Abstract Details

AOGS 1st Annual Meeting > Ocean and Atmospheres > Mesoscale Simulation of a Heavy Rain Event over Southern Taiwan in Meiyu Season >

Corresponding Author : Ms. Lisa Tzu-Chi Chang (lisacc@ms17.hinet.net)

Organization: Department of Atmospheric Sciences, National Taiwan University

Category: Ocean and Atmospheres

Paper ID: 57-OOA-A1688

Title: Mesoscale Simulation of a Heavy Rain Event over Southern Taiwan in Meiyu Season

Abstract: During the period of 29-30 May 2001, a series of mesoscale convective systems (MCSs) developed in the vicinity of Taiwan along a weak Meiyu front. The development and northeastward propagation of the MCSs produced heavy rainfall over southern Taiwan, with a maximum 24-h accumulation rainfall over 200 mm. The atmospheric component of the Naval Research Laboratory's (NRL) Coupled Ocean/Atmosphere Mesoscale Prediction System (COAMPS; Hodur 1997) was conducted with full physics in this study to evaluate the ability of the model to simulate the evolution of MCSs and the heavy rainfall event occurred in Taiwan area. The control (CTNL) and the QuikSCAT (QUIK) experimental runs were performed. The CTNL run was conducted similar to the COAMPS operational mode with data assimilation capability. In order to include mesoscale features in the model initial condition, the QUIK run was conducted by blending QuikSCAT surface wind observations at 50-km resolution using the Multivariate Optimum Interpolation (MVOI) scheme (Barker 1992) into the initial conditions of every 12-h assimilation cycle. The results from two experiments were compared. In 45-km resolution domain, the QUIK run generated better precipitation amount and overall spatial distribution as validated against TRMM rainfall estimation. In the 15-km resolution domain, the QUIK run has a better agreement with the observed kinematic characteristics associated with Meiyu front. Results of 5-km resolution inner domain illustrated that the QUIK run reproduced the temporal evolution of the local heavy rain event over southern Taiwan successfully. The fact that pertinent features of the Meiyu heavy rain event were reasonably well simulated by QUIK run made it possible to carry out the diagnostic computations utilizing grid data. Moisture budgets computations were performed to diagnose moisture transport during the evolution of convection. Moisture budgets terms are computed prior to, during and after convection outbreak over the Taiwan Strait. The domain of budget computation includes both convective and nonconvective areas. Preliminary findings indicated that convective region was characterized by strong horizontal moisture flux convergence in the low levels. In the boundary layer of nonconvective region, the ratio between the sub-gird scale and resolvable scale vertical moisture transport was estimated to be 0.8 at 1100 m and 0.3 at 10 m. The ratio at 1000 m revealed that both grid-resolvable and sub-grid scale turbulent processes may carry moisture upward away from the boundary layer to the middle troposphere. However, the ratio at 10 m implied the moisture accumulated from strong evaporation near the ocean surface appeared to be carried up to the upper levels of the boundary layer primary by grid-resolvable vertical moisture transport. In addition, the vertically integrated source/sink term was closely related to the presence of convective activity.

Presentation Mode: Oral

Keywords: Meiyu, heavy rain, numerical simulation

Status: Pending.

Co-Authors

No.	Title	First Name	Family Name	Organization
1	Prof.	GEORGE TAI-JEN	CHEN	Department of Atmospheric Sciences, National Taiwan University, Taipei, Taiwan