National Aeronautics and Space Administration

Radiometer Calibration Overview

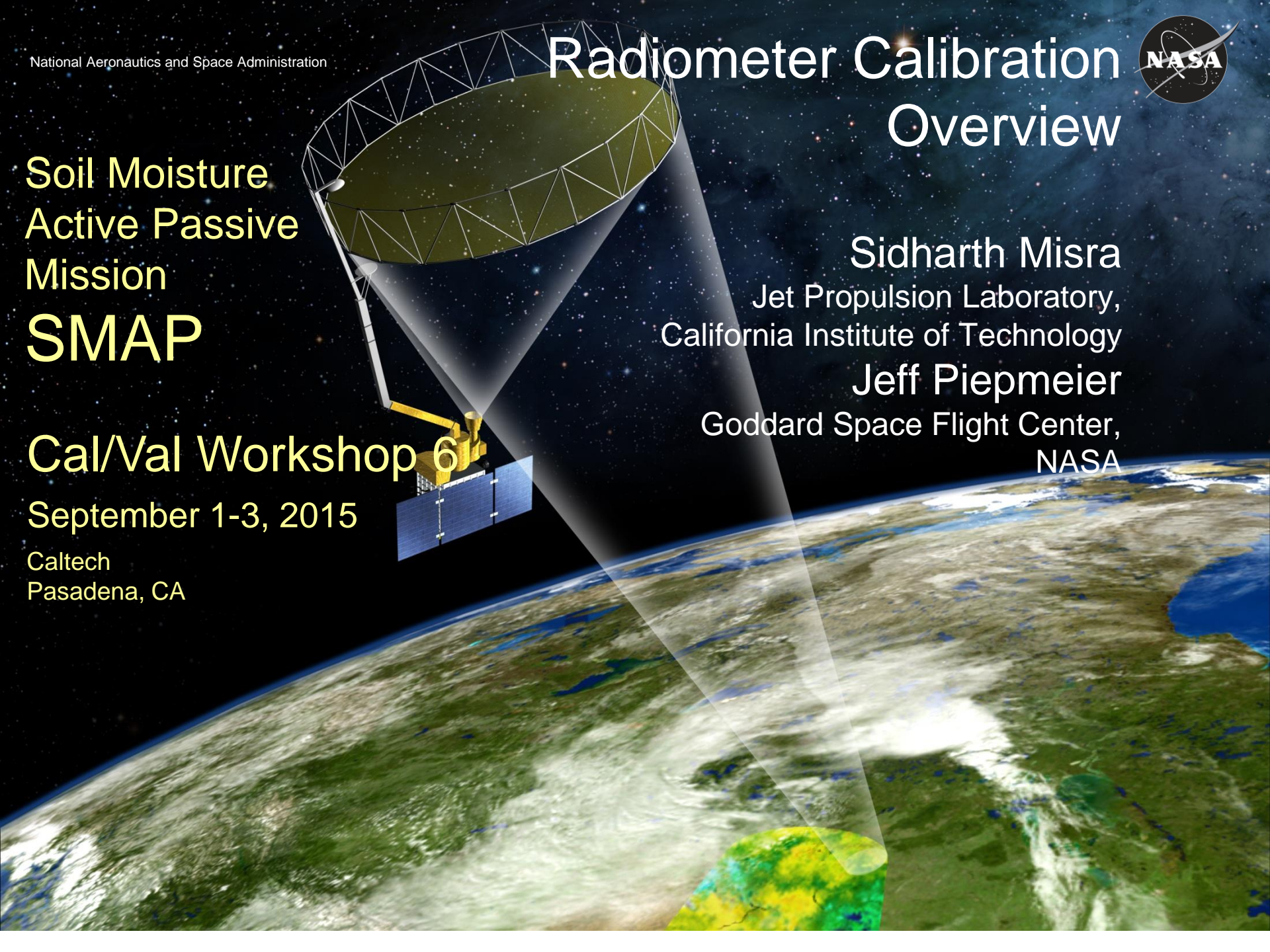## Soil Moisture Active Passive Mission
SMAP

Cal/Val Workshop 6

September 1-3, 2015

Caltech
Pasadena, CA

Sidharth Misra
Jet Propulsion Laboratory,
California Institute of Technology
Jeff Piepmeier
Goddard Space Flight Center,
NASA

SMAP Radiometer Beta-level Performance

- Beta-level Level 1 radiometer data from SMAP was available on the NASA NISIDC DAAC from 30th July 2015
- Beta-level calibration is of sufficient quality to enable reasonable soil moisture retrieval performance

| Parameter	Beta-level	Requirement
NEDT	1.1 K	< 1.6 K
Geolocation accuracy	2.7 km	< 4 km
Land SMAP/SMOS comparison (H pol)	–0.54 K	n/a
Land SMAP/SMOS comparison (V pol)	–0.96 K	n/a

Geolocation assessment
(Next talk – G. DeAmici)
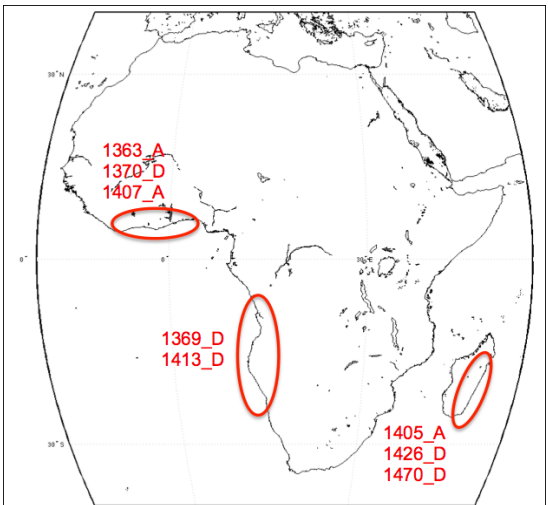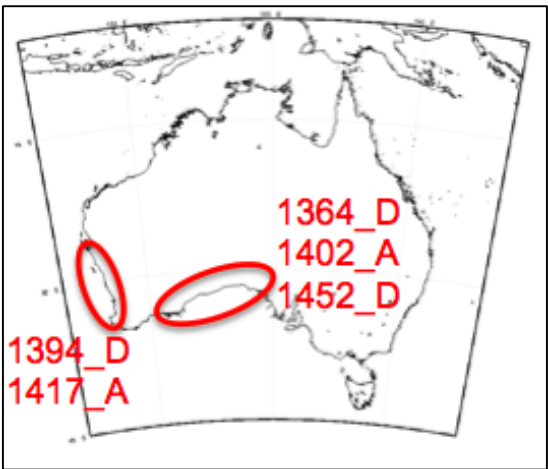
Coastline direction	Geographical Area	Orbit #	Coast Geolocation Error (km)	After Yaw Adjustment (km)
N-S	SW Africa	1369_D	2.55	2.77
	W Australia	1394_D	1.55	1.80
	Madagascar	1405_A	3.06	2.10
	SW Africa	1413_D	2.33	2.62
	W Australia	1417_A	2.03	1.75
	Madagascar	1426_D	2.18	1.57
	Madagascar	1470_D	3.48	3.10
E-W	W Africa	1363_A	3.05	2.96
	Australia	1364_D	3.09	2.13
	W Africa	1370_D	3.13	2.85
	Australia	1402_A	3.54	3.28
	W Africa	1407_A	2.75	2.37
	Australia	1452_D	2.67	2.49
Average			2.73	2.45

- Front end calibration mostly stable – Bake-out showed a calibration bias

Expected TA and TA Comparison
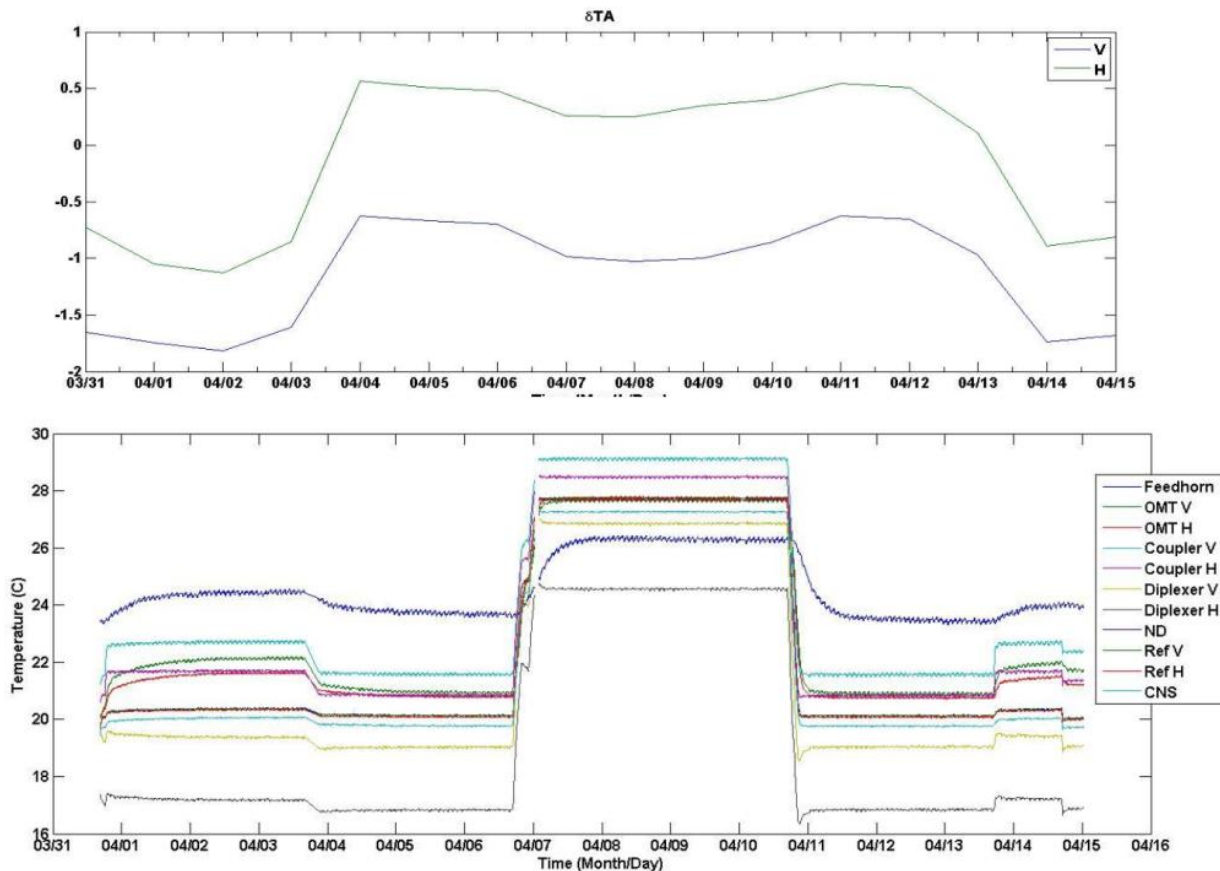
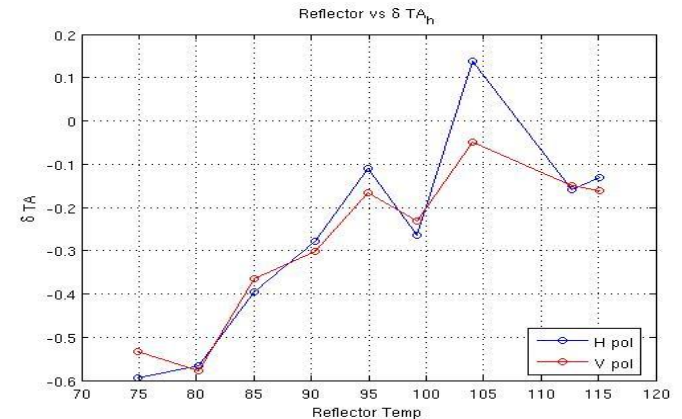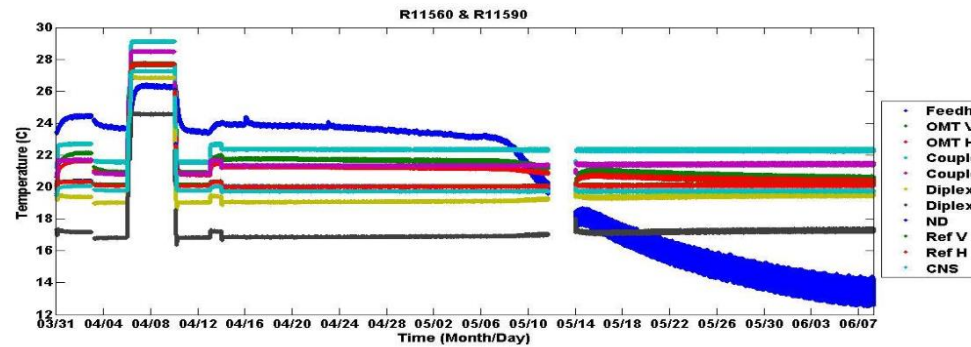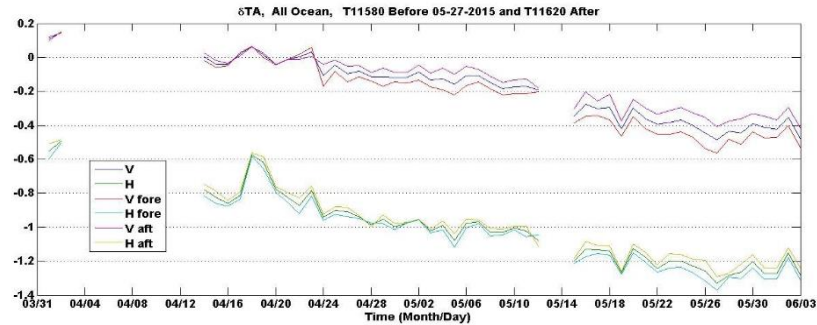- Another potential front-end issue is the emissive nature of front-end radome/reflector elements coupled with drift
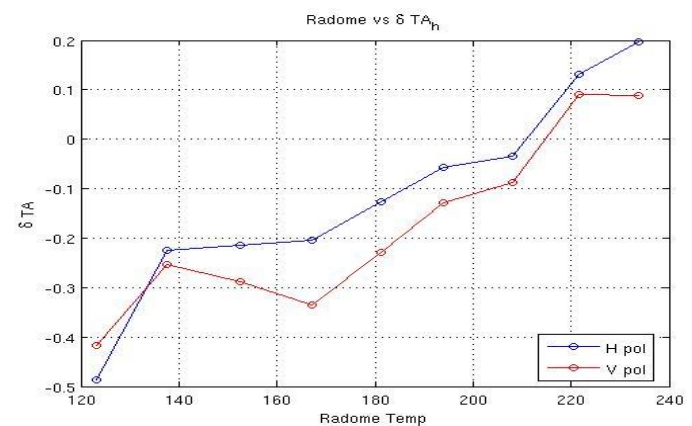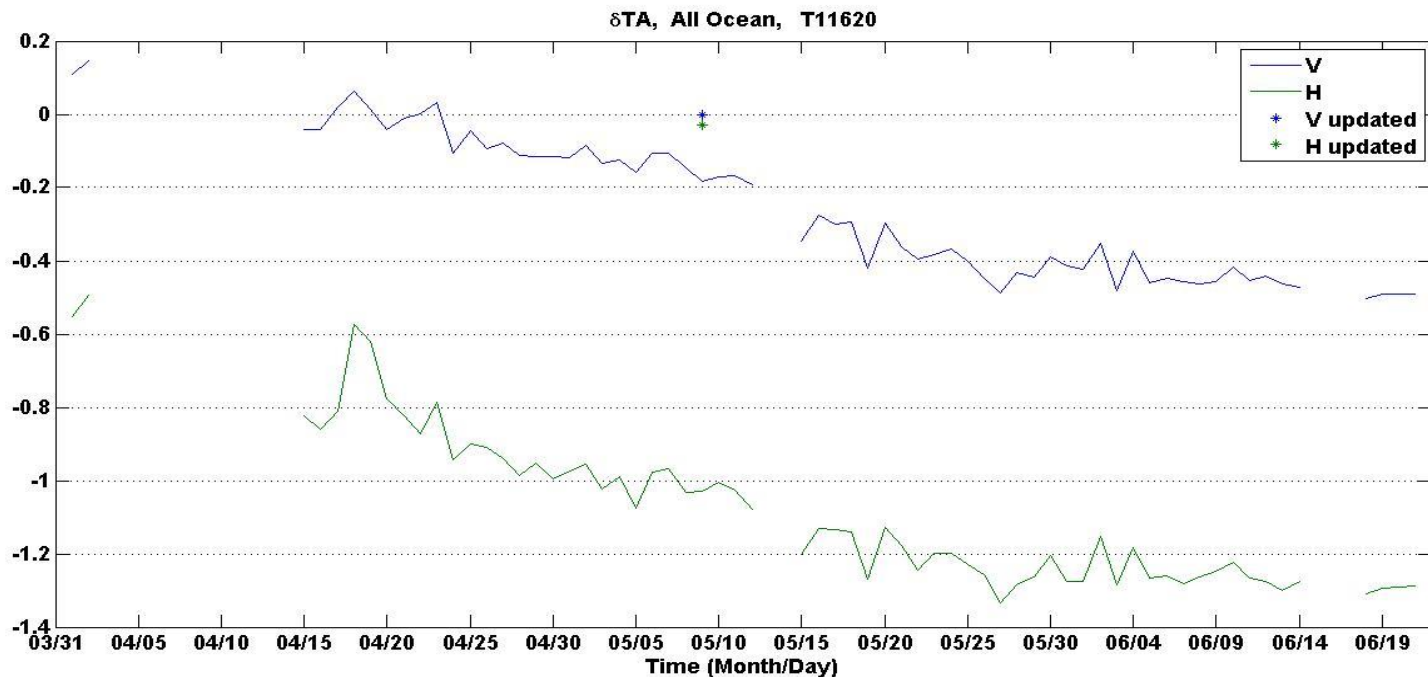
Drift calibration
(Talk by J.Peng)

- TA's drifting when compared to the ocean L-band GMF model
- Also a bias from initial correction
- Beta-release – Implements a time-varying Tnd to correct for drift
  - Aliased with front-end element drifts
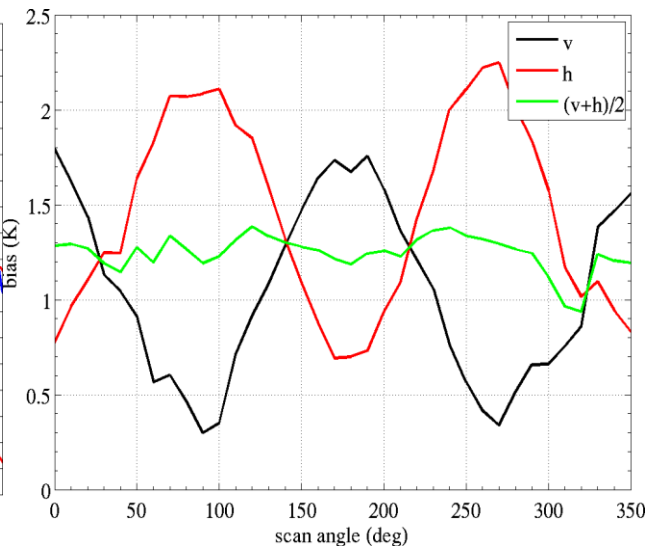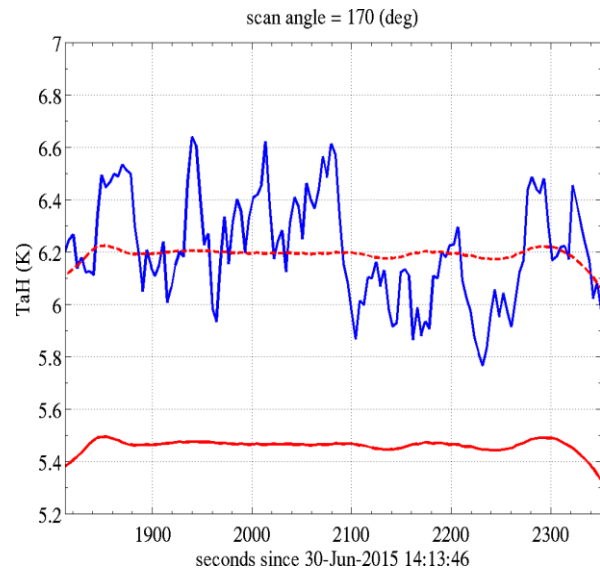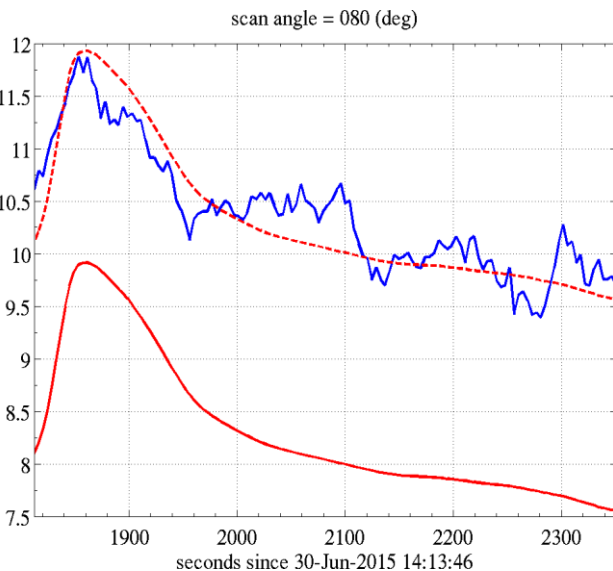 - Has minimal impact on land Tas.

Cold-sky Calibration
(Talk by E. Dinnat)

- Beta release – Three nominal CSC were performed: 04/23, 05/27, 06/30
- SMAP biased warmer than simulations 1.2K +/- 0.7K
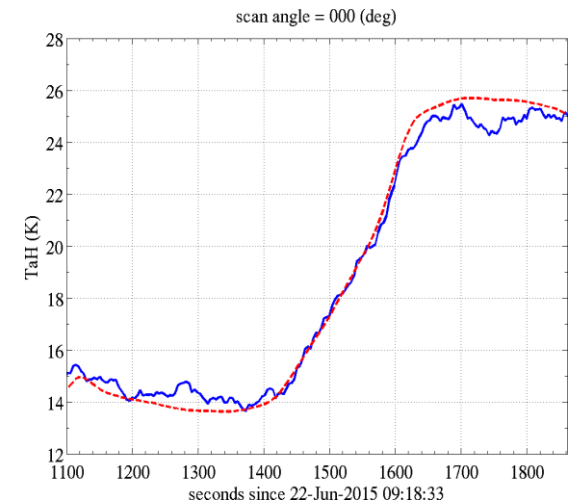- Bias stable between three CS maneuvers
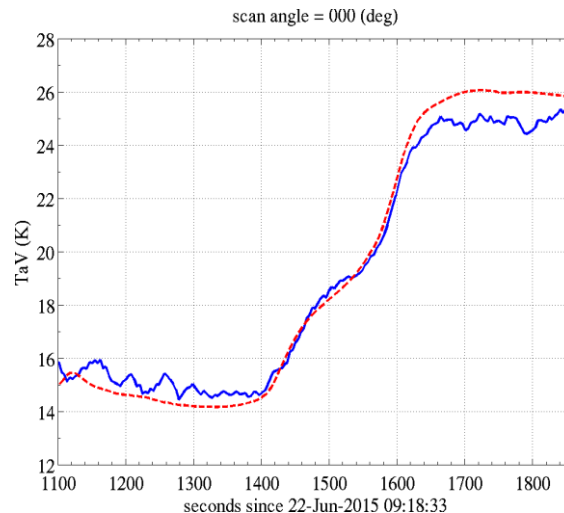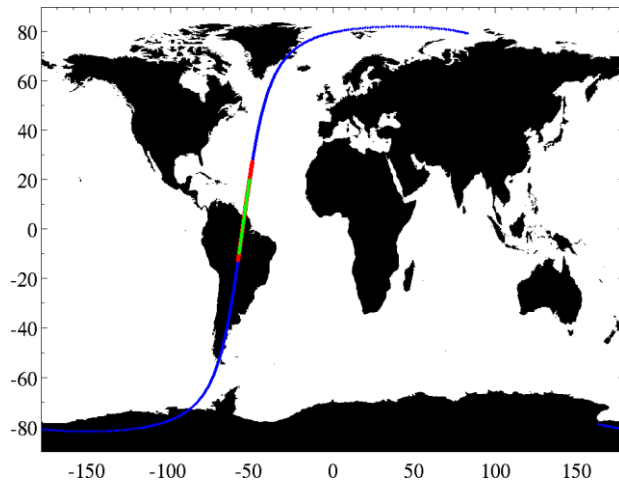- Scan dependent bias observed

Cold-sky Calibration
(Talk by E. Dinnat)

- Special CSC – Ocean/Land crossing to assess spillover correction
- Beta release – Does not include correction yet
    - Details will be presented in E. Dinnat's talk
- Good agreement between observation and model

L- band Inter-comparison
(Talk by R. Bindlish)

		RMSD (K)	R	Bias [SMAP-SMOS] (K)
H pol	Land	3.34	0.9708	−0.54
	Ocean	2.32	0.4991	−0.22
	Overall	2.61	0.9994	−0.30
V pol	Land	3.14	0.9746	−0.96
	Ocean	2.15	0.5505	0.16
	Overall	2.44	0.9995	−0.12

- SMAP/SMOS in good agreement over the full range.
- Aquarius
  - Comparisons over ice – 4.5K Vpol/2.5K H-pol
  - Comparisons over land – Smaller bias
  - Potentially due to different incidence angle, atmospheric correction, galactic correction
- Consolidating measurements from all three missions bigger than the beta-release or Cal/Val Phase I release.
- Intercal working group headed by D. Le Vine looking into the complexities of this issue
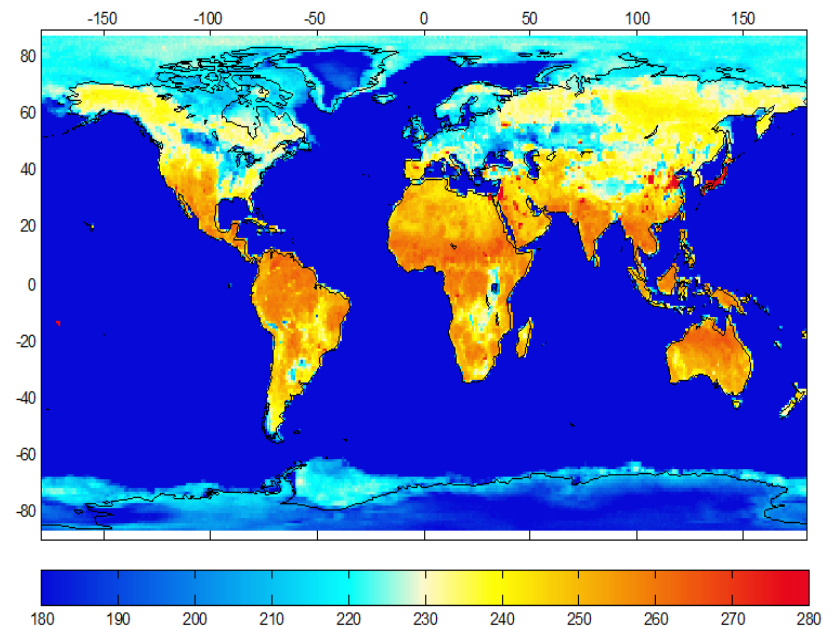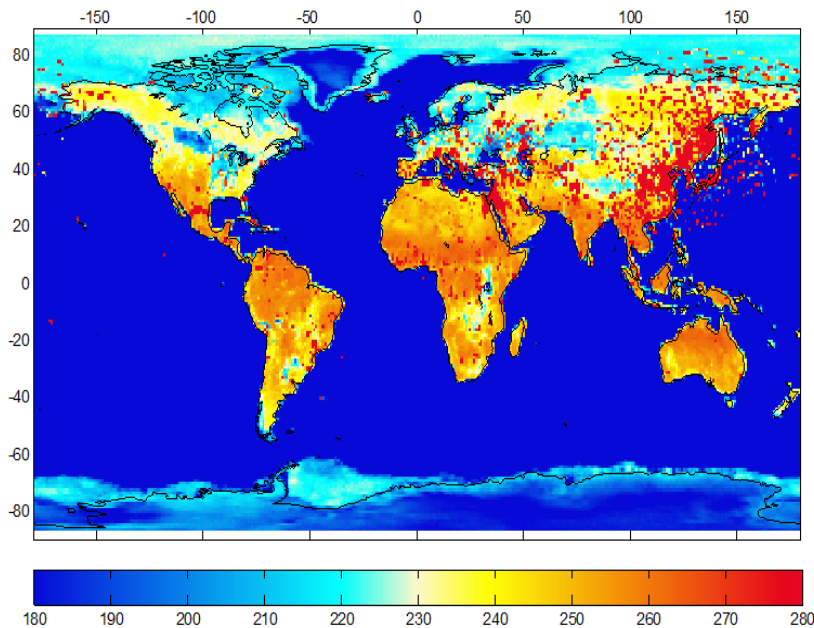
Reflected Galaxy Correction
(by G. DeAmici)
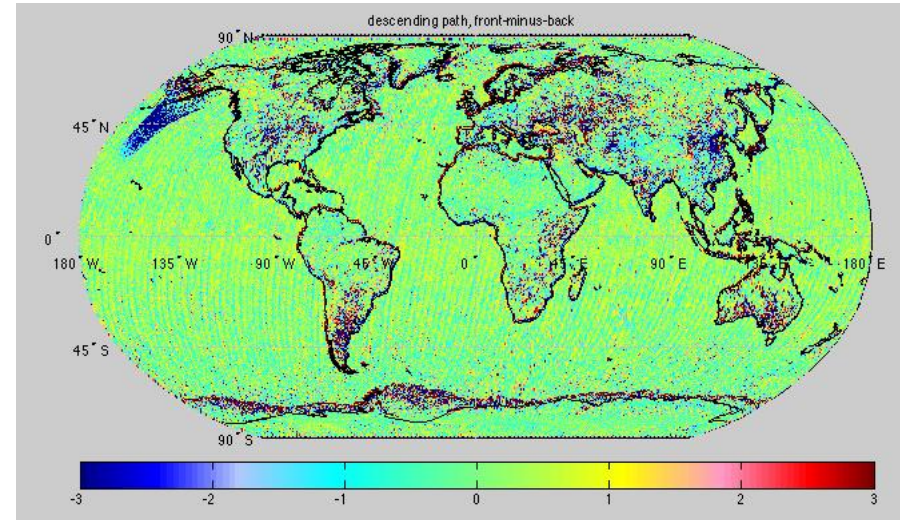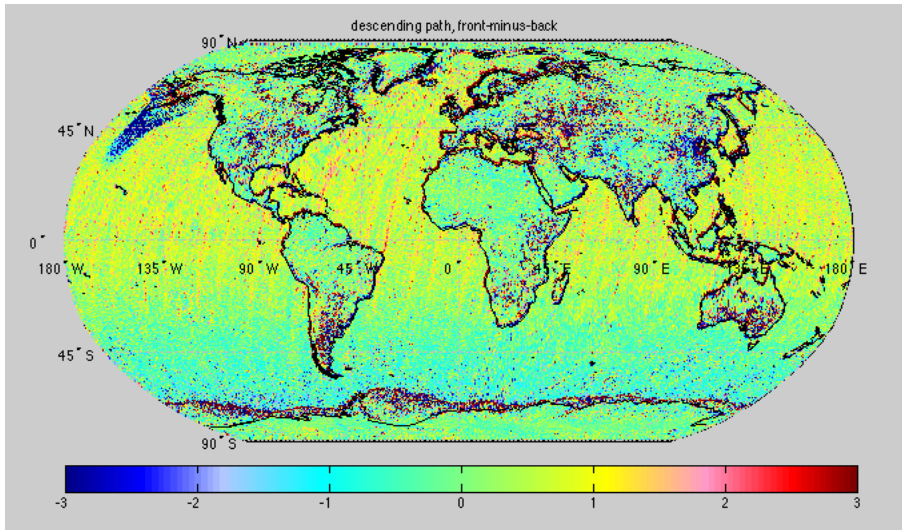
- Reflected galaxy correction works on the first order
- Model improvements are being considered
    - Introduce "real" asymmetric beam pattern
    - Account for surface roughness (e.g. wind-speed)
    - Account for scan angle
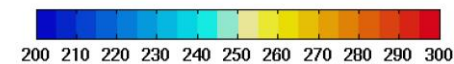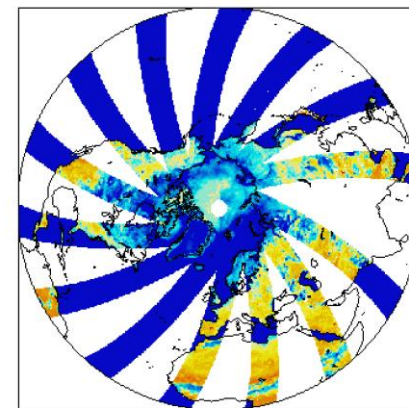
RFI assessment
## (talk by P.Mohammed)

- Max-PD 9 algorithm approach very successful in detecting and mitigating RFI
- East China/Japan still problematic (for other L-band sensors as well)
- Information from data still being analyzed to improve upon algorithms

- The L1C TB product is derived from the L1B TB product, which represents calibrated, geolocated, time-ordered TB observations acquired by the radiometer.
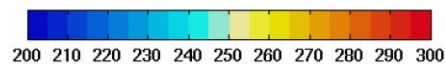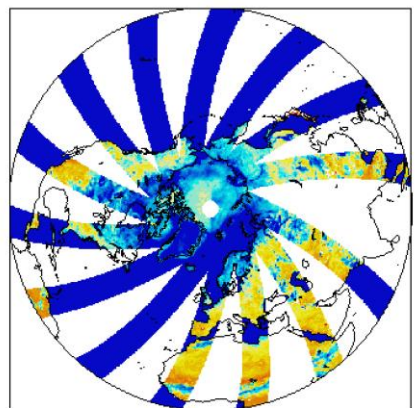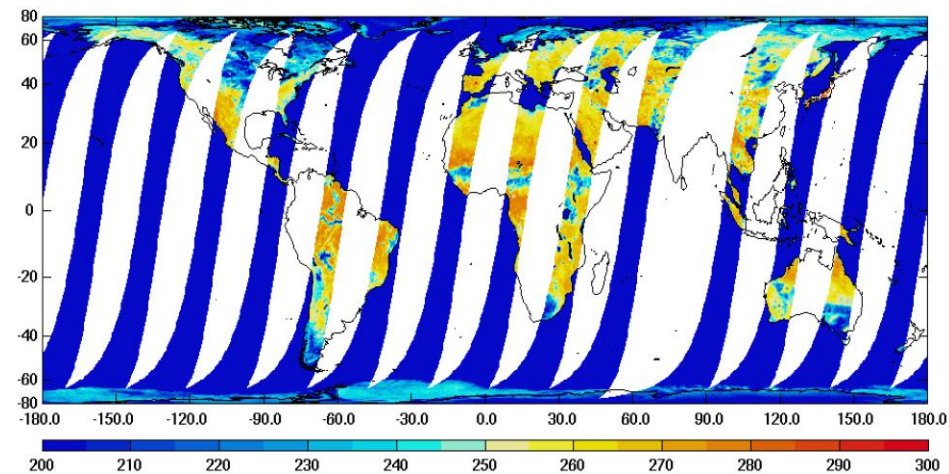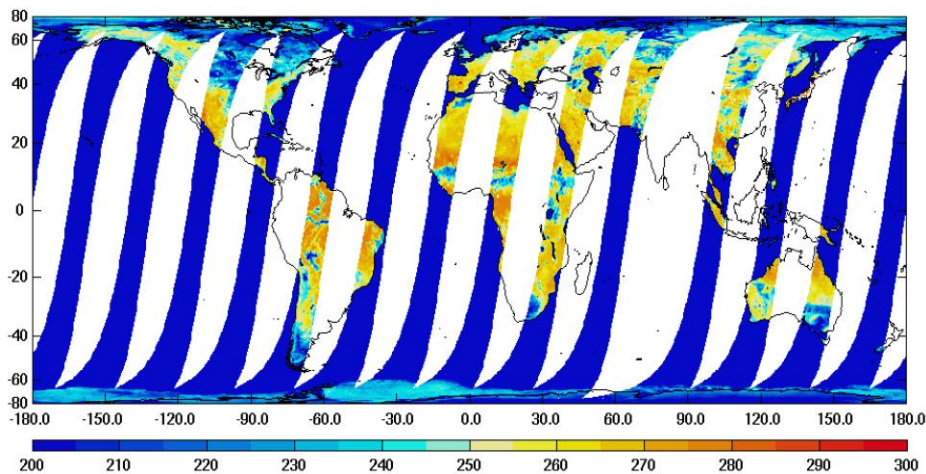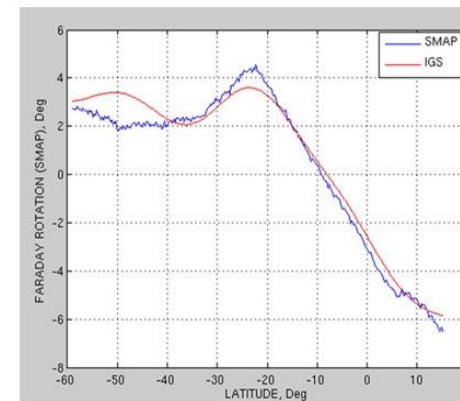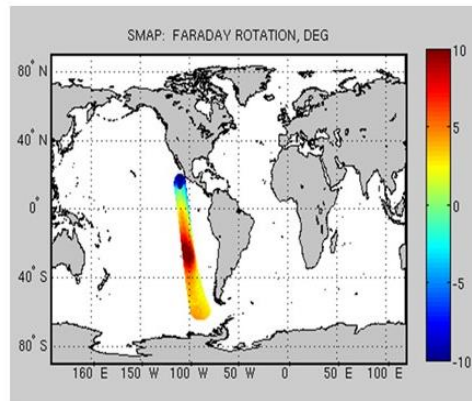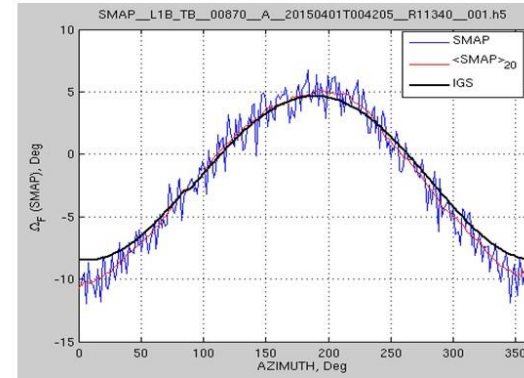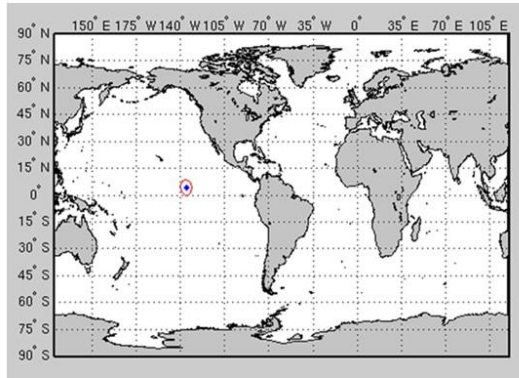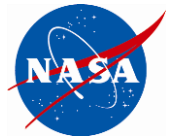
Backup

Faraday Rotation Correction
(by D. LeVine)

- Correction looks reasonable over ocean
- Land assessment undergoing

- Repeatable asymmetry in front/back bias
- Consistent between H,V,I components
- Cause probably not pointing error and is probably due to some antenna beam pattern asymmetry currently under study

Ta_h, ascending front-back, 1-to-10 april, T11340 orbit 870 to 1015, 0.25deg binning

min -569.4979   max 1278.9879