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WRF simulation of snow event on the Eastern Anatolia Region, Turkey: assessment using different microphysics and ground observations

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Snow is of primary importance for climatological and hydrological processes and is a good indicator of climate variability and change. A great amount of snow is deposited on the Eastern Anatolia region of Turkey during winter months. Compared to the other parts of Turkey, the eastern Anatolia region has the longest snow cover with the duration of 120 days in a year. Therefore, the accumulated snow on the region is biggest water resource which melts during spring and feeds the major river systems within the southern part of the region (Euphrates and Tigris rivers).
Since the region has high and complex topography with the average altitude of about 2200m, and precipitation and temperature data are generally measured in the lower altitudes, meteorological observations are scarce in the region. Therefore, station based comparison of simulated snow cover is difficult.
In this study, the Weather Research and Forecasting (WRF) model ability in retrieving snowfall during a single event is evaluated by using two different microphysics options: WSM5 and WSM6. The simulated event is selected after examining five stations' snow fall records between 1960 and 2007 for winter months. The average snow fall amount of these five stations shows a maximum on 18-19 February 1990.
Three nested domains are used during simulations with the resolutions of 27km, 9km and 3km. The largest domain extends towards eastern Italy on the west and Caspian Sea on the east while the smallest domain is located just on the Eastern Anatolia region of Turkey.
Our simulations for this event indicate that WRF with both WSM5 and WSM6 microphysics simulates the extreme snow fall event reasonably well. However, in both cases, the location of the snow fall is slightly northward of the region. Therefore, station based comparisons show relatively large errors in some locations. However, visual resemblance of the simulation with the satellite image shows that WRF simulates the snow cover distribution fairly well and need further investigations. It is important to study the sensitivity of the atmospheric models as well as the microphysics options within the models over such a complex terrain since a better understanding of the snow cover can significantly improve existing snow products at the regional scale.