

Towards an improved data assimilation in the tropics

Nedjeljka Zagar
NCAR/ASP

Analysis procedures are dominated by the background information coming from NWP models. Therefore a reliable estimate of the background-field errors is an important input to data assimilation. This especially applies to the tropics due to the lack of direct wind observations and complex dynamics.

Most NWP assimilation schemes are effectively univariate near the equator. In this seminar I will present a multivariate formulation of variational assimilation for the tropics based on equatorial wave theory. This approach has been previously applied by Daley (1993) and there is broad observational evidence in support of the theory of linear tropical waves, in particular those coupled to convection. It is thus justified to attempt applying their "balance" relationships in data assimilation.

The modelling framework is idealized with respect to NWP but it still contains the basic dynamical processes, it utilizes the data assimilation methodology that is used in operational NWP systems and it applies realistic background-error covariances. Background-error statistics are derived from the tropical forecast errors of the ECMWF model. The resulting assimilation model produces "balanced" analysis increments and thereby should increase the impact of all types of observations. A comparison of the background-error statistics in two phases of the quasi-biennial oscillation (QBO) shows the impact of the QBO on the background-error covariances in the tropical stratosphere.

Examples of tropical assimilation experiments will be presented from a study of the potential impact of space-borne line-of-sight wind measurements to be provided by the Atmospheric Dynamic Mission (ADM-Aeolus).