Evaluation of the precipitating convective systems over the Arabian Peninsula using Megha-Tropiques data

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Abstract

The Megha-Tropiques Mission offers a unique opportunity to observe precipitating convective systems over the Arabian Peninsula using the MADRAS imager. Because of its low inclination (20○) orbit, the joint Indian-French satellite mission yields frequent revisits of tropical regions providing 3 to 5 sampling orbits every day at a given location. This relatively frequent sampling from space provides an opportunity to study spatial characteristics of convection at various stages of its lifecycle.
This study is focused on the western region of the Arabian Peninsula, which is bounded by the Rea Sea to the west and desert to the east. The climate is generally arid to semi-arid. However, this area includes a mountainous terrain that parallels the Red Sea about 100 to 150 km inland from the coast. The tallest terrain features range from 2000 to 3000 m in height above sea level. Typically during the spring and summer, a daily sea breeze initiates along the Red Sea between 0900-1100 local time and propagates inland until it interacts with this complex terrain. Convection often develops along the mountains and depending on the strength of the sea breeze, deep convection can form along the tallest terrain features.

The complex land-atmospheric interactions that lead to deep convection are still poorly understood for this region. Furthermore, there are also limited surfaced based instruments available to characterize the precipitation variability and associated atmospheric conditions. Thus, monitoring and forecasting significant precipitation events remains limited. However, satellite observations (e.g., Megha-Tropiques) provides an opportunity to improve the monitoring that could lead to better forecasting of deep convective events.

In an effort to improve the monitoring of precipitating convective storms, the Kingdom of Saudi Arabia has deployed a network of weather radars in the western region. One of the radar systems (located in Al Baha, Saudi Arabia) has dual-polarimetric capability. The polarimetric radar observations provide a unique opportunity to examine precipitation structures and spatial and vertical distributions of hydrometeors.
These datasets combined with satellite (e.g., brightness temperature observations from Megha-Tropiques) can help provide a better understanding of the microphysics and lifecycle properties of the precipitating convective events over broader region. The long-term goal of the

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project is to improve the understanding of macro- and micro-physical characters of convective lifecycle of storms which are unique to Arabian Peninsula. For this presentation, we will discuss the initial evaluation of polarimetric radar and Megha-Tropiques MADRAS imager measurements for two convective storms observed over the western region of the Arabian Peninsula.