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Impact of radio occultation data assimilation on tropical cyclone intensity forecast over the western North Pacific

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This study explores the potential impact of global navigation satellite system radio occultation (RO) data assimilation on the tropical cyclone (TC) intensity forecast over the western North Pacific. The forecast experiments are performed through a regional model for six TCs occurring in 2020. RO data are mainly obtained from the Constellation Observing System for Meteorology, Ionosphere, and Climate Mission II. The forecasts with and without assimilation of RO data are compared, and their difference is regarded as the impact of RO data on TC forecasts. Overall, the forecasts tend to underestimate the TC intensity relative to the best track data. Compared to the forecasts assimilating without RO data, forecasts assimilating with RO data improve the initial conditions and reduce the underestimation of TC intensity forecast by 13 kt and 16 hPa in subsequent forecasts. This intensity improvement is more significant for TCs developing in drier environments than those in moister environments. The main period of intensity increase is 48-24 h prior to TCs developing to the maximum intensity. The assimilation of RO data increases the moisture around the TC centers, especially at mid-levels (700-300 hPa). It also increases the low-level vorticity but reduces the mid-level vorticity around the TC centers. These characteristics favor TCs with stronger surface wind speed and lower sea surface pressure. In summary, this study highlights the positive contribution of RO data to TC intensity forecast and explores the potential mechanisms.