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Correction of the Barotropic Mode in Data Assimilation Experiments with AMIC

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Results from idealized data assimilation experiments are presented that perform an analysis step being restricted to correcting the barotropic mode in the analysed model state. Such a procedure mimics to some extent the improvement in analysis accuracy that is achievable if observations of surface pressure only are used or if background error statistics that too strongly emphasize barotropic structures are used. Clearly, in more general situations, other vertical modes are also corrected through the use of observational information.

The **A**tmospheric **M**odel of **I**ntermediate **C**omplexity AMIC is used as the dynamical model in performing these experiments. AMIC is a horizontally spectral model (using resolutions T45 or T106) with six or nine levels in the vertical describing the dynamics of the quasigeostrophic potential vorticity equation. As it is critical in the process of assessing properties of data assimilation methods that the model used faithfully resembles atmospheric properties, such as time scales, dynamics, and error growth behavior, AMIC has been tuned to match such observed properties to a reasonably satisfactory degree by including a number of physical processes (e.g., climatological forcing, diffusion, and damping). Data assimilation experimentation with AMIC is also facilitated since the model contains a complete tangent–linear and adjoint package.

Preliminary results from the barotropic–mode correction experiments will be presented, such as the influence on the analysis itself, the impact on subsequent forecast error, as well as on other vertical modes during a short–term forecast period over which the non–modal nature of growing errors is important. Also, the combined im-

pact on the analysis of correcting some of the baroclinic modes together with the barotropic mode is discussed. Preliminary results suggest that the barotropic–mode correction may substantially improve analysis accuracy.