Roughness Correction for AQ SSS Algorithm using MWR

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AQ Cal/Val Meeting

Nov. 15 – 17, 2011

Pasadena, CA

Pre-launch: AQ SSS Algo Approach

- Develop linear regression SSS models using V- & H-pol <u>separately</u>
  - Correct measured AQ surface Tb_{meas} for wind speed effects

$$Tb_{meas} = \left(e_{smooth} * SST\right) + \left(\Delta e_{rough} * SST\right) = Tb_{smooth} + \Delta Tb_{rough}$$

$$Tb_{smooth} = Tb_{meas} - \Delta Tb_{rough}$$

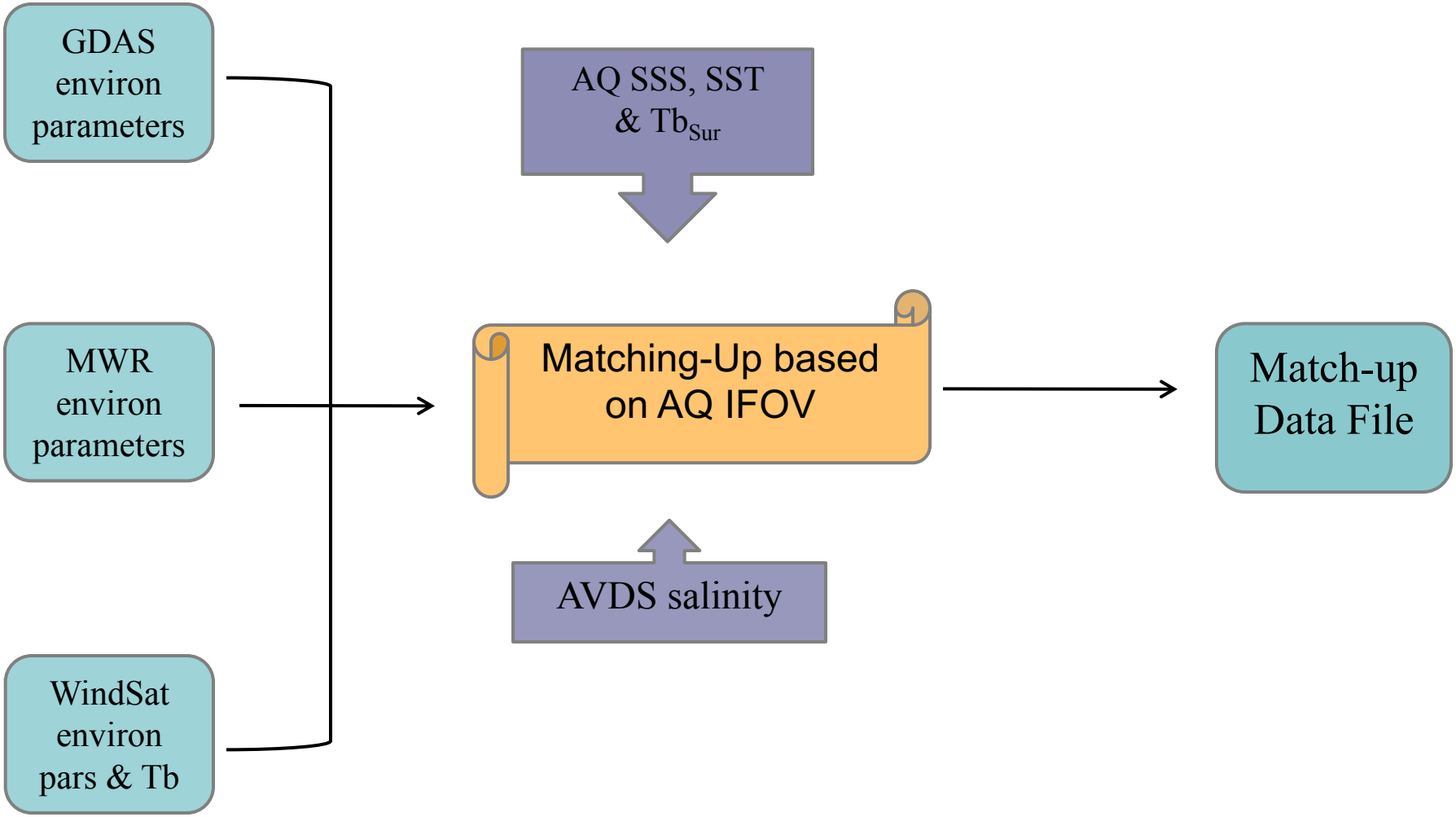
$$\Delta Tb_{rough} = \left.\frac{\partial Tb_{meas}}{\partial WS}\right|_{SST=const} * \Delta WS$$

  - Use smooth ocean emissivities for SSS rerievals

$$SSS_V = b_0(sst) + b_1(sst) * TbV_{smooth}$$

$$SSS_H = c_0(sst) + c_1(sst) * TbH_{smooth}$$

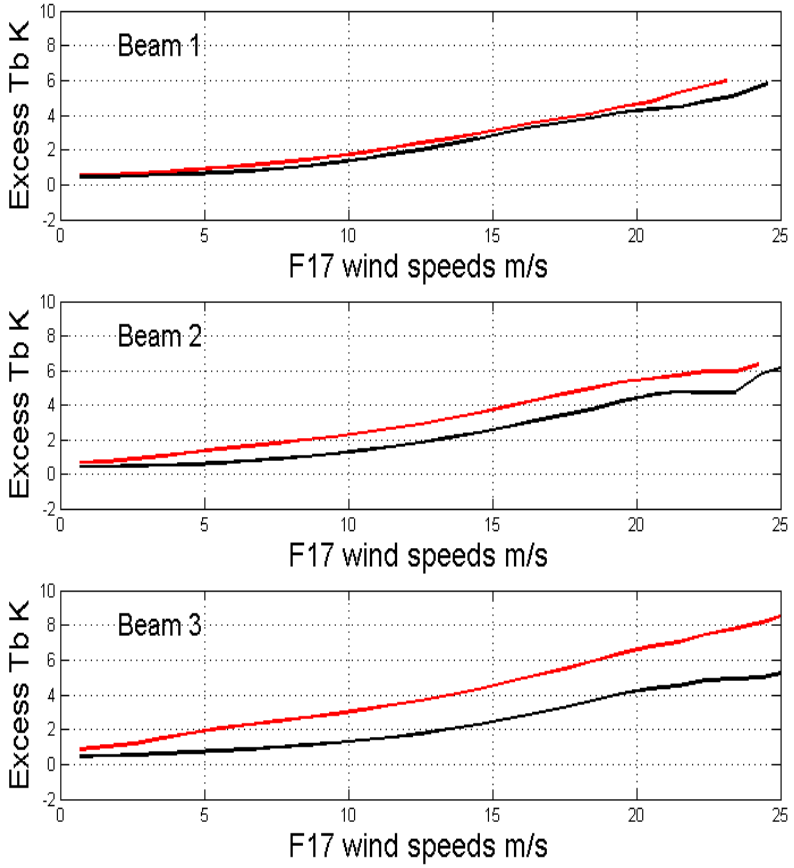
Post-launch year-1: Develop AQ match-up data set



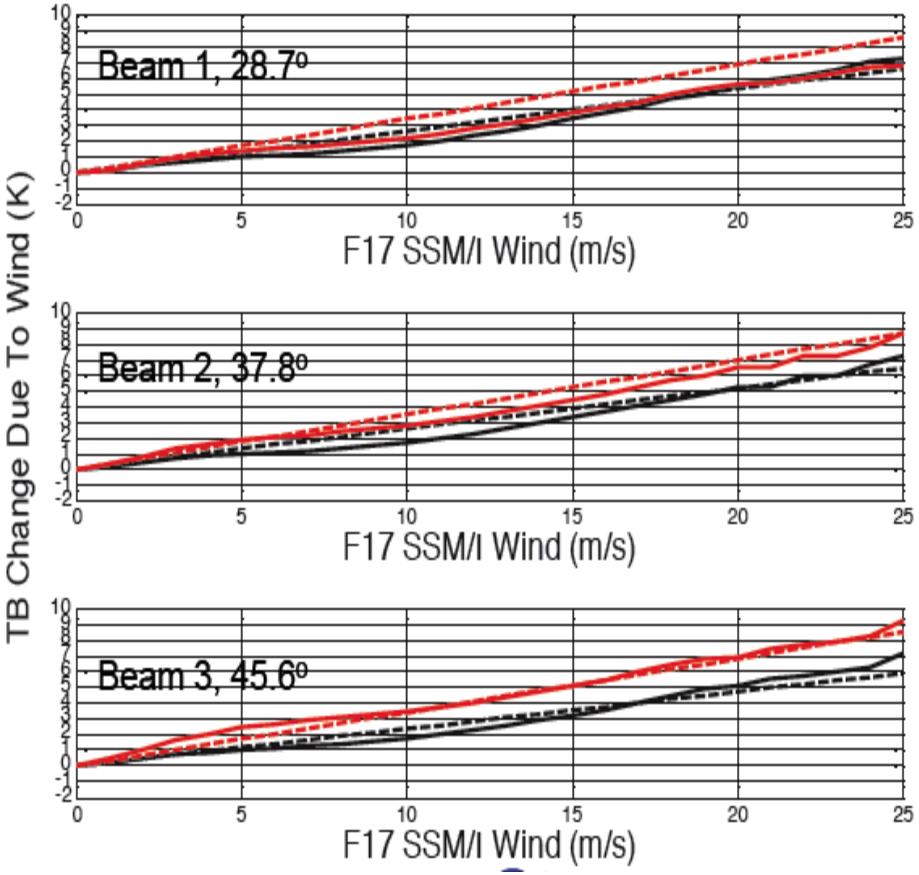
Post-launch year-1: CFRSL Ocean Emissivity & $SSS_{V/H}$ Algo Validation

- Using AQ match-up data set
  - Tune CFRSL ocean emissivity model to match AQ Tb_{sur}/SST
  - Use Meissner/Wentz surface emissivity model to relate “smooth surface Tb” to EIA, salinity & SST
  - Using AQ Tb_{sur}, SSS, SST and wind speed Calculate excess brightness Tb_{Ex} due to surface roughness (wind speed)
    - Compare with Cal/Val team results

Comparison of CFRSL and Cal/Val Team Excess Tb's



CFRSL



D-68873 Aquarius PLAR
06 – AQ Science Assessment , slide 16

MWR Based AQ Roughness Correction

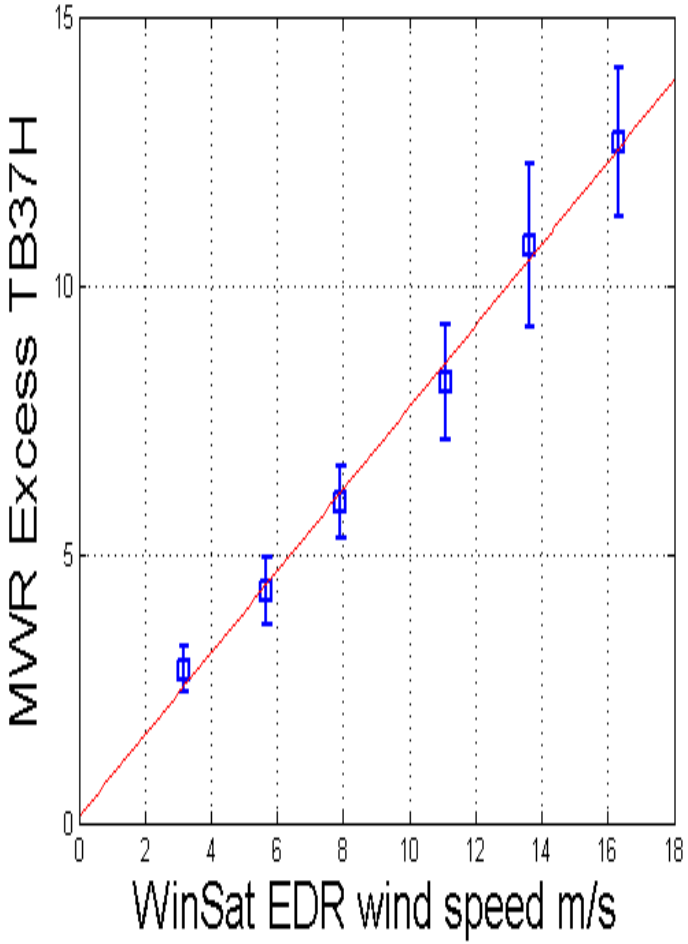
MWR Excess Tb Algorithm

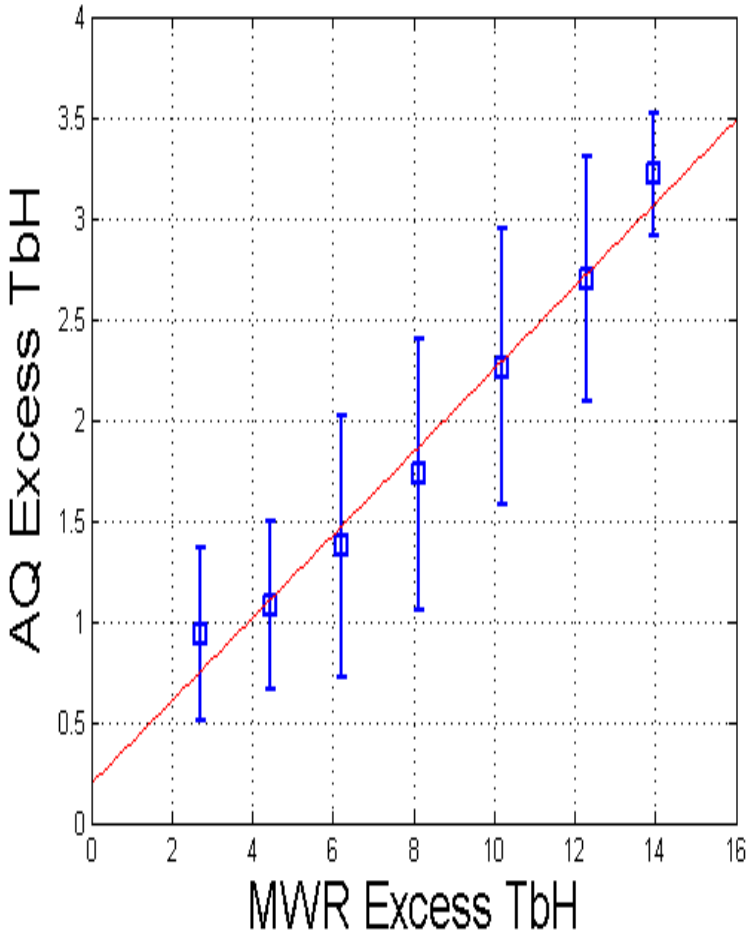
- Use MWR 37GHz V & H-pol to retrieve wind speed (WS)
- Sanity check: Compare collocated MWR and WindSat WS
- Use CFRSL ocean emissivity model with retrieved WS to calculate Tb_{Ex_MWR}
- Compute AQ excess Tb using SST & HYCOM SSS

$$Tb_{Ex\_AQ} = (T_{sur\_meas} - T_{smooth})/SST$$

- Cross correlate MWR & AQ excess Tb

Example: MWR & AQ Excess TbH





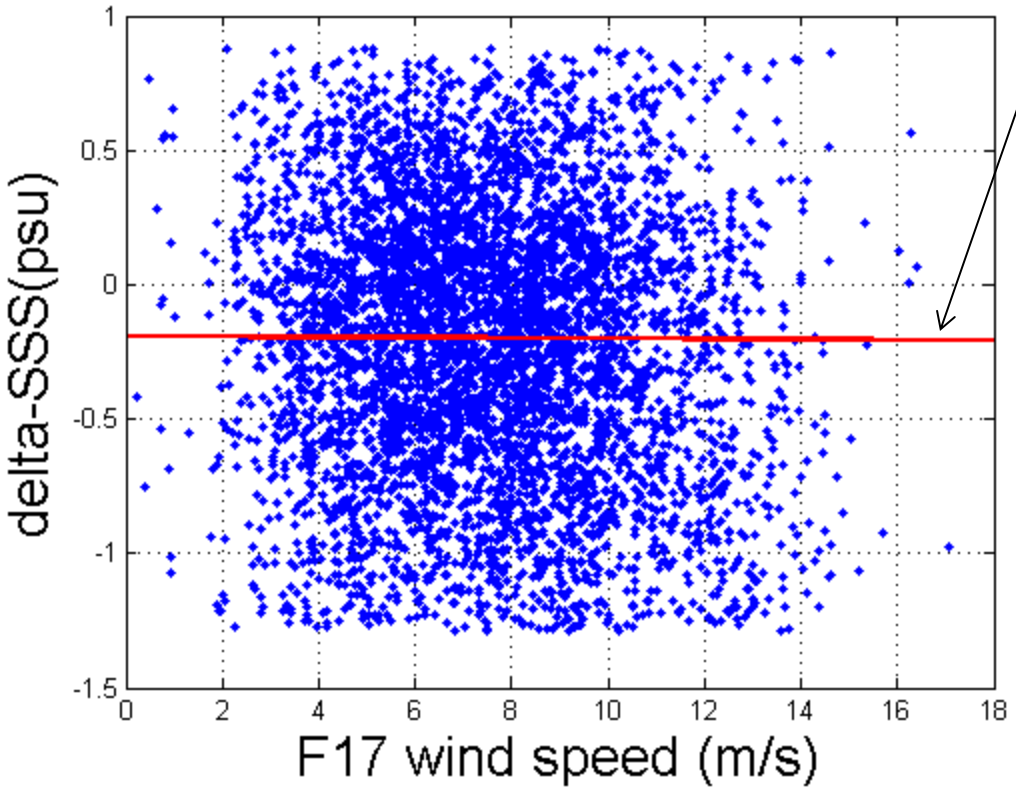
CFRSL Salinity Retrievals

- Calculate the salinity corresponding to the AQ smooth Tb
- Calculate the difference between AQ smooth salinity and ADVS salinity match-ups
- Find correlation between delta salinity and wind speed
  - Delta salinity independence implies that the AQ roughness correction is correct

Correlation of delta-SSS with Wind Speed

No points ~ 5500

Linear regression: SSS error = -0.0008*WS – 0.2 psu



Cal/Val Status

- CFRSL L-band ocean rough-emissivity model tuned to AQ excess Tb measurements with WindSat collocated wind speeds
- AQ smooth emissivity model uses Meissner/Wentz GMF
- MWR based L-band roughness correction uses 37 GHz V & H-pol Tb's
- CFRSL SSS algorithm compared to ADVS insitu salinity measurements
  - *Delta-SSS = (CFRSL – AVDS)* is nearly independent of wind speed