

APPLICATIONS OF GPS RADIO OCCULTATION DATA TO TROPICAL CYCLONE PREDICTION

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The atmospheric limb sounding technique making use of radio signals transmitted by the Global Position System (GPS) satellites has emerged as a powerful and relatively inexpensive approach for sounding the global atmosphere in all weather. Since its launch, COSMIC/FORMOSAT-3 has been providing large number of GPS RO soundings to support the research and operational communities. As of July 2010, COSMIC has taken 2.4 million neutral atmospheric RO soundings, serving a total of 1350 users from 54 countries. On average, COSMIC is providing 1,500 to 2,000 GPS RO soundings per day, uniformly distributed around the globe.

A unique attribute of GPS RO sounding is its ability to penetrate clouds and precipitation with virtually no impact on its accuracy. With its ability to take measurements over the ocean, where there are few traditional observations, GPS RO soundings from COSMIC and other international missions offer great promises to improve the analysis and prediction of tropical cyclones. In particular, GPS RO soundings provide valuable information on the moisture in the tropical lower troposphere, which is crucial for the development of tropical storms. In this paper, we will review the recent work being done in the use of GPS RO observations to improve the analysis and prediction of tropical cyclones. This includes the analysis and prediction of tropical cyclogenesis, as well as the track and intensity forecast of mature tropical cyclones. We also show the impacts of the GPS RO observations on prediction of typhoons impinging Taiwan, including the catastrophic Typhoon Morakot (2009).

Taiwan and U.S. are now actively planning for the COSMIC follow-on mission, known as COSMIC-II/FORMOSAT-7, which promises to provide 8,000 to 10,000 GPS RO soundings per day. We will also discuss potential impact of COSMIC-II on tropical cyclone prediction, as revealed by the observing system simulation experiments (OSSE).