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Natural weather phenomena such as hurricanes and tornadoes can be devastating. They are of great concern around the world. The only way to reduce the impact of a potential disasters is to make an accurate forecast and raise awareness. The advancement in modern computational capabilities and superior climate model yields a more accurate forecast; however, the lack of high-resolution initial conditions still hinders the accuracy of the result. It is well established that the warm water region of the Atlantic Ocean, known as the “Hurricane Alley”, is the birthplace of most of the hurricanes. Hurricane season originated from “Hurricane Alley” approximately runs from the start of June through the end of November 30, and the typhoon and cyclone seasons follow slightly different patterns. To accurately forecast the time and strength of these hurricanes/typhoons/cyclones we need high-resolution in situ ocean data and data from the atmosphere above the ocean surface that can fill the void in the existing models. Examining profiles from different satellite mission datasets like GPS/MET, CHAMP and COSMIC GPSRO, it is found that Radio Occultation (RO) is most accurate for measuring atmospheric conditions at altitudes of 5-25 km above the surface. However, below this altitude the accuracy from available datasets is poor. Besides, it is known that, we have a higher number of data profiles in the land surface compared to the surface over the ocean. Thus, there’s a very high demand for high-resolution data in this region –which is the primary focus of this research. In this project, we are investigating the number of data profiles available in the surface over the ocean for both in situ ocean data and data from the atmosphere above the ocean surface (e.g. GPS-RO), to understand the gases and energy exchanges between the atmosphere & ocean. These data will be fed into Numerical Weather Prediction (NWP) models such as Weather Research and Forecasting (WRF) and Data Assimilation System (WRFDA). The results will be compared with simulated datasets to assess the validity of the existing observations. By the end of this project it is expected to provide a recommendation for filling the void in the high-resolution NWP model dataset. Eventually, this will help improve the accuracy of the atmospheric profiles in the region between 0-5 km above the surface.
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