

National Aeronautics and Space Administration

Aquarius Antenna Temperature Calibration Working Group (TAWG) Report

prepared by:
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January 29, 2013

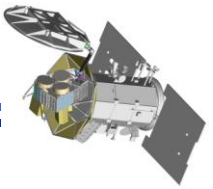
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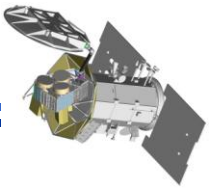


Understanding
the Interaction
Between Ocean
Circulation, the
Water Cycle,
and Climate by
Measuring
Ocean Salinity

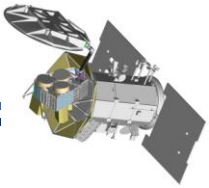
Aquarius/SAC-D



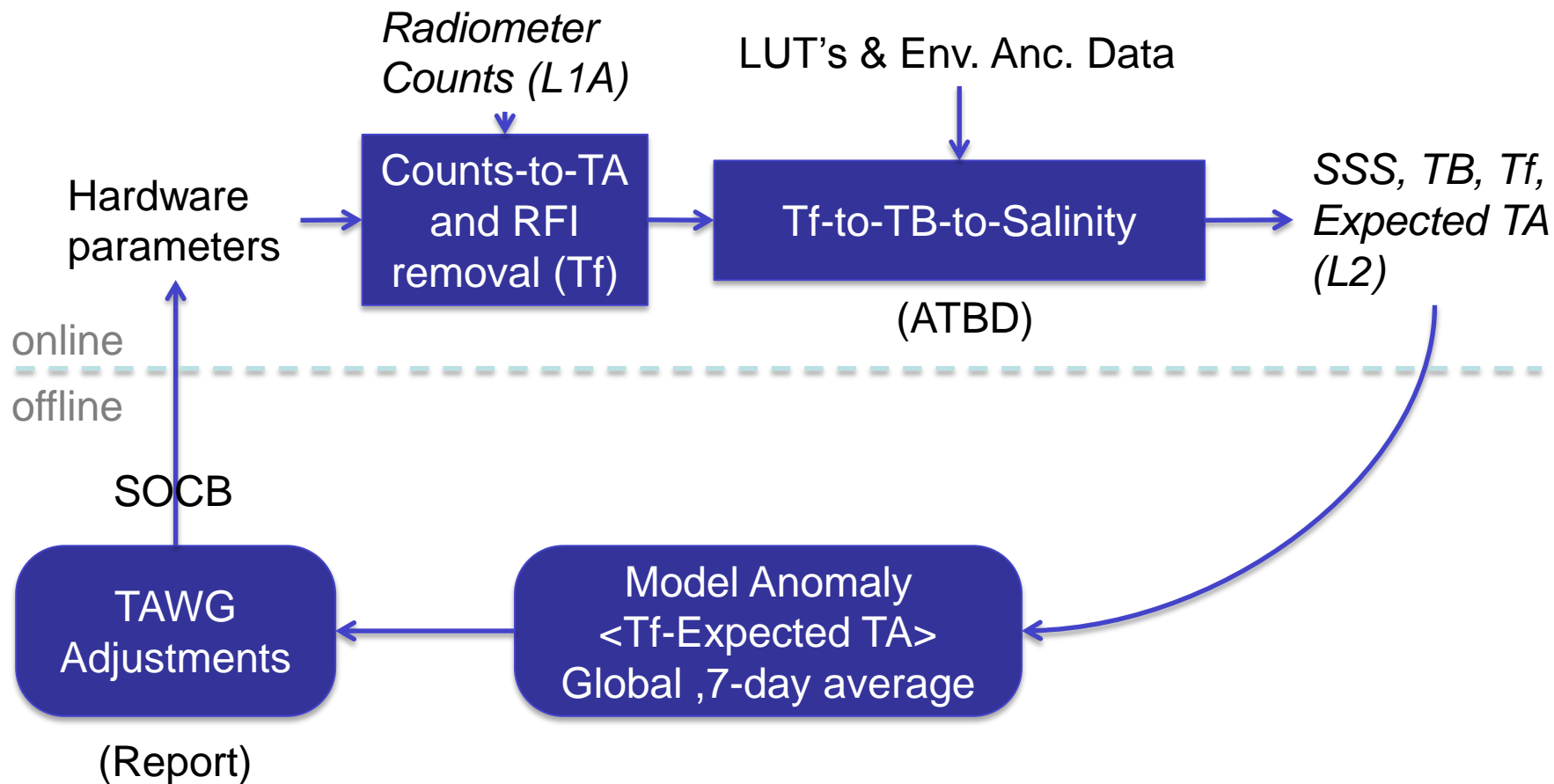
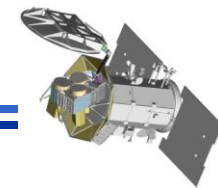
- Today's TAWG session
- TAWG scope and tasks
- TA calibration context
- Technical background
- Findings and plan forward

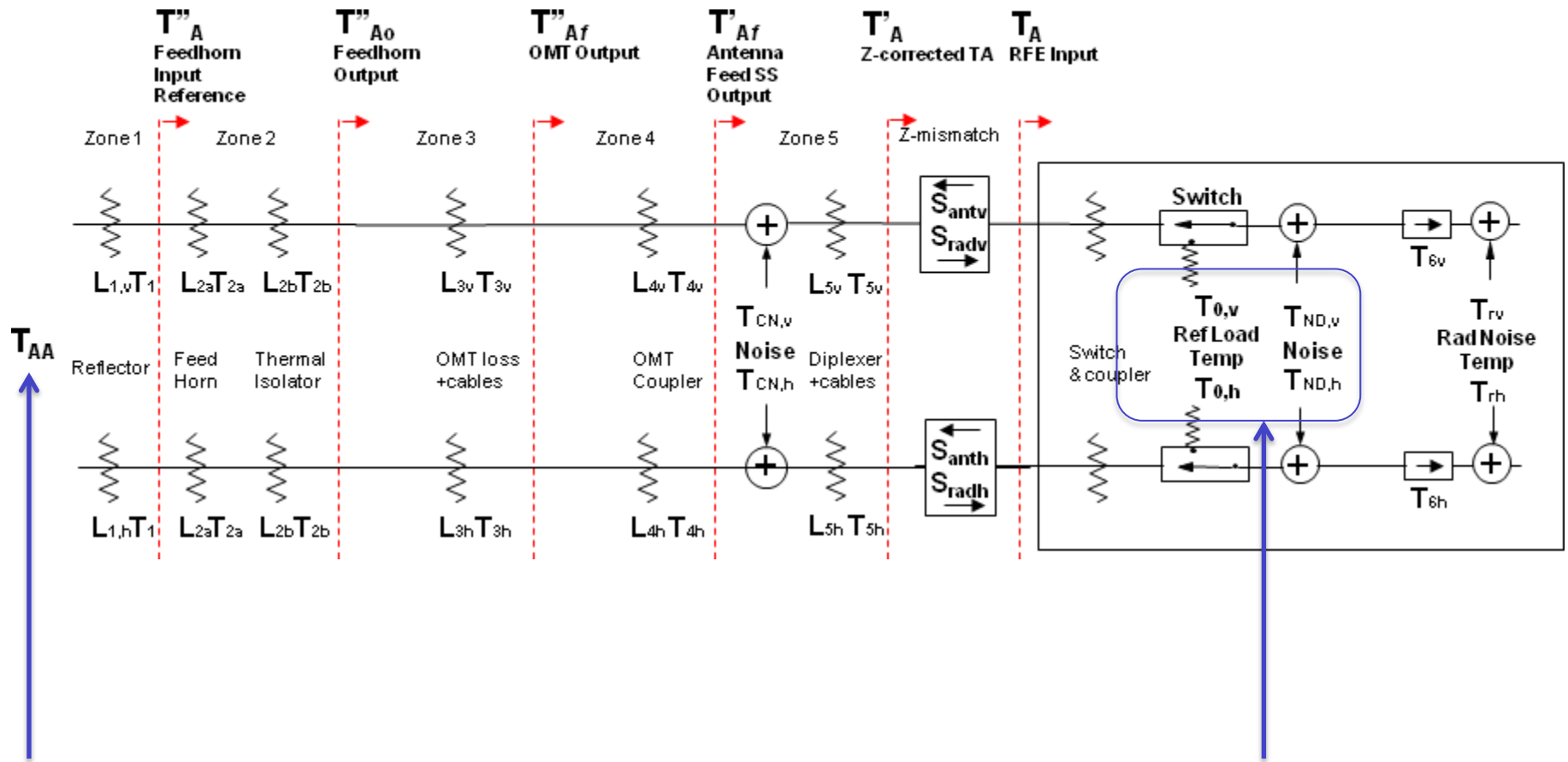
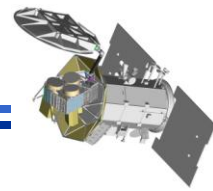


- Report – Jeff Piepmeier
- TA Calibration Assessment – Jeff Piepmeier
- Separating instrument from model errors – Gary Lagerloef
- Antarctica and Separating instrument from model errors – Shannon Brown/Sid Misra
- Cold sky cal and Warm end cal – Emmanuel Dinnat (contrib. from Rajat Bindlish)
- Closing comments – Jeff Piepmeier



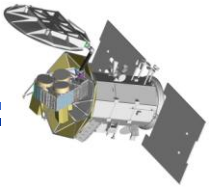
- Purpose
 - Assess and recommend improvements for instrument calibration
 - Scope
 - Calibrate the instrument to produce TA consistent with L2 retrieval algorithm
 - Hardware (electronics) calibration drift
 - Ocean surface TB's
 - Whole dynamic range
 - Inform model, RFI and antenna pattern WG's
- Actions
 - Concentrated on correcting calibration drift over ocean
 - Separated instrument and model effects
 - Recommendations implemented in V2 discussed today
 - Whole dynamic range calibration assessment on going
- Participants
 - Internal and external science team members and project staff
 - Meissner; Brown; Misra; Yueh; Lagerloef; Dinnat; Bindlish; Levine; Lang; Jones; Fore; Hacker; Kim; Hong; Patt; Feldman; Gales



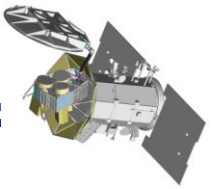


TAWG is calibrating antenna temperature

... by adjusting instrument parameters



- TA calibration based upon
 - Minimizing modeling anomaly in an average sense
 - Constraining corrections to those traceable to instrument behavior
- Basis of comparison is $dTA = T_f - TA_{exp}$
- Filters
 - AOCS in science mode
 - S/C roll < 1 deg, pitch < 1 deg, yaw < 5 deg off nominal
 - Avoid excessive RFI. i.e. $abs(TA - T_f) < 1$ and $abs(TA_{exp} - T_f) < 1$
 - Exclude scatterometer detected RFI (flags 29 and 31)
 - Select only open ocean
 - Land fraction < 0.001
 - Ice fraction < 0.001
 - Exclude likely RFI contaminated locations (suspected)
 - LAT: [30N, 60N] + LON: [330, 360] + ascending.
 - LAT: [25N, 50N] + LON: [290, 310] + descending.
 - LAT: [15N, 50N] + LON: [120, 160] + ascending.
 - Exclude high galactic radiation: reflected for specular surface < 3 K
- Everything available in L2 product files



- Findings
 - Instrument errors
 - There is a long-term gain drift well modeled by exponential decay
 - There are shorter-term non-monotonic offset errors (i.e., “the wiggles”)
 - Geophysical model errors
 - There remain modeling errors in the TA-TA_exp global average comparison
 - Dynamic range
 - Cold-sky and SMOS matchups over land indicate the full dynamic range calibration has too high a slope
 - Noise diode and APC coefficients are only consistent for ocean scenes
- TAWG Plan Forward
 - Collaborate with Antenna WG on harmonizing ND cal with APC
 - Continue to investigate instrument behavior to determine cause of instrument calibration errors to inform correction methodology
 - Collaborate with Model WG on residual offset error correction