ON SURFACE WIND SPEED RETRIEVAL FROM SAR IMAGERY IN WEST PACIFIC OCEAN

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ABSTRACT

With the development of climate change and global warming, more and more severe tropical storms, hurricanes and typhoons tend to emerge[nature], leading devastating threat and damage to human lives and social productions. Accurate forecasting of storm track and intensity is of vital importance to help evacuation and hence decrease losses. However, the accuracy of storm forecast heavily depends on the amount of precise measurements under the storm that occurs. Few data were obtained under such strong forced wind in the ocean due to limited measurement methods. In-situ buoys are generally broken under such strong wind. Satellite remote sensing tend to be the only candidate for effective storm monitoring in the ocean.

Among satellite remote sensing instruments that have capability of obtaining ocean surface wind speed, such as radiometer (SSM/I, AMSR-E etc.), scatterometer (QuikSCAT, ASCAT), synthetic aperture radar (Envisat SAR, Radarsat-1/2 SAR, TerraSAR, PolSAR, etc.), C band synthetic aperture radar (SAR) stands out for its unique ability of accurate high wind speed monitoring. The ability of other instruments in strong ocean surface wind monitoring is either inferior or under investigation, as well as for the other band SAR, such as L band. In this present work, a huge SAR dataset under typhoons -Radarsat-1 SAR Hurricane Watch Dataset, were analyzed for ocean surface wind speed retrieval in west Pacific Ocean.

Objectives are obtaining ocean surface wind speed with fine scale spatial resolution from SAR

imagery and studying impact of new wind data on the forecasting of typhoon track and intensities in west Pacific.

METHODOLOGY.

Based on the valuable Hurricane Watch dataset, a large number of Radarsat-1 images which are captured during various typhoon period in west Pacific, a SAR wind speed retrieval algorithm developed by Shen et al. (*GRL*, 2006) is applied to get wind speed and direction information from SAR imagery. For super forced typhoon cases (with intensity stronger than category 5 hurricanes), a wind speed ambiguity problem exist in SAR measurements of lower to middle radar incident angles[]. The ambiguity removal algorithm must be applied in order to derive the true typhoon wind speed. The final retrieved wind speed is assimilated into meso-scale atmospheric numerical model MM5 to investigate its impact on improving accuracy of typhoon forecasting.

MAJOR RESULTS.

The Radarsat-1 SAR Hurricane Watch dataset is of great value for studying ocean surface wind vectors with fine scale spatial resolution. The retrieved wind field provide rich information for numerical weather prediction model. With the assimilation of the new data, the NWP model shows better accuracy on hurricane track forecasting as well as hurricane intensity. The methodology and results suggested the necessity to include SAR measurements on the ocean surface into future operational typhoon forecasting.

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