AOGS 2005

Initialization with Rainfall defined Diabatic Heating

L. M. MA[1], N.E. DAVIDSON[2], Y.H. DUAN[1] and J. C. L. CHAN[1]
[1]*Shanghai Typhoon Institute, China Meteorological Administration*
[2]*Bureau of Meteorology Research Center, VIC*

In this paper, the assimilation of NRL (US Naval Research Laboratory) rainfall is implemented with the idea of adjustment of diabatic heating to improve the initial conditions of Tropical Cyclone Chris, which made landfall near Port Headland, Western Australia during 3-6th, Feb. 2002. The NRL rainfall data, classified as three types (i.e. stratiform, convective and composite rainfall) following Churchill and Houze[1] (1984), is used to define the vertical profiles of diabatic heating. During the period of initialization (assimilation), the diabatic heating from the cumulus scheme is replaced by the heating profile given by Johnson[2] (1984). The BMRC (Bureau of Meteorology Research Center, Australia) tropical limited-area model (Davidson[3], 1992) is used for the experiments performed with the options of "rainfall assimilation" and "dynamic nudging" (Table.1). For the experiments RA (with rainfall assimilation) and RAN (with rainfall assimilation and dynamic nudging), 6-h accumulated NRL rainfall data are ingested in the model within each of the 4*6h initial (assimilation) periods, valid respectively at 24h, 18h, 12h, 6h prior to the base time of the simulation (23UTC 3 Feb 2002). To help make the momentum field more consistent with the mass field during the initialization, dynamic nudging (using conventional observations) is used in RAN.

Inclusion of NRL rainfall data improves the track in all the experiments (Fig. 1), with the RAN experiment giving the most significant improvement.

Keywords: Rainfall; Assimilation; Tropical Cyclone; Diabatic Heating.

Table 1. Design for numerical experiments.

Numerical expt.	Rainfall assimilation?	Dynamic nudging?
CTRL	No	No
RA	Yes	No
RAN	Yes	Yes

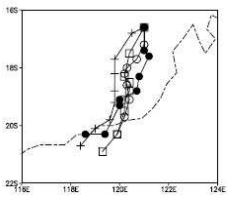

Figure 1: Observed and predicted tracks of Chris from 00UTC 3 Feb. 2002 at 6-h interval
The track with mark "open circle" denote the observation, "cross" - CTRL experiment, "open square" - RAN experiment, "closed circle" - RA experiment.