



Validation for a tropical belt version of WRF: Sensitivity tests on radiation and cumulus convection parameterizations

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The Weather Research and Forecasting model (WRF ARW) version 3.9, is run with a tropical belt configuration for a period from 2012 to 2016 in this study. The domain covers the entire tropics between 45°S and 45°N with a spatial resolution about 45 km. In order to verify two radiation schemes and four cumulus convection schemes, eight experiments are performed with different combinations of physics parameterization schemes. The results show that eight experiments present reasonable spatial patterns of surface air temperature and precipitation in boreal summer, with the spatial correlation coefficients (COR) of temperature between simulated and observed over 0.95, and COR of precipitation between simulated and observed ranging from 0.65 to 0.82. The four experiments, by using the RRTMG radiation scheme, show a better performance than other four experiments with the CAM radiation scheme. In the four experiments with the RRTMG radiation scheme, COR of surface air temperature between simulated and observed about 0.98 and COR of precipitation between simulated and observed ranging from 0.76 to 0.82. Comparatively, the two experiments by using the new Tiedtke cumulus parameterization scheme can simulate better diurnal variation of precipitation in boreal summer than other six experiments. Especially, for the diurnal cycle of precipitation over land and ocean, the experiment by using the RRTMG radiation scheme and the new Tiedtke cumulus convection scheme shows that the peaks of precipitation rate appear at 0400 LST and 1600 LST, that in agreement with the observed.