4.4 IMPROVING SYNTHETIC APERTURE RADAR WIND OBSERVATIONS BY CORRECTING NOGAPS WIND DIRECTION FIELDS USING SUBJECTIVE ANALYSIS

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1. INTRODUCTION

Synthetic aperture radar (SAR) has proven to be a useful tool for extracting high resolution estimates of the surface wind speed field over the earth's oceans. Recently, the Johns Hopkins Applied Physics Laboratory (JHU/APL) in conjunction with the National Oceanic and Atmospheric Administration's National Environmental Satellite, Data, and Information Service (NOAA/NESDIS) has developed a technique for extracting wind speed maps from RADARSAT-1 ScanSAR imagery of the Gulf of Alaska and Bering Sea (Monaldo 2000; Thompson and Beal 2000). Comparisons between the JHU/APL wind extraction method, buoys and QuikSCAT wind speeds indicate that the SAR winds are highly correlated with buoy and QuikSCAT winds (Monaldo et al 2001a, Monaldo et al. 2001b). However, there are situations where significant differences exist between the SAR winds and both QuikSCAT and buoy winds. While there are several possible explanations for these discrepancies, one of the largest, known sources of error affecting SAR winds are wind direction errors. We plan to examine the effect that wind direction errors have on SAR wind speed retrievals and demonstrate that corrected wind direction estimates obtained from subjective analysis can improve the SAR wind speed estimates.

2. WIND DIRECTION ALGORITHM

The relationship between radar cross-section and wind speed depends on *a priori* knowledge of the surface wind direction in addition to known parameters relating to radar geometry. The JHU/APL operational SAR wind speed algorithm has used the initialization fields from the Navy Operational Global Atmospheric Prediction System (NOGAPS) model to obtain independent wind direction estimates. This method has the advantage that it is always available, but wind directions are not always as accurate as desired. One of the major sources of error in these wind directions occurs when there are position errors in the locations of fronts and extratropical cyclones. This problem is particularly severe in the Bering Sea where frontal and storm locations are often not predicted well. Because the signatures of fronts and storms are often visible on SAR images, it should be possible to reasonably correct the surface wind direction fields using subjective analysis. In this study, we plan to examine 4 cases where significant storms and fronts are evident in SAR images from the Bering Sea. In all cases, the National Data Buoy Center (NDBC) buoy 46035 (located at 56.9º N, 177.8º W) was in the image scene. This buoy will provide the ground truth for a study in which wind speed estimates obtained using the NOGAPS wind directions is compared with wind speed estimates obtained by correcting the NOGAPS wind directions using subjective analysis. It is expected that significant improvements in the SAR retrieved wind speeds will result.

3. REFERENCES

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