Radiometer pointing accuracy assessment

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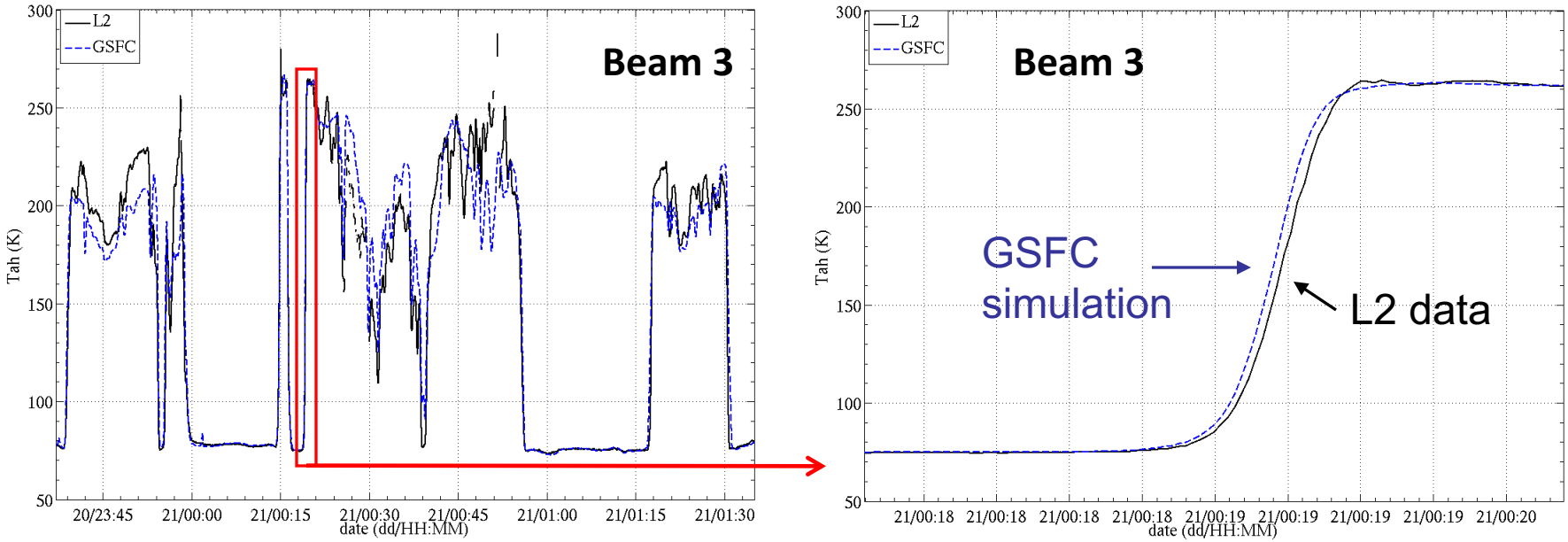
Method: assess Ta at land/ocean transitions



Good agreement of model/data at full land and full ocean locations **<u>for that example</u>**

⇒There should be small impact of model uncertainty on relative levels during transitions

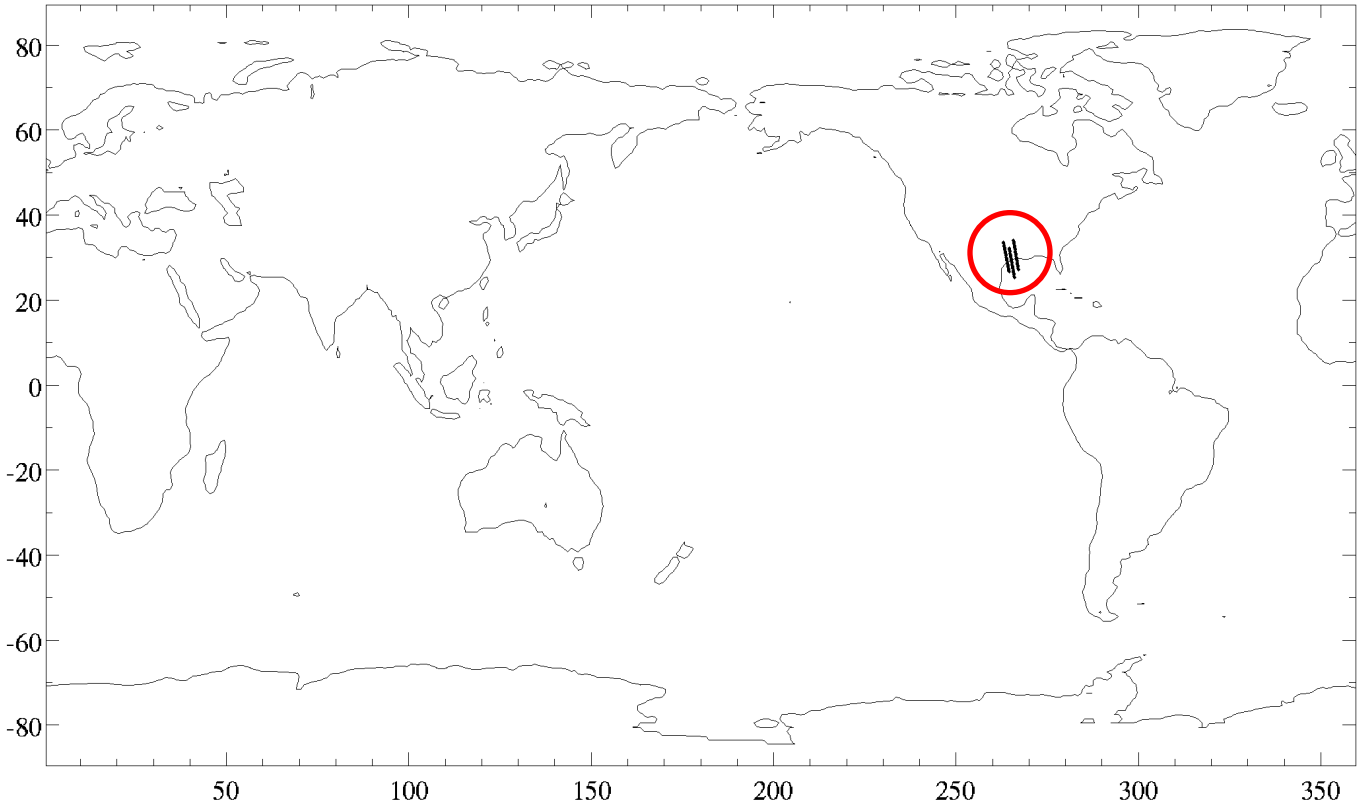
⇒'Shift' in front location due to pointing error?

⇒Shift of about 1.5 sample (~ 2 sec. ~ 15 km) between model & data

15 km difference due to uncertainty in land/sea mask for model ?

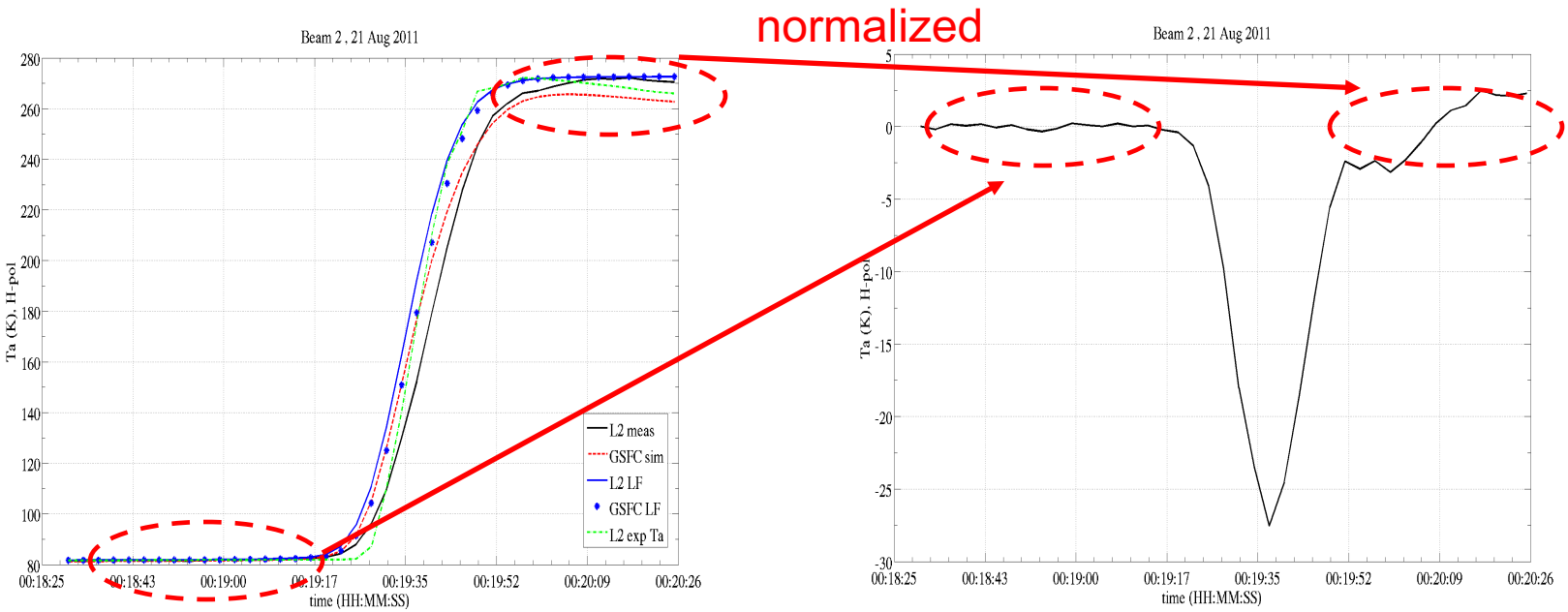
Results: case study #1

Orbit on 21 Aug 2011 – 00:18:25 UTC to 00:20:25 UTC



Transition from ocean to land – ascending orbit

Method: simulate pointing error, search for ‘minimum difference’

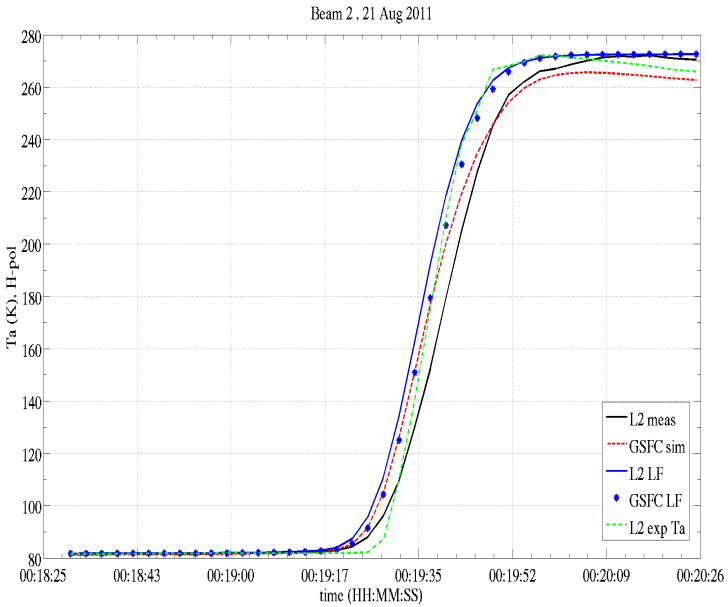


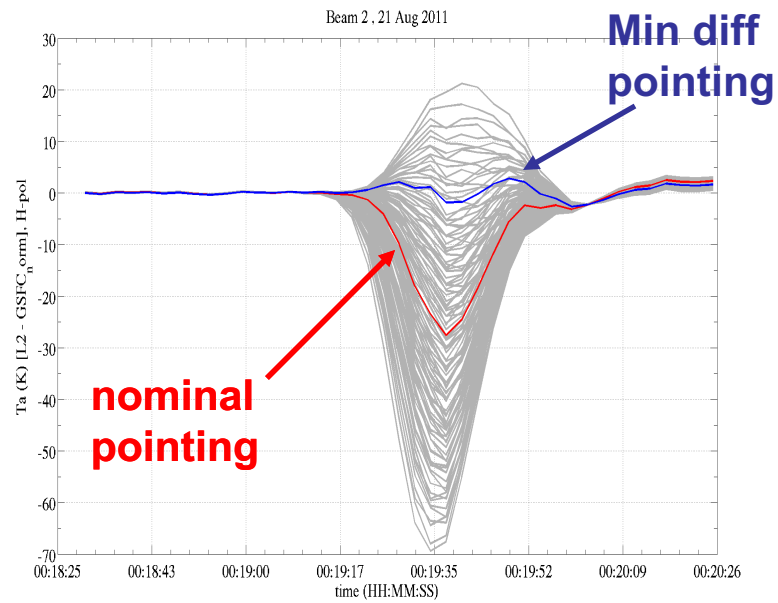
- Land fraction: GSFC (blue dots) very similar to L2–computed (blue curve) [scaled]
- GSFC Ta at front (red-dash) in good agreement with land fractions
- L2 ‘expected Ta’ (green) not a good metric at transition, computation do not integrate the mixed scene

- Ta GSFC is scaled to match L2 at full land and full ocean
- Difference Ta [L2 – GSFC_scaled] is large over the front (**-28 K**) because of position discrepancy

=> Introduce pointing error in GSFC simulation to find minimum difference over front

Method: simulate pointing error, search for ‘minimum difference’





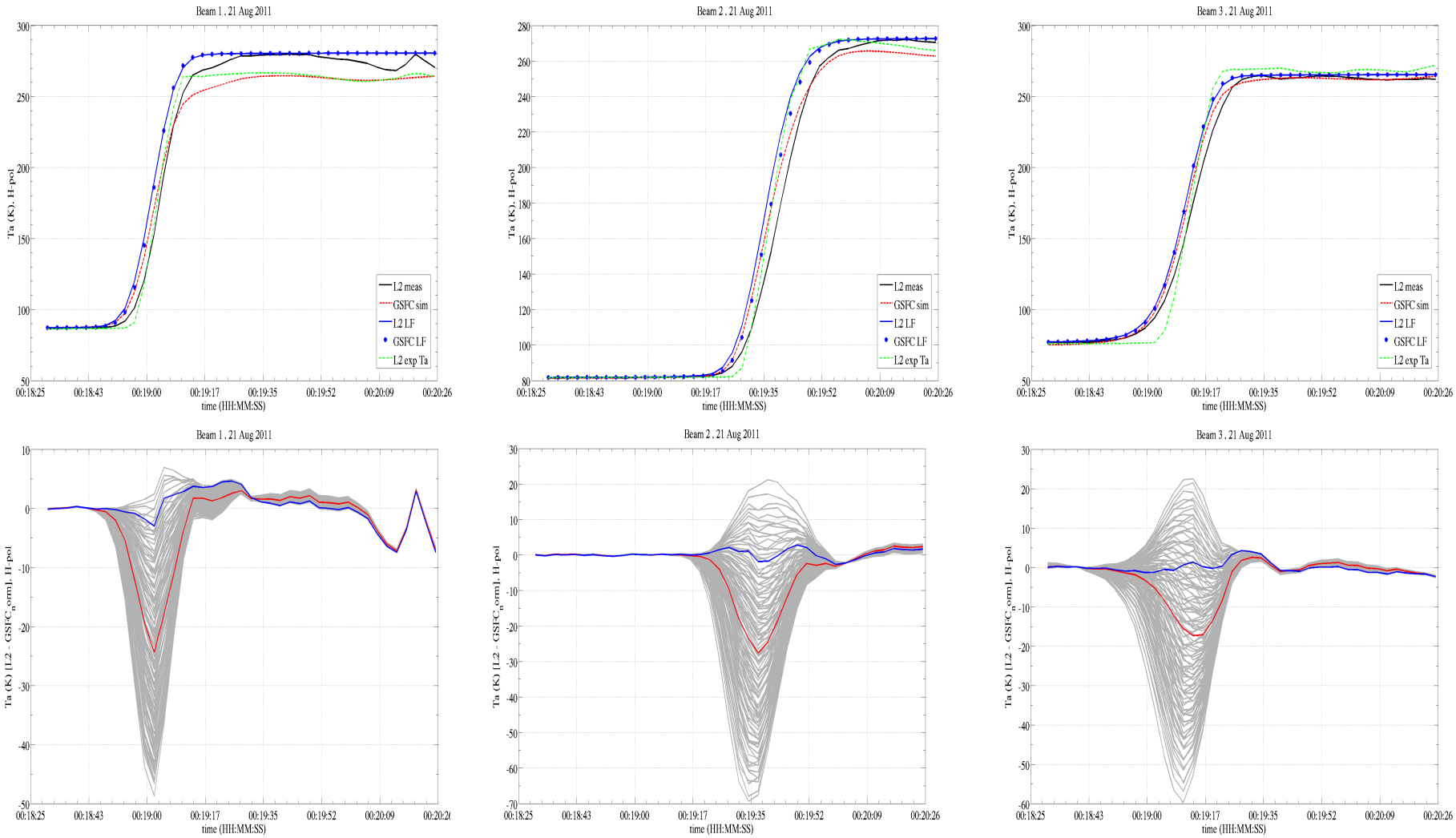
Pointing errors introduced:

look angle (off nadir): -1.5° → +1.5°, steps 0.3°

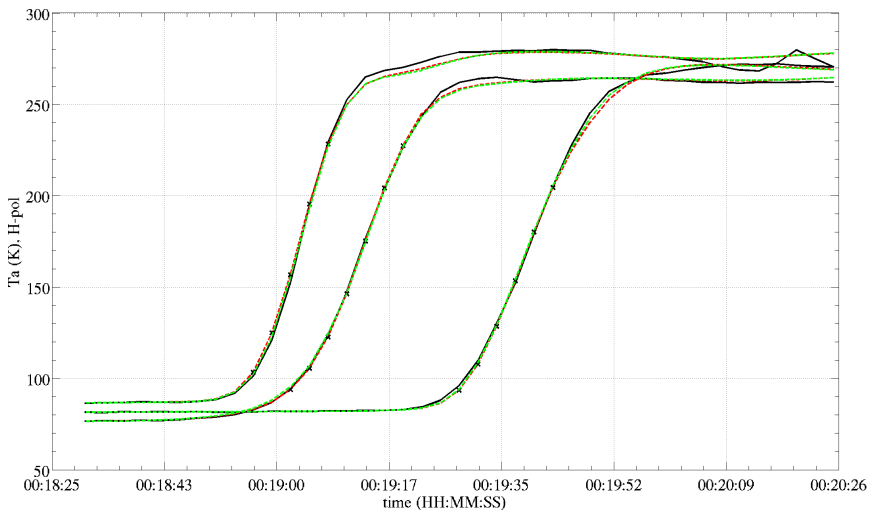
azimuth angle: -2° → +2°, steps 0.4°

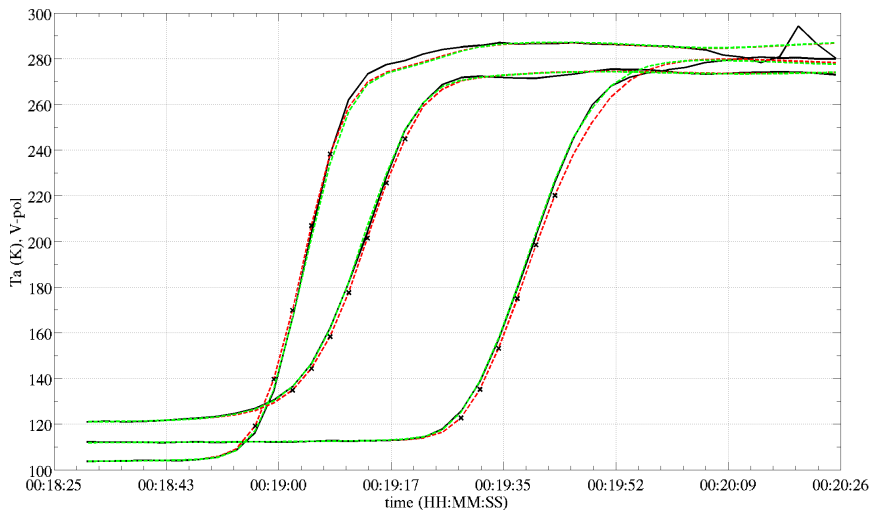
Mean absolute difference L2 – GSFC_scaled computed for a few points over the front, search for minimum of squared mean error at V- and H-pol

Results: all beams for case #1



Results: all beams, both polarizations





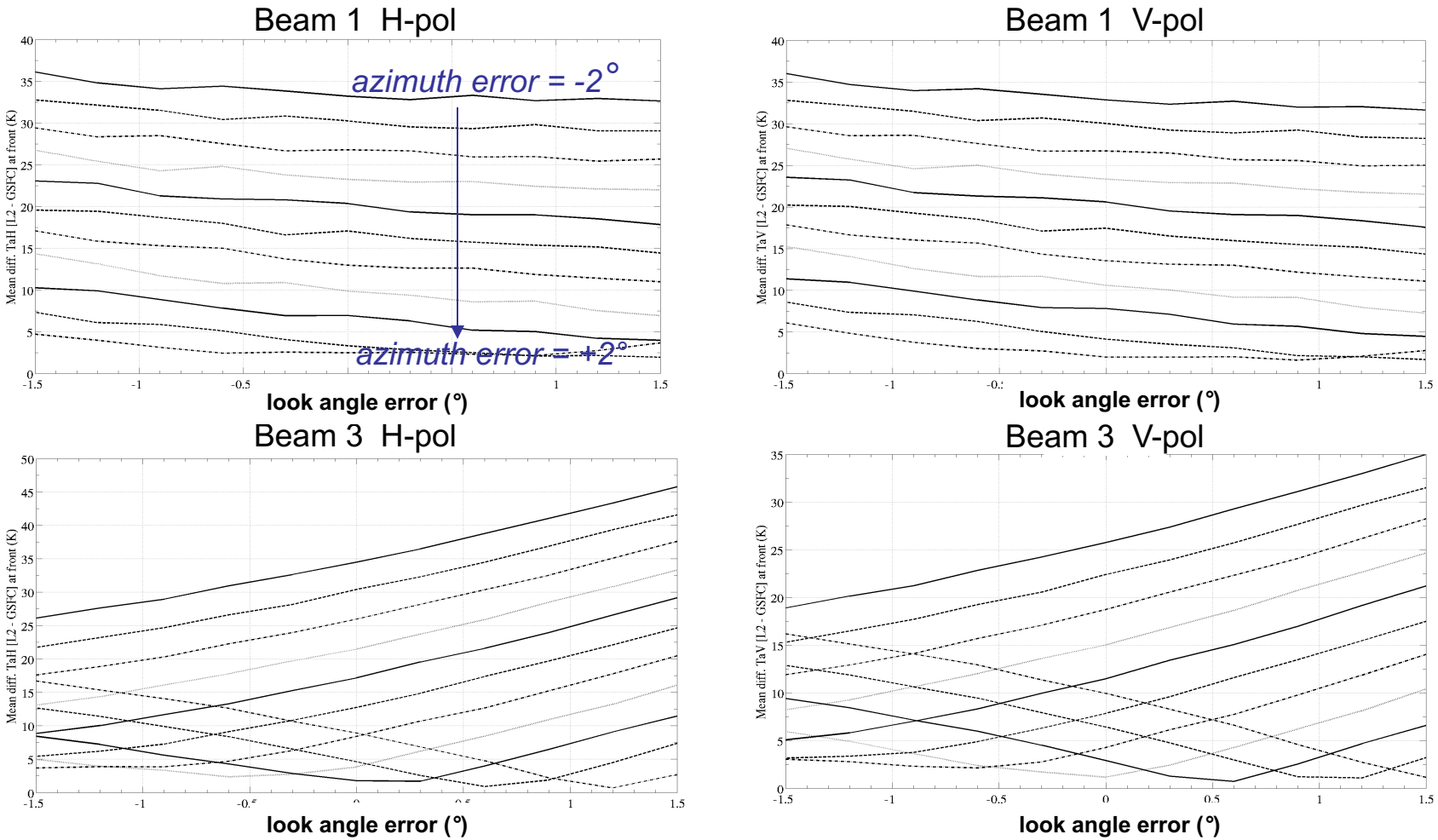
Pointing error computed per beam and per polarization (green curve) gives slightly better results than computation for all beams/all polarizations (red curve).

Results: the ugly truth

	beam 1 H-pol/V-pol	beam 2 H-pol/V-pol	beam 3 H-pol/V-pol	All Beams both pol
Min error (K)	1.94/1.61	1.34/0.63	0.69/0.72	2.21
Look angle error (°)	1.5/0.9	0.9/1.2	1.2/0.6	0.6
Azimuth angle error (°)	1.6/2.0	0.8/-0.4	2.0/1.2	1.6

Results are not consistent from beam to beam and across polarizations

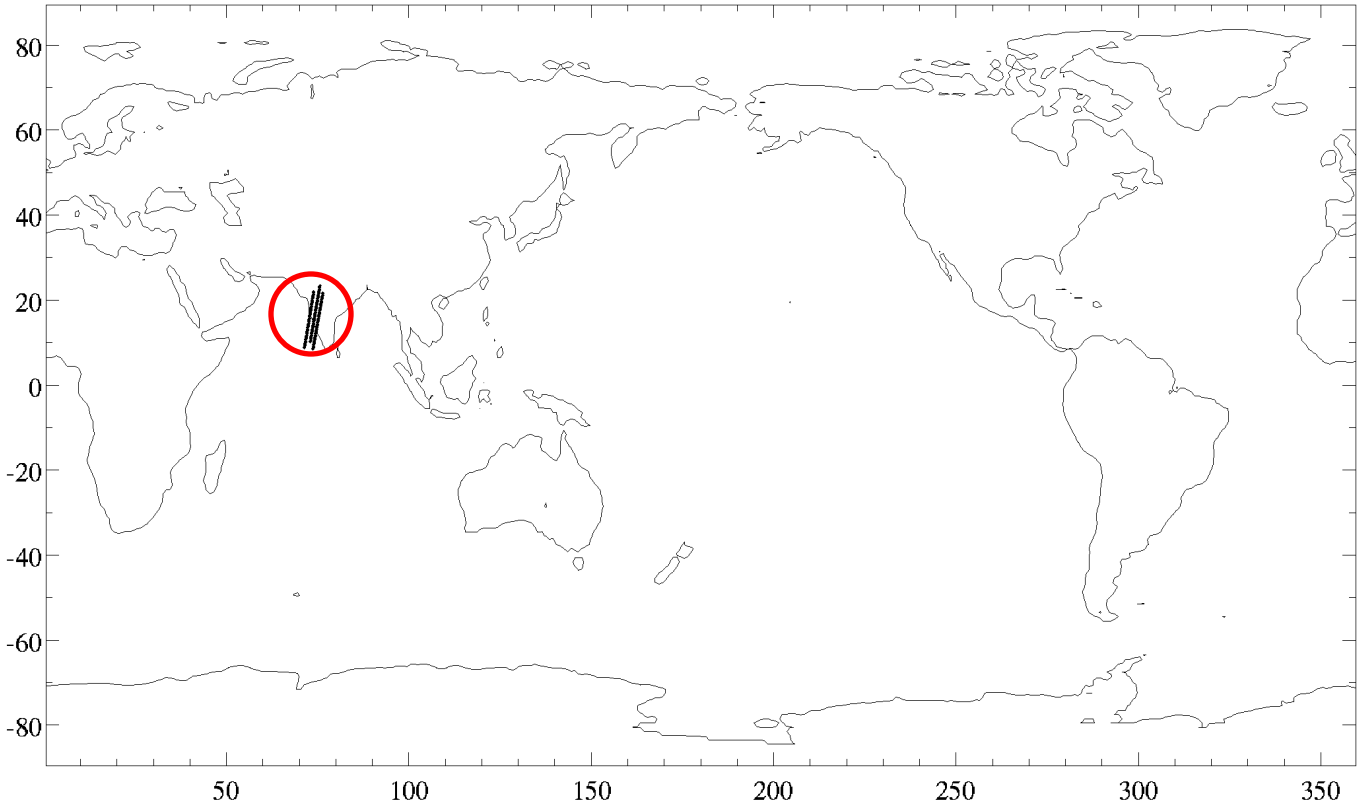
Results: ‘mapping’ of the error



Look angle relatively poorly constrained
negative azimuth error very unlikely for beam 1 & 3

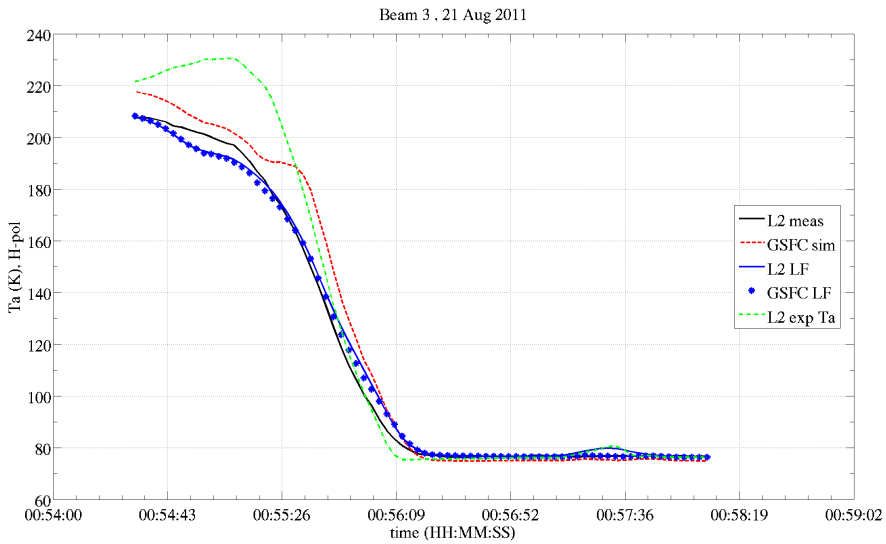
Results: case study #2

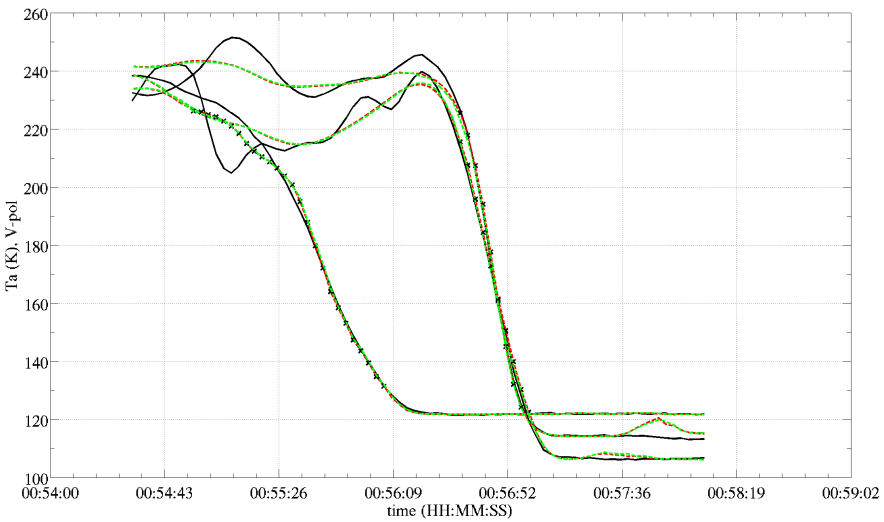
Orbit on 21 Aug 2011 – 00:54:00 UTC to 00:58:00 UTC



Transition from land to ocean – descending orbit

Results: all beams for case #2





In that case, the model does poor at simulating land Ta (more than a constant bias issue)
=> Comparison model/data to locate the front are less accurate

Results: both cases

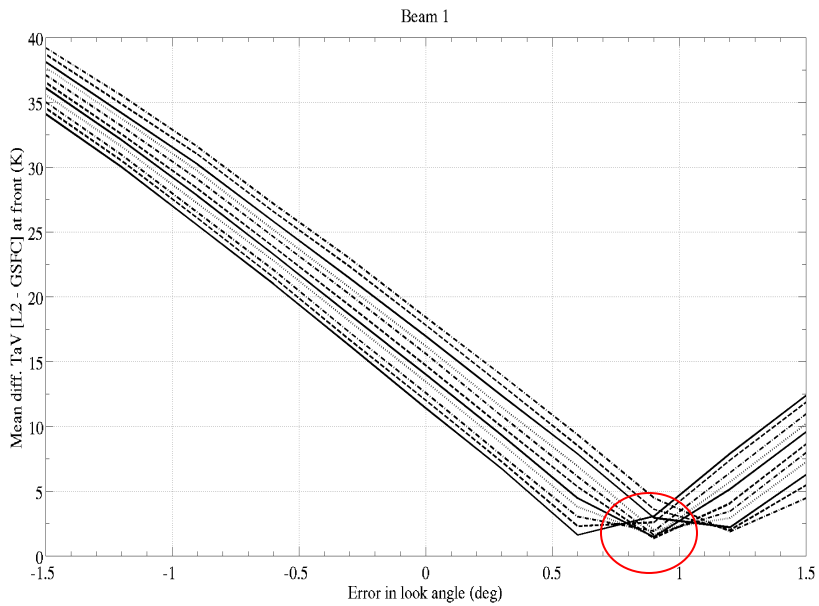
Case 1

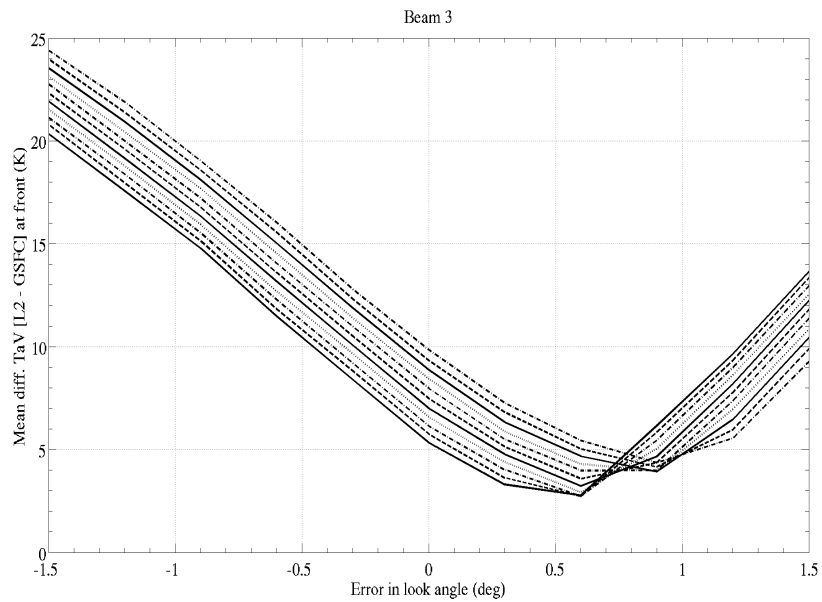
	beam 1 H-pol/V-pol	beam 2 H-pol/V-pol	beam 3 H-pol/V-pol	All Beams both pol
Min error (K)	1.94/1.61	1.34/0.63	0.69/0.72	2.21
Look angle error (°)	1.5/0.9	0.9/1.2	1.2/0.6	0.6
Azimuth angle error (°)	1.6/2.0	0.8/-0.4	2.0/1.2	1.6

Case 2

	beam 1 H-pol/V-pol	beam 2 H-pol/V-pol	beam 3 H-pol/V-po	All Beams both pol
Min error (K)	0.69/1.36	1.61/1.26	4.50/2.72	2.07
Look angle error (°)	0.6/0.9	0.6/0.9	0.6/0.6	0.6
Azimuth angle error (°)	-2.0/0.0	-1.6/-1.2	-2.0/-1.2	-1.6

Results: ‘mapping’ of the error for case #2





Minimum error was found for azimuth = 0°,
But results for other azimuths are very close

The results for beam 3 being never close to 0 illustrate that the comparisons need to account for model inaccuracies

Conclusion:
Can the inclusion of more fronts with different geometry coastline vs FOV better constrain solution and improve consistency?