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TECHNICAL NOTE[1]

Using QuikSCAT Wind Vectors in Data Assimilation Systems

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Abstract

High quality wind vector fields (swaths) retrieved from QuikSCAT measurements have already found many applications in different fields of meteorology, climatology, and other environmental sciences. To generate these fields, the current retrieval procedure successfully integrates or fuses the first guess wind fields and satellite data. As a result, the QuikSCAT wind field is a blend of satellite information and information from the FG. For most QuikSCAT wind applications, the percentage of independent satellite information, α, (or the ratio of satellite to first guess information) in the wind field is not an essential parameter and does not significantly affect the applicability of the data. In data assimilation applications, where the FG wind fields are one of the constituents of the data assimilation system, the amount of independent satellite information in the data may be at least as important as the error statistics (bias and RMSE) and should be taken into account. The parameter α may help to control a double count of the first guess in the data assimilation system and strongly influence the impact of satellite data on numerical weather prediction models. For different parts of the wind field this parameter will be different. Areas with lower values of this parameter should be assimilated with lower weights (higher errors).

In this study we empirically examine QuikSCAT wind vectors from this point of view. It is shown that amount of independent satellite information is lower in areas where scatterometer has lower accuracy, such as areas where the wind direction is orthogonal to one of the radar look directions, wind speeds are higher, and edges of the swath or nadir are close. It is also shown that these areas fall mainly in the part of the data where the ambiguity removal procedure selects one of the higher (not the first) ambiguities. This fact suggests a simple procedure for data assimilation applications: use the ambiguity removal procedure as a flag, assimilating only the part of the nudged solution where the first ambiguity is selected or assimilate this part of data with higher weight (lower errors).