Abstract:

The thesis reports characteristics of clouds and rainfall over the Mahabaleshwar region of the Western Ghats using data from a disdrometer and a weather radar. Hypotheses regarding observed spatial distribution of rainfall are tested using WRF-ARW model simulations. Rain events of varying durations are studied to understand rain duration related microphysical properties and associated types of clouds. Findings show that long duration events (>10 h), though less frequent, are major contributors (~ 75%) to the monsoon rainfall and are closely linked to the large-scale monsoon circulation. A technique is proposed to identify and correct bias in radar reflectivity factor using which spatial distribution of rainfall at 1 km×1 km resolution has been obtained. While the Western Ghats gets substantial amount of rainfall, spatial distribution is not uniform along the Ghats. A rainfall maximum zone (RMZ) with seasonal rainfall exceeding 7000 mm is observed. Within RMZ, rain rates are moderate but rain frequency very high. The location of rainfall maximum across the Ghats occurs where slope of the mountain is maximum and ahead of mountain peak. Observations suggest mountain geometry, wind orientation and diurnal heating are important in deciding the spatial distribution of rainfall over the Western Ghats. WRF-ARW model sensitivity experiments show that rainfall decreases when the terrain is smoothened or when winds strike the terrain at less perpendicular angles.