Tropical cyclones are one of the most devastating severe weather systems that are responsible for huge loss of lives and properties every year. Accurate prediction of tropical cyclogenesis by numerical models has been a significant challenge, largely because of the lack of observations over the tropical oceans. The atmospheric limb sounding technique, which makes use of radio signals transmitted by global navigation satellite systems, has evolved as a robust global observing system. This technique, known as GPS radio occultation (RO) can provide valuable water vapor and temperature observations for the analysis and prediction of tropical cyclogenesis. Using the WRF modeling and data assimilation system, we show that the assimilation of GPS RO data can substantially improve the skills of the model in predicting the tropical cyclogenesis for ten typhoon cases that took place over the Western Pacific from 2008 to 2010. To gain insight on the impact of GPS RO data assimilation, we perform a detailed analysis of the formation process of Typhoon Nuri (2008), and examine how the assimilation of the GPS RO data enables the model to capture the cyclogenesis. The joint Taiwan-U.S. COSMIC-II mission was launched in June 2019. It is currently going through check-out phase, and will provide 5,000 GPS RO data per day over the tropics when it is fully operational. This will provide a great opportunity to study tropical cyclogenesis.