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Wind induced errors on retrieving SSS with SMOS brightness temperature

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The Soil Moisture and Ocean Salinity (SMOS) satellite, launched in November 2009, carries the first interferometric radiometer at L-band (1.4GHz) in orbit. The global distribution of SMOS SSS is very encouraging [Font et al., 2011]. In particular, the latitudinal variation of SSS is well captured by SMOS [Yin et al., 2012] and SSS anomalies in tropical regions seen by ARGO floats also appear on SMOS SSS [Boutin et al., 2011].
However, large discrepancies between SMOS SSS and Argo are noticed when there are large differences between SSMI wind and ECMWF wind, which is used for initializing iterations of SSS retrieval. SMOS does not carry microwave scatterometer or microwave radiometer at high frequency to simultaneously measure roughness, although it's proved in this paper that SMOS retrieved wind speed in the center of the swath ($\pm$ 300 km) is partly (but not entirely) corrected for inconsistencies between ECMWF wind speeds and true wind speeds, whereas it's not possible to correct wind speed in the border of the swath.
Two main aspects of wind induced errors on retrieving SSS with SMOS are:
1) The difference between and ECMWF forecast model wind and neutral equivalent wind which is defined for microwave remote sensing
2) The difference between wind used as prior and the truth.
When the discrepancies between ECMWF wind and SSMI wind is out of SMOS's capability of wind correction, the retrieved SSS is biases. In this paper, we show some examples of large discrepancies between SMOS SSS and Argo when there are large differences between SSMI wind and ECMWF wind:
1) The SMOS is systematically to high in the equatorial area in the Eastern Pacific in Summer of 2010, where there is a strong westward current.
2) A case with strong wind front in the southern Pacific ocean.
In this paper, we study the precision on SMOS SSS when SSMI wind speed is used as prior and compare it with SSS when ECMWF wind speed is used as prior. We also present the result of SMOS SSS when ECMWF wind is used with correcting sea surface current. We study also the method to retrieve SSS and wind speed with multi-bands brightness temperature (TB) by collocating SSMI multi-bands TB and SMOS L-band TB.

References

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