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Heavy rainfall event over Sri Lanka: An assessment with WRF model

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This study used a series of mesoscale cloud-resolving simulations with Weather Research and Forecasting (WRF) Model to reproduce the heavy rainfall and persistent flooding event over Sri Lanka during 14th - 20th May 2016. This major precipitation event, associated with a case of a depression over the Bay of Bengal in the Indian Ocean, originated southeast of Sri Lanka and moved along the east coast of Sri Lanka. This low-pressure system affected most of the country and caused severe flooding and damages particularly in the western part of the Island during this period. Timely availability of an accurate weather forecast can give the lead time for hazards preparedness and minimize potential damages in such situations. Numerical weather prediction with models like WRF is highly utilized for this purpose in many parts of the world. Hence this study aims in finding the ability of the WRF model to reproduce extreme heavy rainfall event and its usefulness in numerical weather prediction in Sri Lanka. The model domain consists of one domain with 9 km grid resolution. Model simulation fields are compared with available daily rainfall data from in-situ weather stations of the Department of Meteorology, Sri Lanka. The WRF model simulated the initiation of the low-pressure system and its development along the east coast of Sri Lanka at nearly the right time. The corresponding precipitation simulation was also reproduced in its spatial distribution aligning with the weather station data, although the overall amount was overestimated. A sensitivity experiment that excludes the orography over the model domain revealed that orographic forcing over the central mountains in Sri Lanka is responsible for about 23% increase in precipitation over the heavy rainfall area in the western Sri Lanka during this event. Moreover, the WRF model able to capture the daily rainfall tendency of this event over Sri Lanka, suggesting it has a potential for operational use in numerical weather prediction in Sri Lanka.

Keywords*:* Heavy precipitation, WRF model, Orographic effect, Low-pressure system