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Evaluation of predicted diurnal cycle of precipitation after tests with convection and microphysics schemes in the Eta Model

J. L. Gomes, S. C. Chou, and S. M. Yaguchi
INPE, CPTEC, Cachoeira Paulista, Brazil (jorge.gomes@cptec.inpe.br)

Physics parameterizations and the model vertical and horizontal resolutions, for example, can significantly contribute to the uncertainty in the numerical weather predictions, especially at regions with complex topography. The objective of this study is to assess the influences of model precipitation production schemes and horizontal resolution on the diurnal cycle of precipitation in the Eta Model . The model was run in hydrostatic mode at 3- and 5-km grid sizes, the vertical resolution was set to 50 layers, and the time steps to 6 and 10 s, respectively. The initial and boundary conditions were taken from ERA-Interim reanalysis. Over the sea the 0.25-deg sea surface temperature from NOAA was used. The model was setup to run for each resolution over Angra dos Reis, located in the Southeast region of Brazil, for the rainy period between 18 December 2009 and 01 de January 2010, the model simulation range was 48 hours. In one set of runs the cumulus parameterization was switched off, in this case the model precipitation was fully simulated by cloud microphysics scheme, and in the other set the model was run with weak cumulus convection. The results show that as the model horizontal resolution increases from 5 to 3 km, the spatial pattern of the precipitation hardly changed, although the maximum precipitation core increased in magnitude. Daily data from automatic station data was used to evaluate the runs and shows that the diurnal cycle of temperature and precipitation were better simulated for 3 km when compared against observations. The model configuration results without cumulus convection shows a small contraction in the precipitating area and an increase in the simulated maximum values. The diurnal cycle of precipitation was better simulated with some activity of the cumulus convection scheme. The skill scores for the period and for different forecast ranges are higher at weak and moderate precipitation rates.