Status and plans for whole range TA calibration

E. Dinnat, D. Le Vine
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Objective

• Use Ta obs and sim over Sky and Ocean and apply empirical linear adjustment to Tb to remove differences

=> Ta_model is computed using spillover-adjusted antenna pattern over Ocean and Cold Sky.

\[
Ta_{\text{new}} = A \cdot Ta_{L2} + B
\]

Find A and B so that

\[
Ta_{\text{new}} = Ta_{\text{model}}
\]

• Check adjustment over land reference site
Validation over land
2 instrumented USDA sites

- Little River (LR),
collocated with beam 2 only
- Little Washita (LW),
collocated with beam 3 only
Little River

• Use USDA measured temperature and SM at LR
  – $T$ (USDA) is $\sim 1.7$ K warmer than $T$ (NCEP) (in L2)
  – $SM$ (USDA) is 0.2 dryer than $SM$ (NCEP)
  $\Rightarrow$ Ta model is increased $\sim 6$ K by using USDA values

• Use of Hybrid gain pattern increases Ta by similar amount $\sim 6$ K
Little Washita

• Use USDA measured temperature and SM at LW
  – T (USDA) is ~ 1.4 K warmer than T (NCEP) (in L2)
  – SM (USDA) is 0.1 dryer than SM (NCEP)
  ⇒ Ta model is increased ~ 4 K by using USDA values

• Use of Hybrid gain pattern increases Ta by ~ 5 K
Calibration status in V4.5.1
Beam 2 (Little River)
Beam 3 (Little Washita)
Empirical Adjustment
Beam 3 V-pol

\[ T_{\text{meas}} = 0.990 \times T_{\text{mod}} + 1.920K \quad \text{-- Beam 3} \]
All channels CS bias, slopes & offset
Histogram Ta obs – sims
Little River, Beam 2

- TaV [sim - obs] (K)
  - V2.0
  - New
  - V45.1

- TaH [sim - obs] (K)
  - V2.0
  - New
  - V45.1

Mean values:
- V2.0: Mean = -9.56K, Median = -9.77K, Std = 4.40K
- New: Mean = -0.28K, Median = -0.80K, Std = 3.79K
- V45.1: Mean = 0.76K, Median = 0.19K, Std = 3.81K

Mean values:
- V2.0: Mean = -16.75K, Median = -17.11K, Std = 6.51K
- New: Mean = -4.30K, Median = -5.05K, Std = 5.75K
- V45.1: Mean = -4.29K, Median = -5.09K, Std = 5.79K
Histogram Ta obs – sim
Little Washita, Beam 3

mean = -8.36K
median = -9.40K
std = 6.14K
mean = -2.94K
median = -4.32K
std = 5.62K
mean = -2.51K
median = -3.74K
std = 5.36K

mean = -9.80K
median = -10.22K
std = 9.54K
mean = -2.73K
median = -3.79K
std = 9.12K
mean = -2.01K
median = -3.22K
std = 8.97K
Future work

• Add land validation sites
  – Needed for beam 1 (no site for now)
  – To increase independent validations

=> Collocations of Aquarius footprints and SMAP calibration sites have been computed.

TO DO: acquire in situ data.

• Reduce scatter over land: QC -> filter data likely to have model issues (e.g. high VWC)

• Impact on ocean part (slope) in TB & retrieve SSS ?
  (changes in empirical corrections ?)

• Update all to latest antenna pattern, calibrated product ...