Abstract

This study addresses observational and modeling sensitivity on the march of the onset isochrones of the Indian summer monsoon. The first 25 days of the passage of the isochrones of monsoon onset is of great scientific interest. Surface and satellite-based datasets are used for high resolution modeling of the impact the motion of the onset isochrones from Kerala to New Delhi. These include the asymmetries across the isochrone such as soil moisture and its temporal variability, moistening of the dry soil to the immediate north of the isochrone by non-convective anvil rains, formation of newly forming cloud elements to the immediate north of the isochrone. The region, immediate north of the isochrone, is shown to carry a spread of buoyancy elements. As these new elements grow, they are continually being steered by the divergent circulations of the parent isochrone to the north and eventually to the northwest. CLOUDSAT was extremely useful for identifying the asymmetric cloud structures across the isochrone. In the modeling sensitivity studies, we used a mesoscale WRF model to examine days 1 to 25 of forecasts of the onset isochrone. We first modeled prediction experiments during normal, dry, and wet Indian monsoon seasons using default values of model parameters. This study was extended to determine the effects of changes in soil moisture and non-convective rain parameterizations, these are parameters suggested by the satellite observations. These sensitivity experiments show that the motion of the isochrones from Kerala to New Delhi are very sensitive to the parameterization of soil moisture and non-convective anvil rains immediately north of the isochrone.