MONITORING HIGH-RESOLUTION WIND FIELD DURING STORM OVER THE GREAT LAKES USING QUIKSCAT/SEAWINDS SCATTEROMETER DATA

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Storms with strong winds and high waves over the Great Lakes can cause severe and extensive flooding, erosion, property damages, and loss of lives across vast regions. Monitoring the evolution of wind fields in storm conditions on the regional scale over the Great Lakes is important to numerous scientific studies and operational applications. We present high-resolution wind results derived from the SeaWinds scatterometer (QSCAT) on QuikSCAT satellite. The QuikSCAT satellite was launched in June 1999 and more than 3 years of scatterometer data have been collected the Great Lakes. From QSCAT data, surface wind vectors are derived over the lakes as a special product with a resolution of 12.5 km compared to the standard QSCAT wind retrieval product at 25-km resolution. With the higher resolution, the special QSCAT grid is sufficient to represent the wind field over the Great Lakes. We present wind vectors over all Great Lakes on 21, 22, and 24 of October 1999 corresponding to conditions before, during, and after a strong with winds more than 20 m/s (40 knots) and significant wave height of 6 m (20-foot waves). Buoy measurements and web camera observations verify QSCAT high wind results during the storm over Lake Superior. Moreover, the National Oceanic and Atmospheric Administration (NOAA) Great Lakes Environmental Research Laboratory (GLERL) produces nowcast wind fields (objective analysis of point measurements by buoys and other in-situ instruments). We collocate QSCAT and nowcast wind data in time and space and carry out quantitative comparisons of both wind speed and wind directions. For wind speed, QSCAT results are higher than GLERL nowcast data in light wind conditions, and are well comparable with nowcast results for strong wind cases. For wind direction, QSCAT and nowcast results are in good agreement overall. Currently, we use geophysical model functions derived for ocean winds to apply for wind retrieval over fresh water surface in the Great Lakes. Such model functions may not be optimal for lake wind applications, and geophysical model functions to be developed for lake-water surface can improve the results. The advantage of QSCAT is that it can provide extensive and consistent results over the Great Lakes on the daily basis without relying on point measurements from buoys (which are taken out of the lakes before every winter season to avoid damages caused by ice). The follow-on SeaWinds scatterometer was successfully launched on the ADEOS-II Satellite on 14 December 2002. Past, present, and follow-on satellite scatterometers will provide long-term data for Great Lakes wind monitoring.