Geophysical Research Abstracts, Vol. 7, 04122, 2005
SRef-ID: 1607-7962/gra/EGU05-A-04122

Atmospheric and oceanic contributions to Chandler wobble excitation determined by wavelet filtering

Florian Seitz and Michael Schmidt

Deutsches Geodätisches Forschungsinstitut (DGFI), München (seitz@dgfi.badw.de)

Dynamic processes in the Earth system force variations of Earth rotation. On seasonal to interannual time scales, the largest effects are due to mass redistributions within the atmosphere and the oceans. These fluctuations are additionally superposed by free oscillations of the Earth, e.g. the Chandler wobble and the nearly diurnal free wobble. Due to friction, the amplitude of the Chandler wobble would diminish within a few decades without perpetual excitation. However, spectral analyses of geodetic observations reveal significant amplitude variations of the Chandler oscillation, which implies the existence of some excitation mechanism. By now, it seems to be understood that the Chandler wobble is excited by a combined effect of atmosphere and ocean. In order to study the contributions of these two subsystems on the Earth's free rotation, the non-linear Earth system model DyMEG is forced by consistent time series of atmospheric and oceanic angular momenta. The numerical results from DyMEG are significantly related with geodetic observations. In order to study, if the excitation energy of atmospheric and oceanic angular momenta within a band around the Chandler frequency is sufficient to reproduce the observed Chandler wobble, the excitation series are bandpass filtered. Therefore, a wavelet filter with a passband between 400 and 460 days is applied. When DyMEG is forced with the filtered excitations, the resulting polar motion resembles the actually observed Chandler oscillation, which is determined from the geodetic observations applying the same wavelet filtering method. For the period between 1980 and 2002, the correlation coefficient between the model result and the observed Chandler wobble amounts to 0.99 and the RMS is 16 mas. Experiments with separated atmospheric and oceanic forcing allow the assessment of the individual contributions of both subsystems.