

# Using GPM radar data to understand the causes of abrupt change in the direction of Cyclone Fani

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Cyclone Fani was a category 4 cyclone, that hit the eastern coast of India at the end of April 2019. Fani is considered to be the longest-lived cyclone in the Bay of Bengal with an elongated time period of 11 days. This cyclone changed its direction 3 times while moving slowly towards the land which made it difficult for the meteorologists to accurately predict the trajectory of the cyclone (See figure 1). The GPM satellite overpassed three times over the cyclone during the time period. In the current study, GPM radar data will be used to study the causes of abrupt changes in the direction of the cyclone.

Initially, the Weather Research and Forecast (WRF) model has been used to simulate the cyclone for 6 days. The simulation domain is divided into two, in which the coarse domain has a 15 km grid and finer domain has a 5 km grid. The latitude and longitude spread of the outer domain are  $-10^{\circ}$  N to  $35^{\circ}$  N and  $65^{\circ}$  E to  $110^{\circ}$  E respectively. Four sets of physics schemes have been used, out of which microphysics scheme WSM6 class, RRTM longwave scheme, RRTMG shortwave scheme, MYNN level 2.5 PBL scheme, and cumulus physics Kain–Fritsch scheme gave best the cyclone track (see figure 1).

In this study, a forward radar operator is developed, using which the WRF output is converted to reflectivity corresponding to GPM frequency. A bias correction is then performed by comparing GPM observed reflectivities with WRF simulated reflectivities. This bias corrected reflectivities are studied to understand the reasons for the abrupt change in cyclone direction.

Keywords: Weather Research and Forecast (WRF), Global Precipitation Measurement (GPM), Cyclone Fani

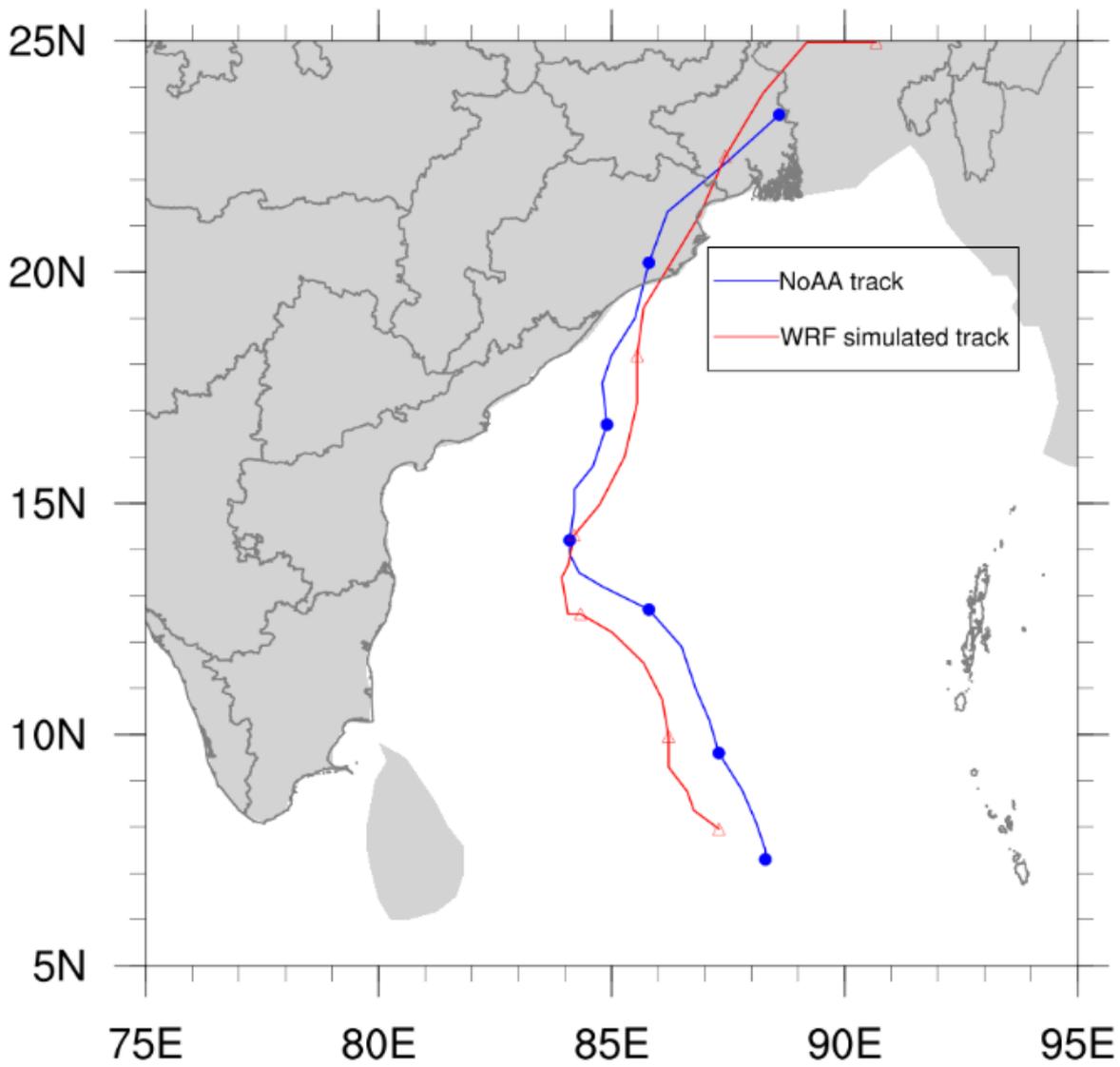


Figure 1: Cyclone Fani, WRF simulated track compared with NoAA observed track