A COMPARASION OF QUALITY INDICATORS FOR KU-BAND WIND SCATTEROMETRY & FOR TYPHOONS LEKIMA AND KROSA IN CSCAT

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Résumé

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ABSTRACT

Uncertainties in wind scatterometry are contributed by system and geophysical noises. The

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system noise can be characterized by noise measurements obtained simultaneously with the normalized radar cross-sections (NRCSs) and the mean NRCS value within a wind retrieval unit, i.e. a square box on the sea surface called wind vector cell (WVC). While the geophysical noise usually comes from factors not or not well modelled by the geophysical model function (GMF), which maps the wind field to the scatterometer observed NRCS. Specifically, the factors include GMF imperfections, wind variability (imperfect spatial beam collocation), and rain. In case the uncertainties in a scene cause the retrieved winds to deviate substantially from the *true wind*, then the deviations should be captured by indicators that are used in the quality control (QC). In general, there are three indicators developed by varying principles: 1) the normalized distance between the set of NRCS and the GMF in a WVC as obtained by the maximum likelihood estimation or MLE in the wind inversion, it also takes the variance of the NRCS with respect to mean in a WVC into account; 2) the singularity exponent (SE) derived from a singularity analysis of spatial observations that quantitatively identifies steep local wind gradients; and 3), Joss , derived from differences of the WVC wind speed and that filtered by the low-pass 2-dimensional variational ambiguity removal (2DVAR) procedure. The MLE provides uncertainties in observed NRCS with respect to their consistency with the wind-based GMF, while the SE and Joss both quantify spatial wind field irregularities.

In March 2020, the Ku-band scatterometer onboard the Chinese-French Oceanographic SATellite (CFOSAT scatterometer, CSCAT) had successfully finished its in-orbit tests and shifted from experimental to an operational mission phase. It is the first rotating fan-beam scatterometer ever in space. And for rotating-beam scatterometers, with varying viewing geometry across swath, the sweet swath WVCs, which are not located near the nadir or the swath edge, have adequate azimuth diversity of NRCS for eliminating system noise. After calibration, the remaining uncertainties in those WVCs is associated with geophysical noise that may reach anomalously high values based on existing prior knowledge. Then uncertainties are mainly due to the presence of rain, which is often present in tropical regions.
In this study, first, the three indicators are introduced in more detail in the Methods section. Then these indicators are compared under rain conditions in CSCAT, and rain rates from the Global Precipitation Mission (GPM). Finally, case studies of the super typhoon Leckima and typhoon Krosa in the year 2019 are discussed, before conclusions and further research are specified. The results of this research contribute to improving the QC procedures and hence winds inversion, providing good references for improvement of CSCAT winds.