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Establishment and analysis of High-Resolution Assimilation Dataset of water-energy cycle over China

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For better prediction and understanding of water-energy exchange process and land-atmospheric interaction, the in-situ observed meteorological data which were acquired from China Meteorological Administration (CMA) were assimilated in the Weather Research and Forecasting (WRF) model and the monthly Green Vegetation Coverage (GVF) data, which was calculated by the Normalized Difference Vegetation Index (NDVI) of Earth Observing System Moderate-Resolution Imaging Spectroradiometer (EOS-MODIS), Digital Elevation Model (DEM) data of the Shuttle Radar Topography Mission (SRTM) system were also integrated in the WRF model over China. Further, the High-Resolution Assimilation Dataset of water-energy cycle over China (HRADC) was produced by WRF model. This dataset include 25 km horizontal resolution near surface meteorological data such as air temperature, humidity, ground temperature, and pressure at 19 levels, soil temperature and soil moisture at 4 levels, green vegetation coverage, latent heat flux, sensible heat flux, and ground heat flux for 3 hours. In this study, we 1) briefly introduce the cycling 3D-Var assimilation method; 2) Compare results of meteorological elements such as 2 m temperature, precipitation and ground temperature generated by the HRADC with the gridded observation data from CMA, and Global Land Data Assimilation System (GLDAS) output data from National Aeronautics and Space Administration (NASA). It is found that the results of 2 m temperature were improved compared with the control simulation and has effectively reproduced the observed patterns, and the simulated results of ground temperature, 0-10 cm soil temperature and specific humidity were as much closer to GLDAS outputs. Root mean square errors are reduced in assimilation run than control run, and the assimilation run of ground temperature, 0-10 cm soil temperature, radiation and surface fluxes were agreed well with the GLDAS outputs over China. The HRADC could be used in further research on the long period climatic effects and characteristics of water-energy cycle over China.