highly accurate point positions within a self-consistent reference system, the station motion model should account for air pressure loading in a conventional way similar to ocean-tidal loading. However, unlike for ocean-tidal loading, where a few (space-dependent) parameters are sufficent to characterize the loading effect accurately, the inclusion of atmospheric loading in the station motion model requires a low-latency prediction model in the time-domain with sufficient accuracy. Moreover, the choice of a reference surface for the air pressure anomalies inadvertently introduces a permanent change in the Earth's shape (similar to the permanent tide), which needs to be addressed carefully.

We assess the status of the available models on the basis of the reanalysis datasets provided by ECWMF and NCEP. We address the uncertainties due to deficiencies of the surface pressure data, the effect of the topography, definition of the reference surface for the surface pressure, treatement of the solar diurnal and semi-diurnal tides, and the response of the ocean to air pressure forcing. Based on a detailed study of the spacio-temporal characteristics of the loading signal (both determined from re-analysis air pressure data and those provided operationally by the two centers) and the accuracy of the predictions, we propose a candidate for the conventional inclusion of this signal in the station motion model of the ITRS.