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Assessment of Precipitation Forecast Accuracy over Eastern Black Sea Region using WRF-ARW

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Surface topography such as mountain barriers, existing water bodies and semi-permanent mountain glaciers changes large scale atmospheric patterns and creates a challenge for a reliable precipitation prediction. Eastern Black sea region of Turkey is an example. Black Sea Mountain chains lies west to east along the coastline with the average height of 2000 m and the highest point is 3973 m, and from the coastline to inland there is a very sharp topography change.

For this project we select the Eastern Black Sea region of Turkey to assess precipitation forecast accuracy. This is a unique region of Turkey which receive both highest amount of precipitation and precipitation throughout whole year. Amount of rain and snow is important because they supply water to the main river systems of Turkey. Turkey is in general under the influence of both continental polar (Cp) and tropical air masses. Their interaction with the orography causes orographic precipitation being effective on the region. Also Caucasus Mountains, which is the highest point of Georgia, moderates the climate of the southern parts by not letting penetration of colder air masses from north. Southern part of the western Black Sea region has more continental climate because of the lee side effect of the mountains Therefore, precipitation forecast in the region is important for operational forecasters and researchers.

Our aim in this project is to investigate WRF precipitation accuracy during 10 extreme precipitation, 10 normal precipitation and 10 no precipitation days by using forecast for two days ahead. Cases are selected in years between 2000 and 2003. Eleven Eastern Black Sea stations located along the coastline are used to determine 20 extreme and 10 average precipitation days. During project, three different resolutions with three nested domains are tested to determine the model sensivity to domain boundaries and resolution. As a result of our tests, 6 km resolution for finer domain was found suitable for our purpose. Also, sensivity tests were made for cumulus, PBL and microphysics schemes for single-day run. Initial conditions have been produced by using ERA-40 and ERA-Interim data. The precipitation results are compared with both NASA TRMM 3-hourly precipitation data and ground observation data obtained from Turkish State Meteorological Service. For case studies, model results were obtained from 72-hour simulations which has 6 hr interval.

Preliminary results indicate that NASA TRMM 3-hourly precipitation data has errors and is not consistent for the area of interest. Furthermore, verification of model simulations with station data shows that model has underestimations and overestimations especially on 3 stations (Rize, Pazar and Hopa) which have more complex topography than the rest of the domain.