Intersatellite Calibration using GMI

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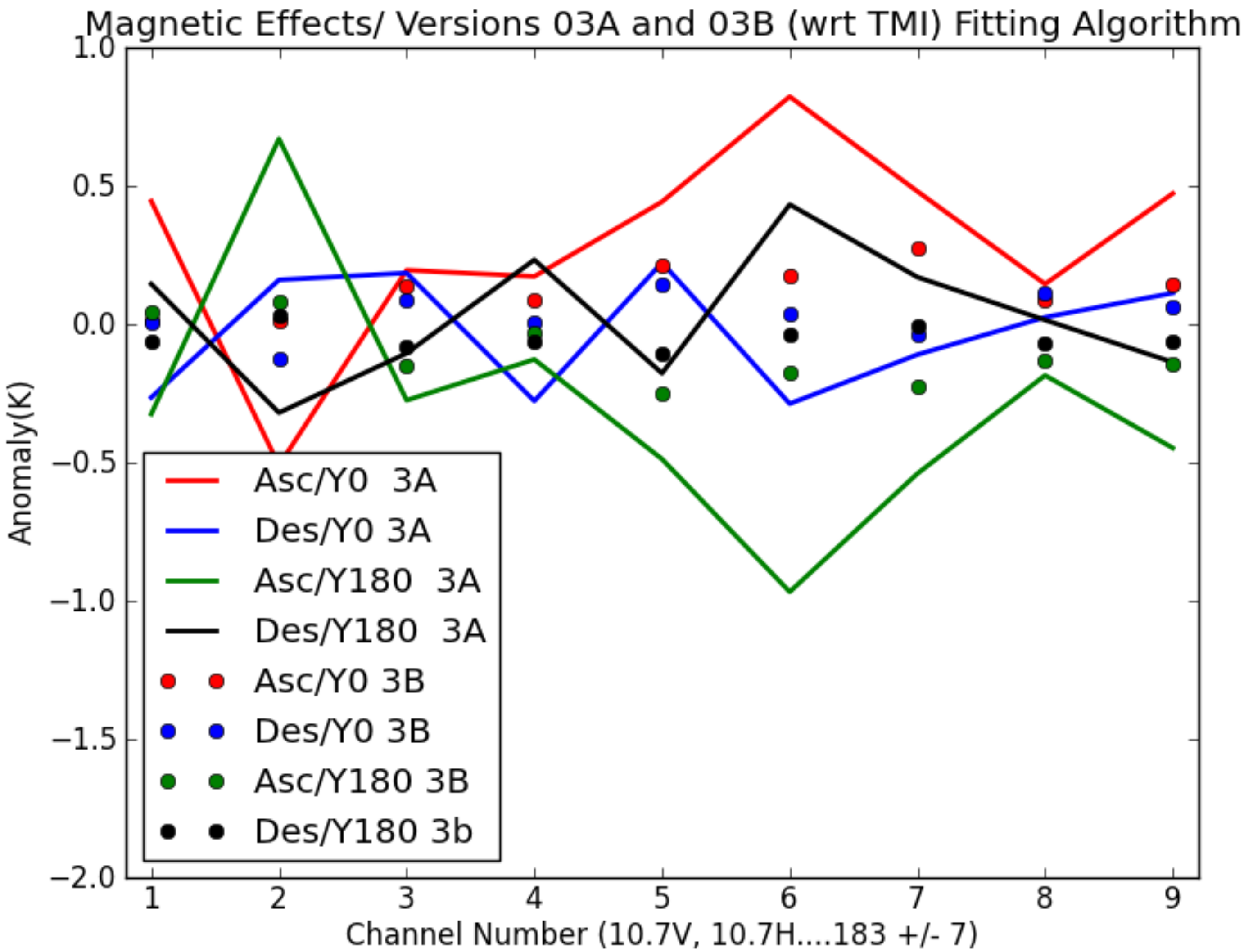
GMI Status

Frank Wentz (RSS) Reports that Pointing Error is < 0.1°

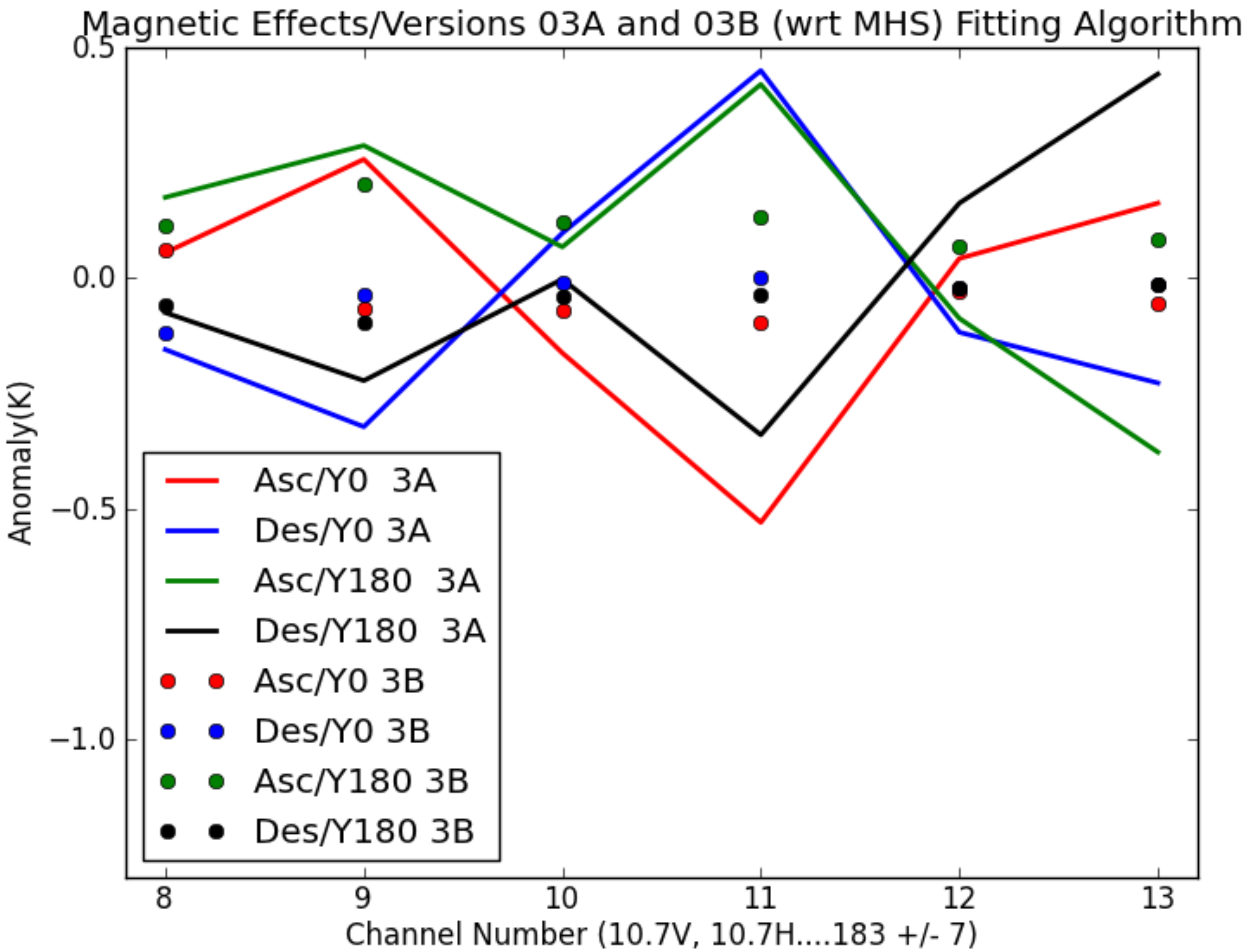
Errors due to Magnetic Fields Corrected to *ca*. 0.5K P-P or better

Scan Position Dependent Biases very Small (McKague Presentation)

We Now Have a Very Good Physically-Based Calibration



Magnetic Effects/ Versions 03A and 03B (wrt TMI) Fitting Algorithm
Anomaly(K)
Channel Number (10.7V, 10.7H....183 +/- 7)
Asc/Y0 3A
Des/Y0 3A
Asc/Y180 3A
Des/Y180 3A
Asc/Y0 3B
Des/Y0 3B
Asc/Y180 3B
Des/Y180 3b
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
1
2
3
4
5
6
7
8
9



Magnetic Effects/Versions 03A and 03B (wrt MHS) Fitting Algorithm
0.5
0.0
−0.5
−1.0
Anomaly(K)
8
9
10
11
12
13
Channel Number (10.7V, 10.7H....183 +/- 7)
Asc/Y0 3A
Des/Y0 3A
Asc/Y180 3A
Des/Y180 3A
Asc/Y0 3B
Des/Y0 3B
Asc/Y180 3B
Des/Y180 3B

GMI Calibration

This time last year, GMI calibration was not consistent with radiometers considered reliable nor with model calculations.

We had a series of on-orbit S/C Attitude Maneuvers for Calibration.

Many thanks to Gail for support and to operations for implementation

Biggest Calibration Uncertainty is the Antenna Pattern Correction

Fraction of the pattern that misses the Earth (1-η)

At Launch: Based on Antenna Pattern Models—*Not Observations*

At-Launch No APC for 166 and 183 GHz channels

Observational Constraints from Calibration Maneuvers

Antenna Emissivity Negligible

Analyzed by Spencer Farrar of UCF

Relative Calibration of H&V Good

ca. 0.3K over ocean and 0.2K over land

Analyzed by Spencer Farrar of UCF

Earth Filling Spillover Region

Direct Physical Measurement of η (mostly)

Analyzed by David Draper of Ball

These Observations result in a Physically-Based Calibration

NOT TUNED TO ANY MODEL

Comparisons with Windsat
Double Differences (G-W) (Kelvins)

	10V	10H	18V	18H	23V	37V	37H	RMS
V03B	2.84	1.54	2.73	0.03	-0.00	-1.52	-1.56	1.80
New	1.14	0.57	-0.55	-1.92	-1.06	-1.40	-1.48	1.25

The Calibration errors of the two instruments are entirely independent

If GMI were recalibrated to match Windsat, The Spencer Farrar's Polarization Difference Observations over land would be satisfied at 10 GHz but not at 18 (*ca*. 3.5K) nor 37 (*ca.* 0.9K)

Thus GMI Calibration at these channels is likely better than Windsat.

If the 1.25 RMS error comes equally from both instruments an accuracy of 0.9K is implied.

Comparisons with MetOpB
Double Differences (G-M) (Kelvins)

	89V	89H	166V	166H	±3	±7	RMS
V03B	0.07	1.07	-3.21	-2.96	**-2.18**	**-2.51**	2.28
New	-0.22	1.04	-0.10	0.18	**0.30**	**-0.34**	0.48

Some of these differences result from calibrating two polarizations from one changing polarization.

Going the Other Way (M-G)

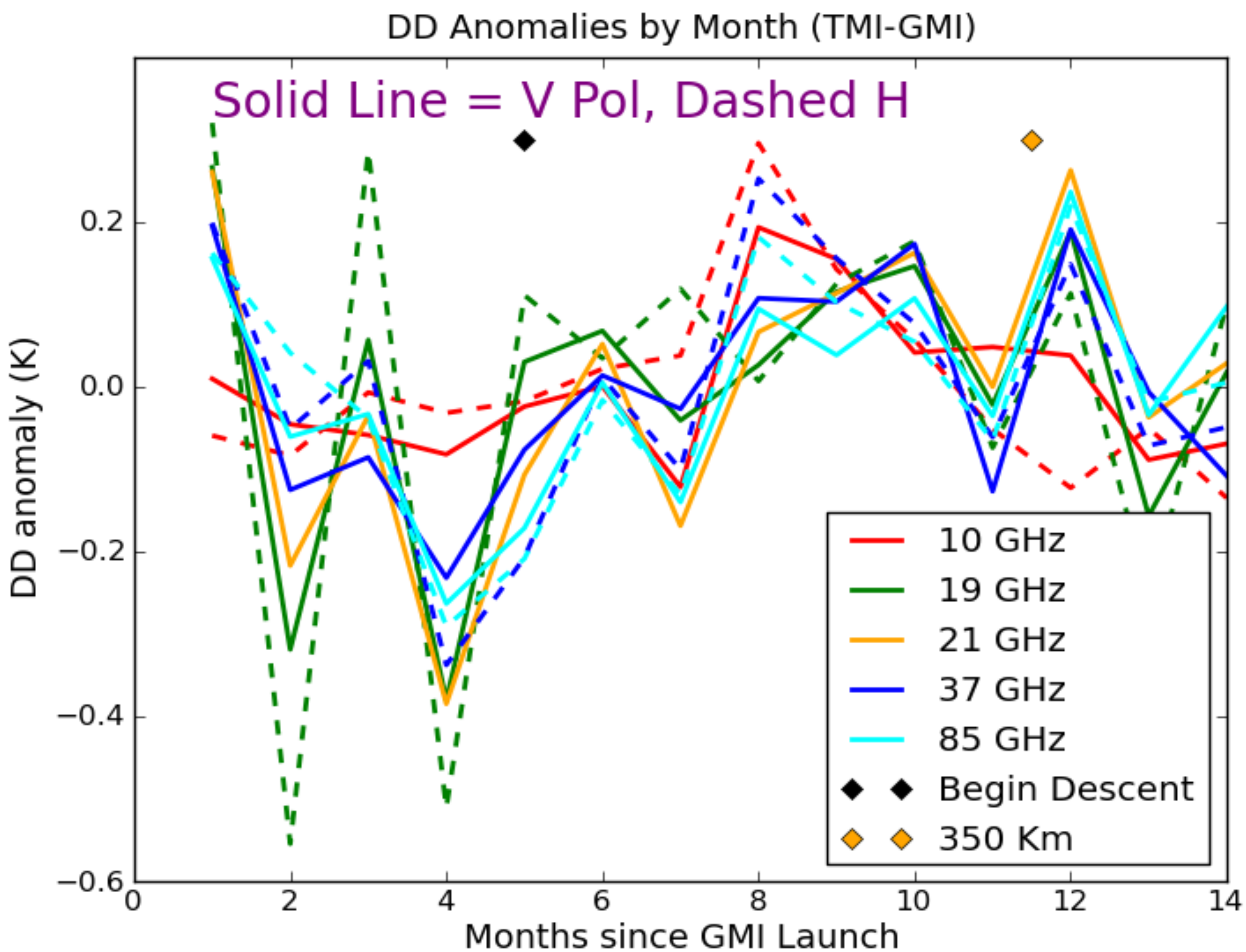
89	157	±1	±3	190.	RMS
0.38	**-0.47**	0.05	**-0.35**	**0.22**	0.33

V03B has no APC for 166 and 183GHz—very unphysical

MetOpB and GMI have entirely independent calibrations so these channels are likely accurately calibrated to better than the 0.5K level.
MHS has a very clean design from a calibration point-of-view.

TMI – GMI (new calibration) TAMU "Improved" Fit

	10V	10H	19V	19H	23V	37V	37H	85V	85H
DDs	-2.29	-1.97	0.42	-0.25	-0.49	-1.86	-1.00	-1.04	-1.29
@	172.	91.	208.	147.	234.	220.	163.	269.	245.



Conclusions

GMI Calibration good to about the 0.9K level for the 10-37 GHz channels and better than 0.5K for the higher frequencies

GMI and Constellation Recalibrated To TMI Basis for Current Production

Constellation Will be Calibrated to New GMI Calibration for September Reprocessing.
Details in Posters

Last 14 Months of TMI look stable in spite of changing altitude.
Very Nice Overlap with GMI *(See UCF & TAMU Posters for more on TMI)*