

Numerical weather prediction experiment over the United Arab Emirates using JMA-NHM

*Akihiro Hashimoto¹, Masataka Murakami^{1,2}, Shigenori Haginoya¹

1. Meteorological Research Institute, Japan Meteorological Agency, 2. Institute for Space-Earth Environmental Research, Nagoya University

Japan Meteorological Agency Non-Hydrostatic Model (JMA-NHM) is applied to meteorological simulations that partly cover the Middle East including the arid and semi-arid regions in the United Arab Emirates (UAE) in order to predict cloud and precipitation properties for supporting the cloud seeding field experiment planned in the summer of 2017. At first, one-year (from February 2015 to January 2016) hindcast experiment was performed with 5 km horizontal resolution to examine the performance of the model for reproducing clouds and precipitation in the UAE and to adjust the model configuration to the UAE's environment, which is much drier than Japanese environment. With the original configuration, the model failed to reproduce daytime high surface air temperature, because of unrealistically large evaporation of soil water and low sensitivity of land surface temperature to solar radiation, which gave adverse effect to reproducibility of clouds and precipitation. We changed the soil and land surface parameters such as heat capacity, heat conductivity, roughness length, soil water content, etc, so as to be more representative for the arid and semi-arid environments. With the new configuration, the model clearly showed much better agreements with observations in terms of the diurnal variation of land surface temperature and surface air temperature, and formation of clouds and precipitation. In addition, we performed another hindcast experiment through the same period with 1 km horizontal resolution to examine a dependency of simulation result on a horizontal resolution. The finer horizontal resolution enhanced thermal convections over the arid and semi-arid regions, and consequently increased cloud formation, which further improved the skill of the model.

Acknowledgement

This study was conducted as a part of the project "Advanced Study on Precipitation Enhancement in Arid and Semi-Arid Regions." that is supported by the UAE Research Program for Rain Enhancement Science, an initiative of the Ministry of Presidential Affairs, under the management of the National Center of Meteorology and Seismology.

Keywords: Land surface temperature, Non-hydrostatic regional model, Arid and semi-arid region, Rain enhancement, UAEREP