

Assessment of Data Assimilation Approaches for the Simulation of a Monsoon Depression Over the Indian Monsoon Region

Vinodkumar · A. Chandrasekar · K. Alapathy ·
Dev Niyogi

Received: 9 December 2008 / Accepted: 31 August 2009 / Published online: 1 October 2009
© Springer Science+Business Media B.V. 2009

Abstract A low pressure system that formed on 21 September 2006 over eastern India/Bay of Bengal intensified into a monsoon depression resulting in copious rainfall over north-eastern and central parts of India. Four numerical experiments are performed to examine the performance of assimilation schemes in simulating this monsoon depression using the Fifth Generation Mesoscale Model (MM5). Forecasts from a base simulation (with no data assimilation), a four-dimensional data assimilation (FDDA) system, a simple surface data assimilation (SDA) system coupled with FDDA, and a flux-adjusting SDA system (FASDAS) coupled with FDDA are compared with each other and with observations. The model is initialized with Global Forecast System (GFS) forecast fields starting from 19 September 2006, with assimilation being done for the first 24 hours using conventional observations, sounding and surface data of temperature and moisture from Advanced TIROS Operational Vertical Sounder satellite and surface wind data over the ocean from QuikSCAT. Forecasts are then made from these assimilated states. In general, results indicate that the FASDAS forecast provides more realistic prognostic fields as compared to the other three forecasts. When compared with other forecasts, results indicate that the FASDAS forecast yielded lower root-mean-square (r.m.s.) errors for the pressure field and improved simulations of surface/near-surface temperature, moisture, sensible and latent heat fluxes, and potential

Vinodkumar · A. Chandrasekar (✉)
Department of Physics and Meteorology, Indian Institute of Technology, Kharagpur,
West Bengal 721 302, India
e-mail: chand@phy.iitkgp.ernet.in; chand_met@yahoo.com

Present Address:
A. Chandrasekar
Indian Institute of Space Science and Technology, Department of Space, Government of India,
Thiruvananthapuram 695 022, India

K. Alapathy
Office of Biological and Environmental Research, Office of Science, Department of Energy,
Germantown, MD 20874, USA

D. Niyogi
Department of Agronomy and Department of Earth and Atmospheric Sciences, Purdue University,
West Lafayette, IN, USA