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WRF Dynamical Downscaling of the Twentieth Century Reanalysis for China 1.Climatic Means during 1981-2010

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This study presents a dynamically downscaled climatology over East Asia by using the non-hydrostatic Weather Research and Forecasting (WRF) model, forced by the Twentieth Century Reanalysis (20CR-v2). The whole experiment is a 111 year (1900-2010) continuous run at 50 km horizontal resolution. Climatic means among observations, the driving fields and WRF results during the last three decades (1981-2010) are examined in continental China, and our focus is on surface air (2-m) temperature and precipitation in both summer and winter. WRF dynamically downscaling is able to reproduce the main features of surface air temperature in two seasons in China, and outperforms the driving fields in regional details due to topographic forcing. Surface air temperature biases are reduced as much as $1\sim2^{\circ}$.For precipitation, the simulated results can reproduce the decreasing pattern from southeast to northwest China in winter. For summer rainfall, the WRF simulated results reproduce the right magnitude of heavy rainfall center around the southeastern coastal area, better than the driving field. One of the significant improvements is that an unrealistic center of summer precipitation in Southeast China in 20CR-v2 is eliminated. However, the simulated results underestimate winter surface air temperature in northern China and winter rainfall in some regions in southeast China.