Investigation of SAR Monitoring of Hurricane Wind

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Abstract

The hurricanes can be detected by many remote sensors, but synthetic aperture radar (SAR) can yield high-resolution (~km) and low-level wind information that cannot be seen below the cloud by other sensors. In this paper, an assessment of SAR capability of monitoring high-resolution hurricanes was conducted. Case studies were carried out to retrieve ocean surface wind field from C-band horizontally (HH)-polarized RADARSAT-1 SAR images or vertically (VV)-polarized ENVISAT ASAR images which captured the structure of several hurricanes. With theoretical wind direction or that obtained from the outputs of NOGAPS model, several C-band wind models which describe the NRCS (normalized radar cross section) dependence on the wind speed and the geometry of radar observations (i.e., incidence angle and azimuth angle with respect to wind direction) such as CMOD5 and newly developed CIWRAP and wind/rain backscatter models have been tested to extract wind speed from SAR data. The SAR retrieved ocean surface winds were compared to the in situ observations and the altimeter wind speeds retrieved from an improved high-wind retrieval model. The results show the capability of hurricane wind monitoring by SAR. In addition, the dimension and location of the typhoon eye are measured based on the estimated SAR wind field.