



Diagonising the Atmospheric Contribution to Earth Rotation in Observations and a Global Atmospheric Model

Lisa Neef (1) and Katja Matthes (1,2)

(1) Deutsches GeoForschungsZentrum, Potsdam, Germany, (2) Freie Universität Berlin, Berlin, Germany

Fluctuations in the angular momentum of the atmosphere result from fluctuations in the mass-distribution and large-scale wind patterns of the atmosphere. By exchange of angular momentum between the atmosphere and the solid earth, these fluctuations excite variations in Earth rotation. This implies that observations of Earth rotation variations (i.e. polar motion and changes in the length-of-day) contain information about atmospheric dynamics, independent of standard meteorological observations.

In this study we summarize the extent to which the atmospheric excitation of Earth rotation can be reconciled with observed Earth Rotation Parameters (ERPs), and evaluate the information that can be successfully gleaned from ERPs about the atmosphere. The residual atmospheric excitation function estimated from observed ERPs is compared to the atmospheric excitation functions estimated from two sources: atmospheric reanalysis sets, which are constrained by meteorological data, and simulations with a free-running climate model. This comparison shows the strength of total atmospheric excitation relative to other excitation sources, and how and where observed ERPs may practically inform an atmosphere model, on timescales ranging from subseasonal to decadal. This in turn tells us where the assimilation of ERPs into an atmosphere model would be useful, and suggests practical pathways for implementing such an assimilation.