VALIDATION OF QSCAT-1 GEOPHYSICAL MODEL FUNCTION USING SEAWINDS LEVEL 2 AND BUOY DATA

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1. INTRODUCTION

Geophysical Model Function (GMF) is the basis and the prerequisite for wind vector retrieval and effective running of the algorithm. The precision of the GMF directly influences on the quality of the retrieved wind field. Qscat-1 model was specifically developed for SeaWinds scatterometer based on SASS-II model and is being applied to SeaWinds operational wind retrieval at present[1]. Just as many other empirical model functions, Qscat-1 model was also established by using multiple sources of wind vector data such as numerical weather prediction (NWP) data, climatic average wind data, and in situ observing wind data[2,3]. But the NWP, climatic average, or other non-directly measured wind data used in modeling have some error in themselves and in turn result in some error in the established model. Compared with these kinds of data, the buoy measurement wind data has more accuracy. In this paper, we focus on validating the Qscat-1 model function by using some Seawinds L2A, L2B and corresponding buoy wind data. First, a comparison between L2B wind speed and buoy wind speed is made, and then a new geophysical model function is established using the match-ups of L2A and buoy data in order to further investigate the precision of Qscat-1 model.

2. DATA DESCRIPTION AND PROCESSING

SeaWinds L2B data contains wind vectors retrieved from L2A data with Qscat-1 model and the L2A data contains the radar backscattering coefficient and other observing parameters (incidence angle, azimuth angle, and polarization, etc.)[4,5]. 51 buoys from NODC (National Oceanographic Data Center) are chosen to validate the Qscat-1 model. These buoys are located at regions of northeastern Pacific ocean, Mexico Gulf, and northwestern Atlantic ocean. The buoy data records wind vectors measured over the ocean surface and is saved as F291 format[6].

The validation of Qscat-1 model in this paper consists of two parts. In the first part, we compare the L2B wind speed with the buoy wind speed to investigate if there is any systematic bias between them. The systematic bias between L2B and buoy wind speed may reflect the bias between the Qscat-1 model and the “real” model. Then, in the second part we verify the systematic error existing in the Qscat-1 model by establishing a new GMF using the backscattering coefficient and other observing parameters (incidence angle, azimuth angle, and polarization) in L2A data, and the wind vector data from the buoys. The new GMF can be viewed as the “real” model function because all the wind vectors used in this modeling are from buoy data—the directly measured wind vectors over the ocean surface. So the bias between the Qscat-1 model and the new GMF model ought to be uniform with that between L2B and buoy wind speed. Through these analytical methods mentioned above, the Qscat-1 model can be validated thoroughly. Certainly, necessary preprocessing of the L2A, L2B, and the buoy data are needed before statistical analyzing and modeling, such as filtering out the bad data, spatial and temporal matching of the SeaWinds L2A, L2B, and the buoy data, and wind speed...
transformation of different reference heights. Because of the ununiform distribution of the matched data in the parameter space, neural network method is used in the new GMF modeling with the incidence angle(polarization) as an independent input parameter according to the geometric observing characteristic of SeaWinds.

3. MAIN CONCLUSIONS

The experiment results show that the L2B wind speeds are systematically higher than the buoy wind speeds, and the backscattering coefficients of the new GMF are higher than those of the Qscat-1 model under nearly all the wind speeds ranging from 3 to 15m/s. From the wind retrieval point of view, these two results for the comparisons of wind speed and model are actually consistent with each other. The systematic error lying in the Qscat-1 model should be paid more attention in practical wind vector retrieval, particularly in the applications of global wind vector analysis using SeaWinds data, and also the reasons for this systematic error should be investigated deeply in the future research.

4. REFERENCES