MWR Roughness Correction Algorithm for the Aquarius SSS Retrieval

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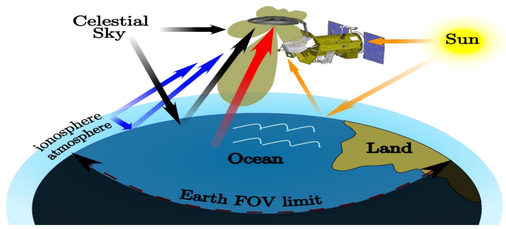
Abstract

The measurement of SSS is challenging because there are many corrections that must be taken into account before obtaining the smooth ocean surface brightness temperature (Tb) that is used to retrieve salinity. The AQ baseline approach to provide roughness correction uses the AQ scatterometer ocean radar backscatter to infer excess ocean emissivity. In this poster, an alternative MWR derived sea surface roughness correction algorithm is presented that uses a new semi-empirical microwave Radiative Transfer Model (RTM) to estimate the excess ocean emissivity using ancillary data such as sea surface temperature (SST) and ocean surface wind vector.

This RTM has been tuned using 1-year of observed AQ and MWR Tb's and corresponding atmospheric and oceanic environmental conditions from numerical weather models (GDAS). The ocean roughness correction algorithm uses this RTM and collocated MWR Ka-band Tb's and available ancillary data (e.g., sea surface temperature, surface wind vector, and HYCOM SSS); and the outputs are the corresponding roughness corrections for each AQ footprint.

Major Sources of AQ Tb Error

- There are 12 major sources of Tb measurements error
  - 6 must be corrected using auxiliary data



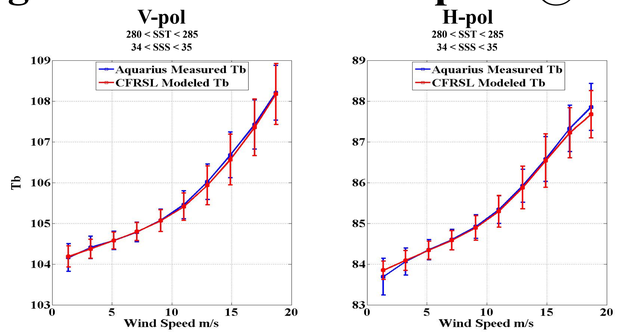
AQ Ocean Roughness Correction

- Aquarius uses the Scatterometer on board to provide roughness correction (ΔTb)
  - By correlating the radar backscatter with excess ocean emissivity
- This project uses the **MWR measured Tb at Ka-band to calculate ΔTb** and then translate it to L-band
  - Ka-band is more ***sensitive*** to changes in wind speed
  - This provides the opportunity for an alternative roughness correction using the simultaneous MWR measurments

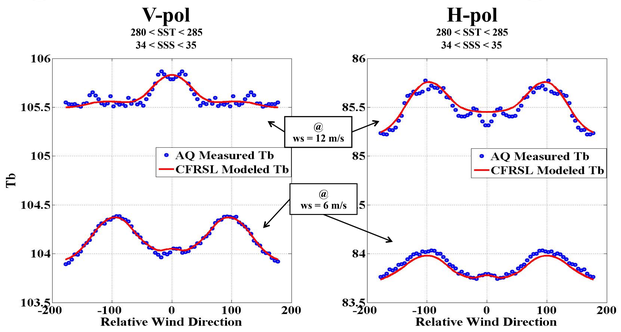
MWR Roughness Correction

- Wind speed and wind direction effects were analyzed using ~ 1 year of AQ & MWR data
  - MWR Tb V7.0
    - ❖ Beam 1, 52°incidence angle
    - ❖ ~ 4,000,000 data points
  - AQ L-2 V2.6.1
    - ❖ Beam 1, 29°incidence angle
    - ❖ ~ 4,000,000 data points
  - The two sets were filtered to remove points where rain exists
  - **MWR data averaged over the AQ IFOV**
- Roughness correction at Ka-band was compared with roughness correction at L-band
  - Empirical relationship was found

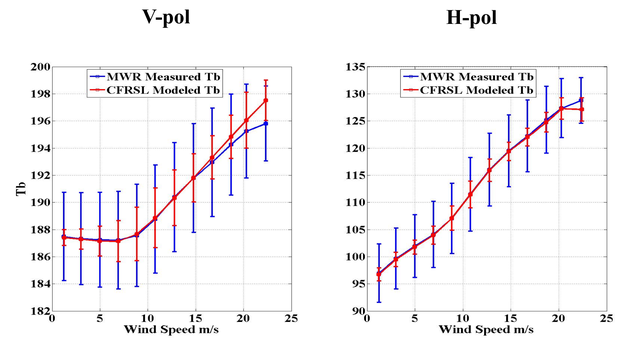
Tuning the RTM for Wind Speed @ L-band



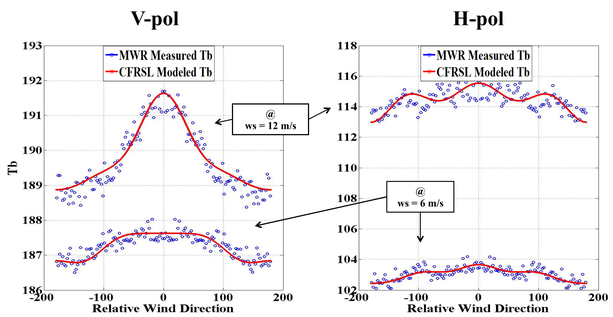
Tuning the RTM for Wind Dir. @ L-band



Tuning the RTM for Wind Speed @ Ka-band

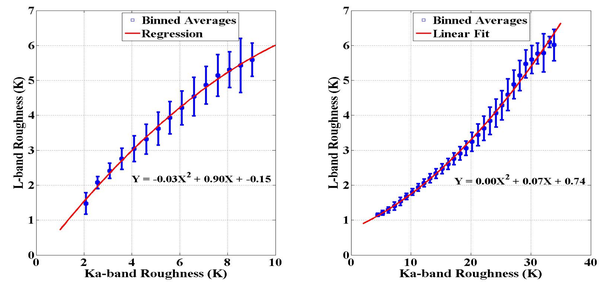


Tuning the RTM for Wind Dir. @ Ka-band



Comparison L-band & Ka-band Roughness Corrections (For Isotropic Wind)

V-pol



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Summary

- A legacy data set of 29 months of MWR data exists for roughness correction
- Preliminary roughness correction algorithm completed for AQ Beam-1
- Release of MWR derived AQ roughness correction (3 beams) in Summer 2015
- Validation of SSS using MWR roughness correction and inter-comparison with Scatterometer roughness correction