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Analyzing a Multidecadal High Resolution Regional Climate Simulation over Complex Terrain

Baris Onol

Istanbul Technical University, Aeronautics and Astronautics Faculty, Meteorological Engineering, Istanbul, Turkey (onolba@itu.edu.tr, +90 0212 2852926)

The resolution of current regional climate simulations for climate change studies is around 20-30 km. Rapid increase in developments of computational power allows modelers to use regional climate models with higher resolutions. High-resolution simulations that may define biases more accurately, supply an important outcome to climate change impact studies, which need more reliable climate information in finer scales.

In this study, 48 years simulation (1961-2008) has been produced by using ICTP-RegCM3 with two-nested domains, which have 50 km (outer) and 10 km (inner) resolutions. The Eastern Mediterranean domain has been selected for the inner domain since the complex topography plays a highly crucial role for atmospheric parameters over the domain. The outer domain, which covers Europe, North Africa, and most of Middle East, has been driven by NCEP/NCAR Reanalysis.

Previous simulations indicate that limited area models have over-estimation problem for precipitation simulations in wet season over Black Sea mountain range which are very steep through the coastline. 10 km resolution choice for the inner domain has valuable contribution to solve these types of deficiencies. In addition, land-sea distribution is very complicated along the Greece and western Turkey coasts and the existence of many small islands over Aegean Sea is another outstanding challenge for recent climate simulations. Therefore, an interaction between the surface characteristics and the atmospheric circulation for inner domain is expected to be much more pronounced in this multidecadal high-resolution simulation.

The primary results indicate that detailed distributions of precipitation and temperature are highly promising compare to previous simulations which have lower resolutions. Station based analyses and high-resolution (10') CRU datasets have been applying to define advanced model versus observation comparisons. Preliminary temperature results of this study show a dominant cold bias over the mountainous regions for all seasons except winter because of the better-resolved topography. Diverse coastal effects in temperature are pronounced very clearly for 10 km domain. However, observational deficiency over the highlands is still the most significant challenge in evaluating model performances.