



STOCKHOLM UNIVERSITY
Department of Meteorology

Erland Källén

Assimilation of winds in the tropics – use of line-of-sight wind profiles

Authors:

Erland Källén
Nedjeljka Zagar
Nils Gustafsson

Presenter: Erland Källén

Department of Meteorology, Stockholm University, Sweden

Brief Abstract:

Tropical circulation systems are mainly determined by the wind field, in tropical data assimilation wind information is more important than mass field information according to geostrophic adjustment theory. The present observing system is much more directed towards providing mass field information (temperature, pressure and humidity) than wind information. Using a Doppler LIDAR technique a new ESA satellite system, the ADM-Aeolus mission, is expected to provide a much improved global coverage of wind profiles in a few years time. The satellite is planned for launch in 2007. To prepare for the use of this new wind data a new technique of assimilating wind and mass field information in the tropics has been developed. The technique builds on tropical wave dynamics and exploits spatial and temporal correlations in tropical waves to make optimal use of wind and mass observations. A variational technique has been developed and tested in a shallow water model. Correlation structures determined from tropical wave dynamics are used to specify the background error correlation matrix in the cost function of the variational scheme. It is shown that line-of-sight wind observations, as will be provided by the ADM-Aeolus mission, can be usefully introduced into a three or four dimensional variational assimilation scheme if complemented by mass field observations. Mass field observations alone are clearly insufficient to determine tropical motion fields. The results need to be generalised to a spherical geometry and to more general vertical structures. We believe, however, that our results could lead into a possible way of improving tropical NWP analyses both in the troposphere and the lower stratosphere.