Introduction to CWB's HRLDAS and evaluation of the impact of surface parameters on HRLDAS over Taiwan

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Abstract

Land physical processes and land-atmosphere interaction are important factors for short-term weather forecasting and regional climate change (e.g. Chen et al. 2001). Complicated land-atmosphere interactions manifested as, for example, soil temperature and soil moisture, exchange energy and moisture with the atmosphere by using sensible heat, latent heat flux, or plant evapotranspiration; moreover, they influence the development of the atmospheric boundary layer and local circulation. Solar radiation, precipitation, surface temperature, moisture and wind etc. from atmospheric forcing influence the soil temperature and moisture by soil diffusion processes.

The High Resolution Land Data Assimilation System (HRLDAS, Chen et al. 2007) is operational at the Central Weather Bureau (CWB). In HRLDAS, the atmospheric surface forcing including hourly precipitation, near-surface air temperature, moisture, wind, and radiation from the model forecast, and radar Quantitative Precipitation Estimation (QPE) are ingested into the NOAH land surface model and spread the surface forcing to the deep soil layers. After a long spin up time, HRLDAS can reach an equilibrium state between atmospheric forcing and soil variables. HRLDAS can output many soil analysis fields including soil temperature and soil moisture. These soil analysis fields can then be used to provide the initial soil conditions of the operational model system.

Comparisons of the soil temperature and moisture analyses from HRLDAS and NCEP GFS, show that the higher-resolution HRLDAS soil temperature and soil moisture fields have more reasonable patterns than the NCEP GFS. We also find that the HRLDAS has a cold bias as compared to observations. In this study, the sensitivity of the surface parameters, such as emissivity, albedo, leaf area index etc. were examined to improve the bias of HRLDAS soil moisture and temperature.

Key words: Land data assimilation, soil moisture, soil temperature, surface parameters