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Evaluating the extreme precipitation events using a mesoscale atmopshere model

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Evidence is showing that global warming or climate change has a direct influence on changes in precipitation and the hydrological cycle. Extreme weather events such as heavy rainfall and flooding are projected to become much more frequent as climate warms. Mesoscale atmospheric models coupled with land surface models provide efficient forecasts for meteorological events in high lead time and therefore they should be used for flood forecasting and warning issues as they provide more continuous monitoring of precipitation over large areas. This study examines the performance of the Weather Research and Forecasting (WRF) model in producing the temporal and spatial characteristics of the number of extreme precipitation events observed in West Black Sea Region of Turkey. Extreme precipitation events usually resulted in flood conditions as an associated hydrologic response of the basin. The performance of the WRF system is further investigated by using the three dimensional variational (3D-VAR) data assimilation scheme within WRF. WRF performance with and without data assimilation at high spatial resolution (4 km) is evaluated by making comparison with gauge precipitation and satellite-estimated rainfall data from Multi Precipitation Estimates (MPE). WRF-derived precipitation showed capabilities in capturing the timing of the precipitation extremes and in some extent spatial distribution and magnitude of the heavy rainfall events. These precipitation characteristics are enhanced with the use of 3D-VAR scheme in WRF system. Data assimilation improved area-averaged precipitation forecasts by 9 percent and at some points there exists quantitative match in precipitation events, which are critical for hydrologic forecast application.