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Assimilation Experiments using Geodetic Observations to Diagnose AAM in a Chemistry-Climate Model

Lisa Neef and Katja Matthes

GFZ German Research Centre for Geosciences, Earth System Modeling, Potsdam, Germany (neef@gfz-potsdam.de, +49 331 288-1163)

Variation of the global angular momentum of the atmosphere (AAM) results from fluctuations in the mass-distribution and large-scale wind patterns of the atmosphere. It has moreoever been known for some time that global-scale natural modes of variability (such as ENSO) have clear footprints in the AAM history. Due to exchange of angular momentum between the atmosphere and the solid earth, fluctuations in AAM are reflected in observations of the Earth Rotation Parameters(ERPs). ERPs therefore provide an observational constraint for global climate models, via the simulated AAM.

We are planning to assimilate ERPs into the chemistry-climate model ECHAM5/MESSy, to not only improve the agreement with observations but also to better diagnose model deficiencies. As a step toward developing such an assimilation system, we present a comparison between modeled AAM, and the AAM implied by ERP observations. We also illustrate and discuss the problem of extracting information about individual components of a model state from observations of a global integral quantity. This is done via data assimilation experiments in a highly simplified (Lorenz) dynamical system.