



# Results from IASI Radiance Monitoring during Recovery from EQSOL in 12/2008

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# Contents

- IASI Radiance Monitoring at EUMETSAT
- HIRS-IASI Inter-Calibration
- Conclusions



# Radiance monitoring (RM-NWP) setup at EUMETSAT

**ECMWF 6-hour forecast**  
91 lev (80km), 55km  
T,WV,O3

SST and  
cloud cover  
from AVHRR L1B

IASI L1C  
spectra  
all channels

co-location:  
nearest neighbour,  
Forecast +/- 1h,  
sea at night only

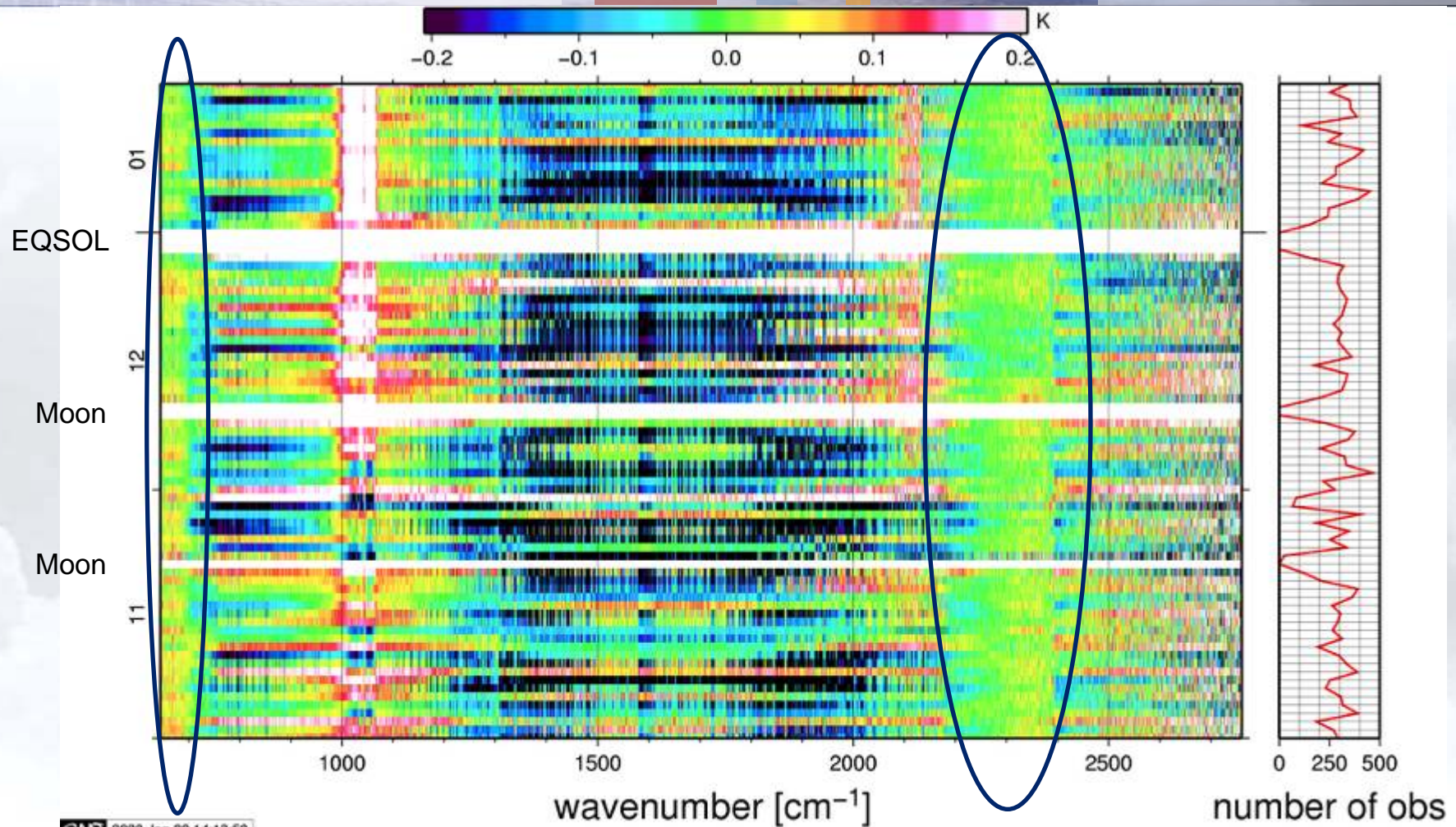
All AVHRR clear and  
99% in one cluster

**RTIASI 4**  
based on GENLN2  
HITRAN2000

OBS – CALC  
Radiance bias



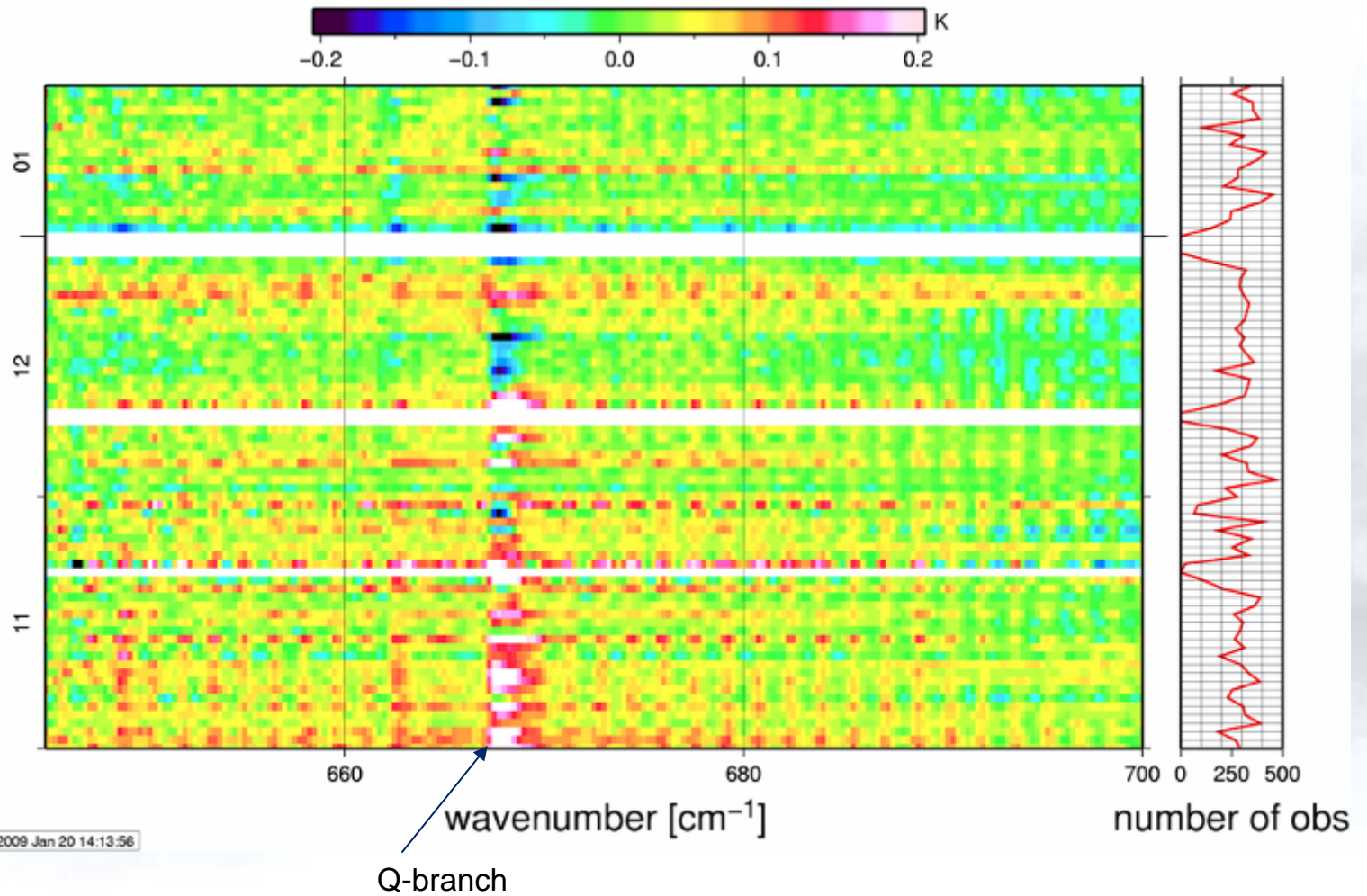
# Results from Obs-Cal NWP and AVHRR based radiance monitoring: Radiance Anomaly (Daily Bias - Annual Bias) in BRT at 280K reference temperature



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55°S - 60°N Clear Sky Nighttime data only, Views 11-19, all iFoVs

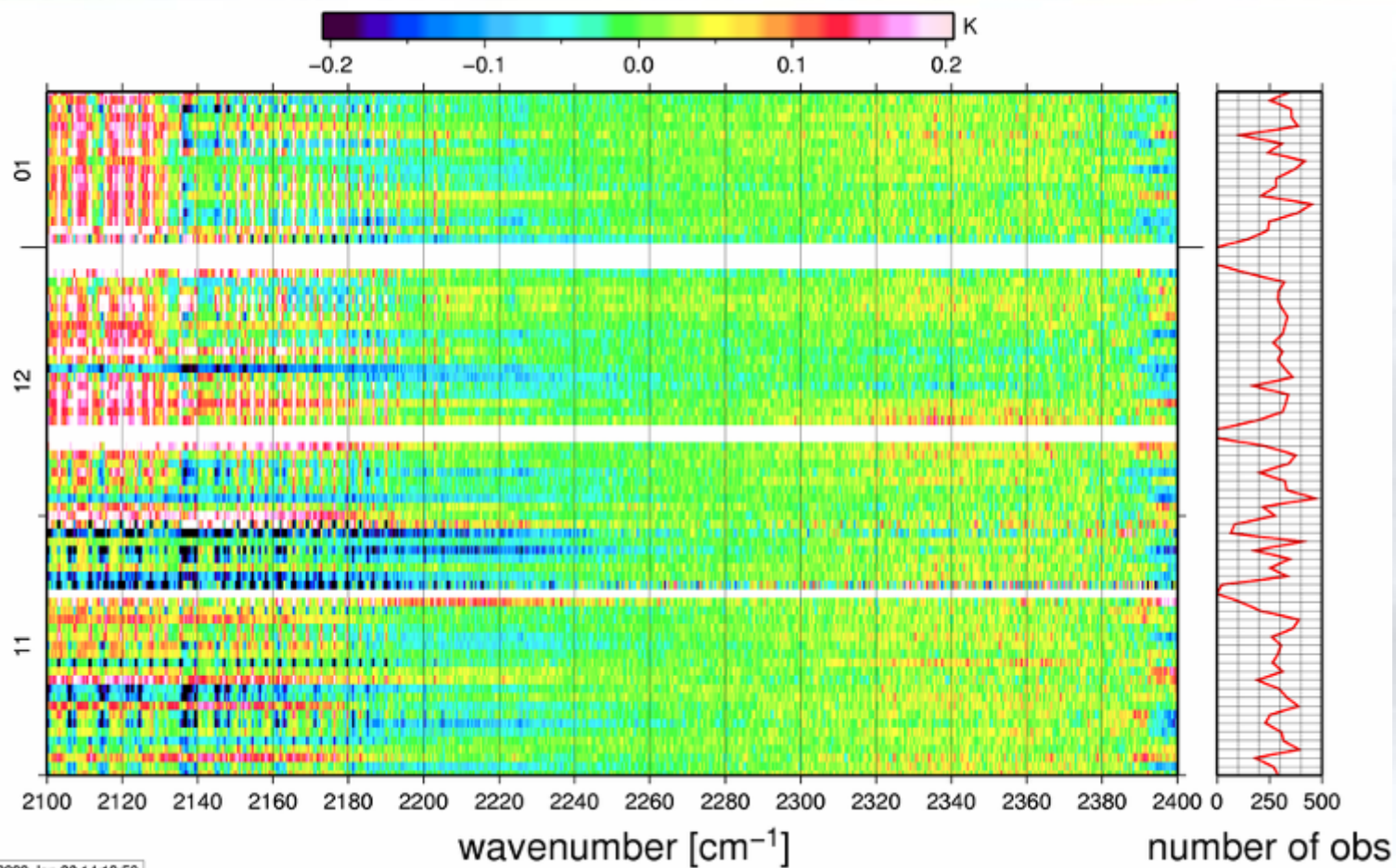
# Radiance Anomaly in CO<sub>2</sub> band at 14 μm in BRT at 280K reference temperature



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# Radiance bias in CO<sub>2</sub> band at 4.3 μm in BRT at 280K reference temperature



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# HIRS-IASI Inter-Calibration

- HIRS = *High-resolution* Infrared Radiation Sounder
- Operated on polar-orbiting satellites since 1970s
  - Importance for Climate-monitoring applications
  - Potential reference for inter-calibration of older GEO radiometers
- Can inter-calibrate with IASI
  - Similar method to Meteosat
- HIRS/4 – IASI both operate on Metop-A
  - *Easy* collocations
  - Over full global range of conditions
  - Allow detailed break-down of statistics



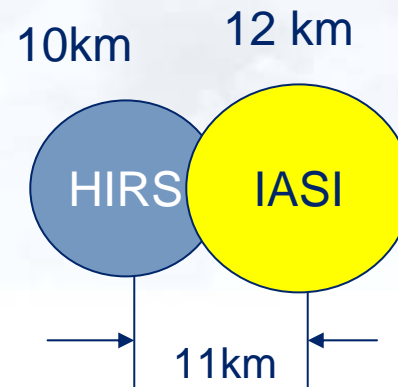
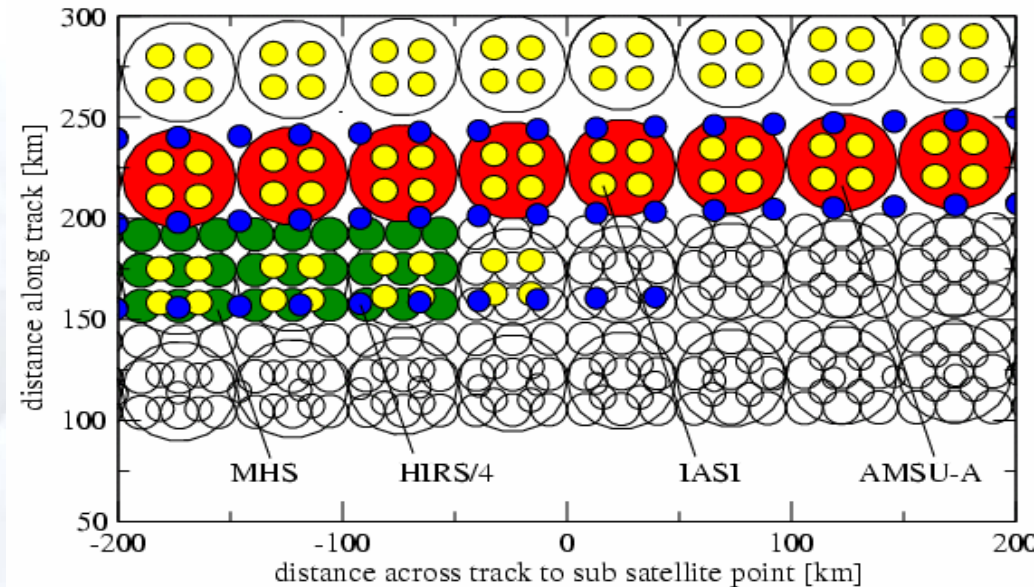


# Collocating under-sampled scan patterns

- GEO-LEO spatial collocation:
  - All GEO pixels within LEO FoV
- LEO-LEO SNO spatial collocation:
  - Resample microwave  
e.g. *Iacovazzi et al. [2007]*

But on Metop-A:

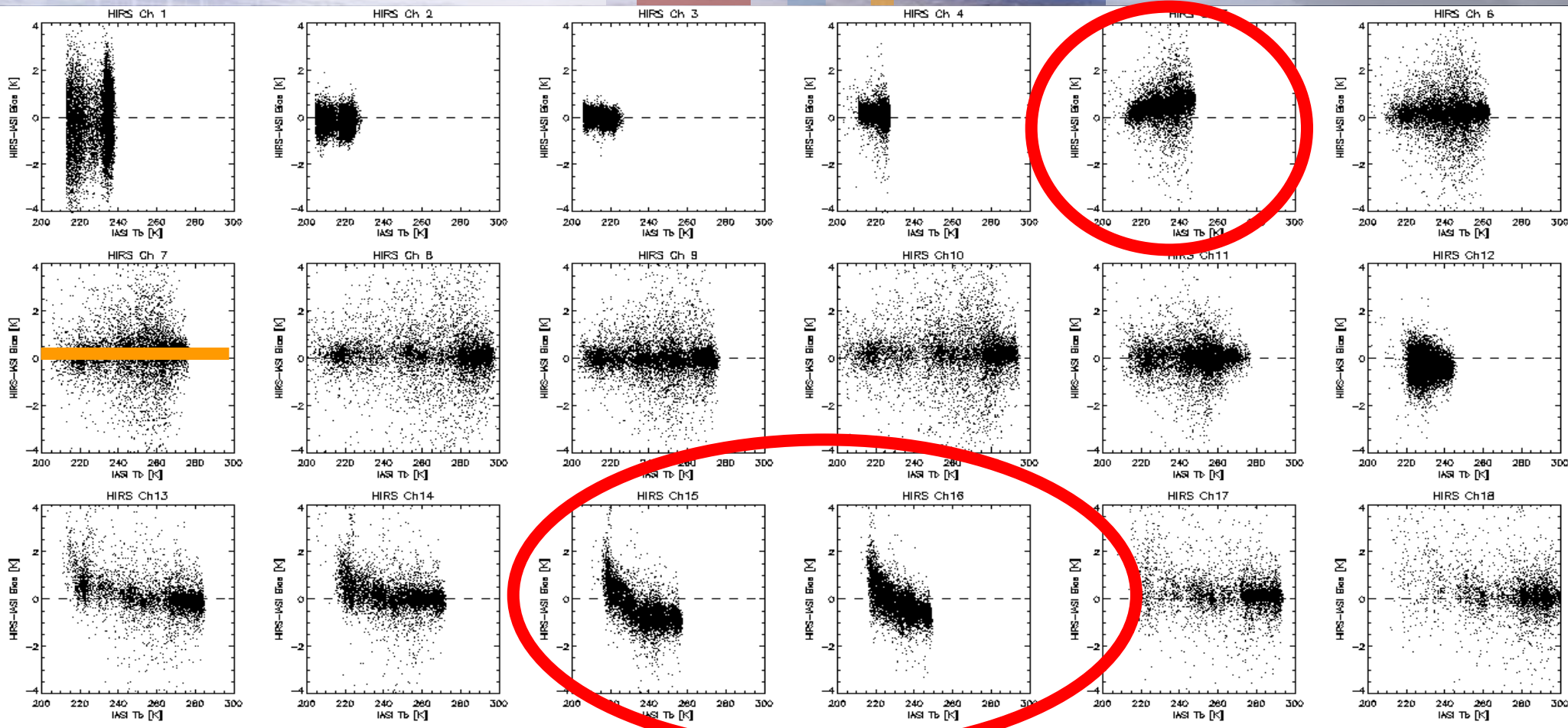
- HIRS & IASI are under-sampled
  - Should not interpolate
  - Take ‘overlapping’ pixels  
[Fiedler (EUMETSAT)]  
[Wang *et al.*, 2008]
  - Or average 4 IASI iFoVs



Define overlapped HIRS-  
IASI pixels at nadir  
whose distance are less  
that  $(12+10)/2=11$  km



# HIRS-IASI Brightness Temp. Bias [K]



Most channels unbiased

Bias depends on brightness temp.



# HIRS-IASI Bias at $T_{bref}$

- Relative biases of HIRS-IASI
  - for two Metop orbits
- 1- $\sigma$  uncertainty  $\sim 0.01$  K
- Largest biases in bold
  - Channels with low  $T_{bref}$
- All biases < 1 K
- In second case ( $\sim 1$  yr later):
  - first 2 channels changed
  - others very constant
  - RMS difference = 0.03 K
- Processed operationally
  - at EUMETSAT since June 2008
  - See Lars Fiedler

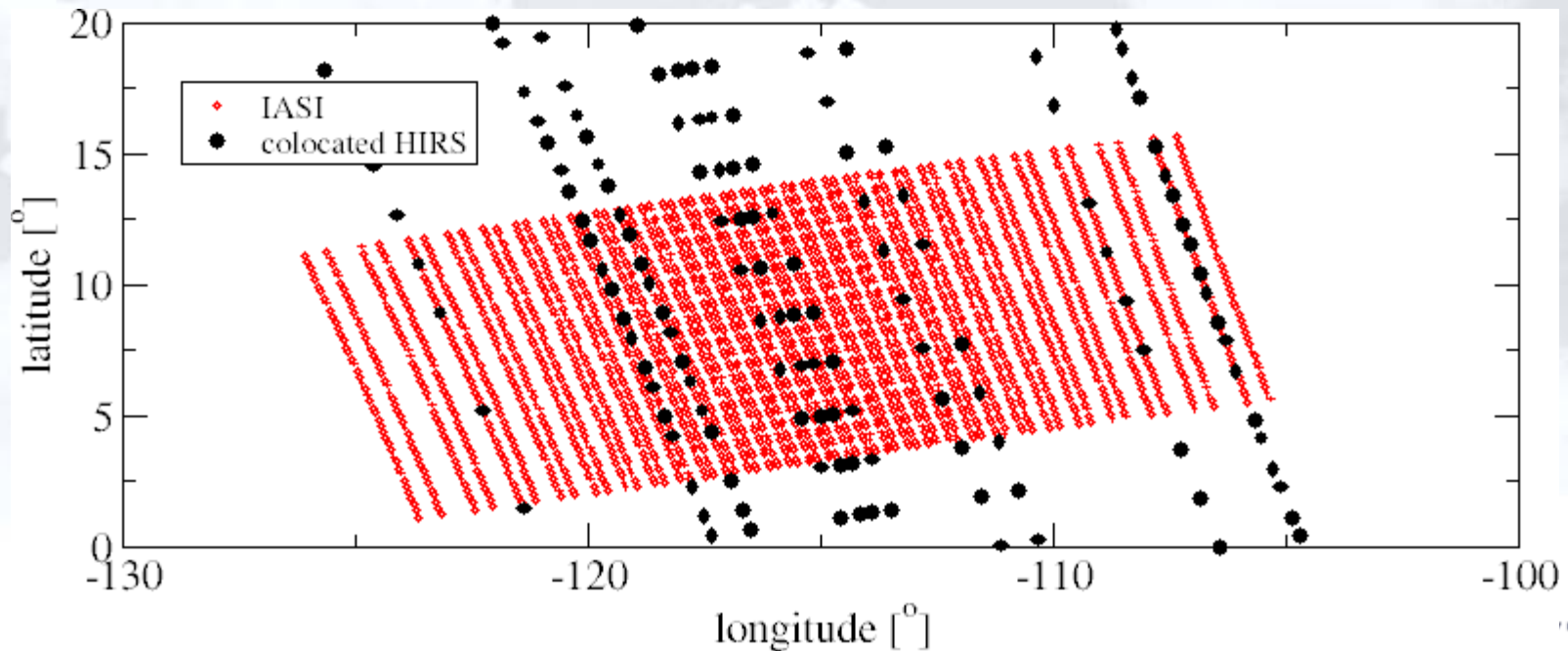
HIRS Channel	Reference Scene, $T_{bref}$ [K]	HIRS-IASI bias at $T_{bref}$ [K]	
		2007-04-27 19:38	2008-05-07 20:56
1	230	-0.35	-0.06
2	220	-0.22	-0.06
3	215	-0.03	-0.04
4	225	0.12	0.04
5	240	<b>0.60</b>	<b>0.61</b>
6	255	0.22	0.18
7	265	0.20	0.23
8	285	0.08	0.10
9	260	0.00	-0.01
10	280	0.18	0.21
11	260	0.02	0.01
12	235	-0.25	-0.32
13	275	-0.03	-0.06
14	260	0.04	0.02
15	250	<b>-0.80</b>	<b>-0.76</b>
16	240	<b>-0.46</b>	<b>-0.45</b>
17	280	0.11	0.13
18	285	0.09	0.11
19	290	0.02	-0.02





# RM: IASI – HIRS setup at EUMETSAT

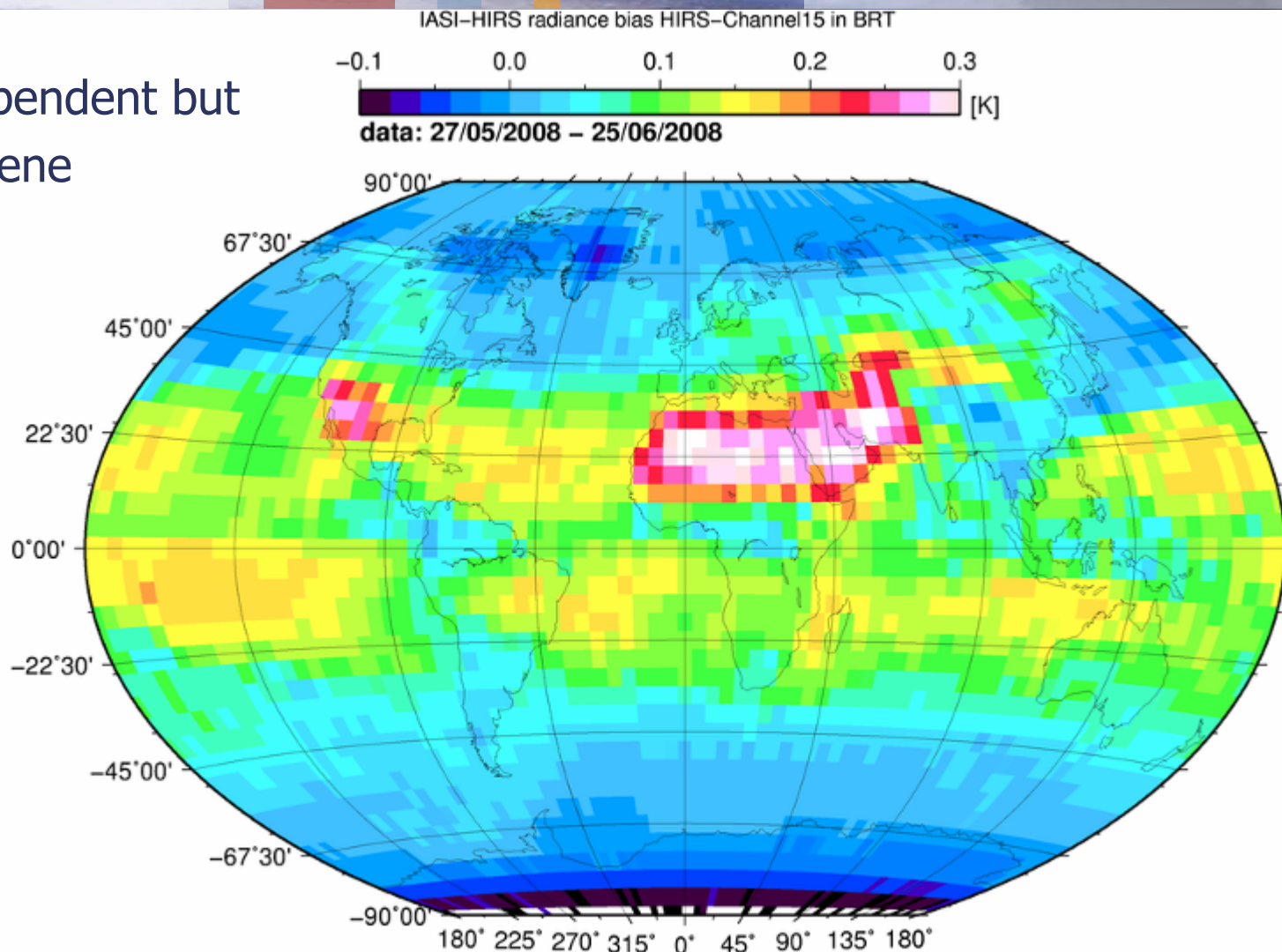
- IASI and HIRS co-location criteria is 3 km distance of the FOVs
- All situations (land, sea, day, night, etc.) are collected
- Maximum of 10 IASI- HIRS co-locations per IASI scan line
- Cloud cover information on the IASI FOV are taken from co-located AVHRR L1B cloud flag.



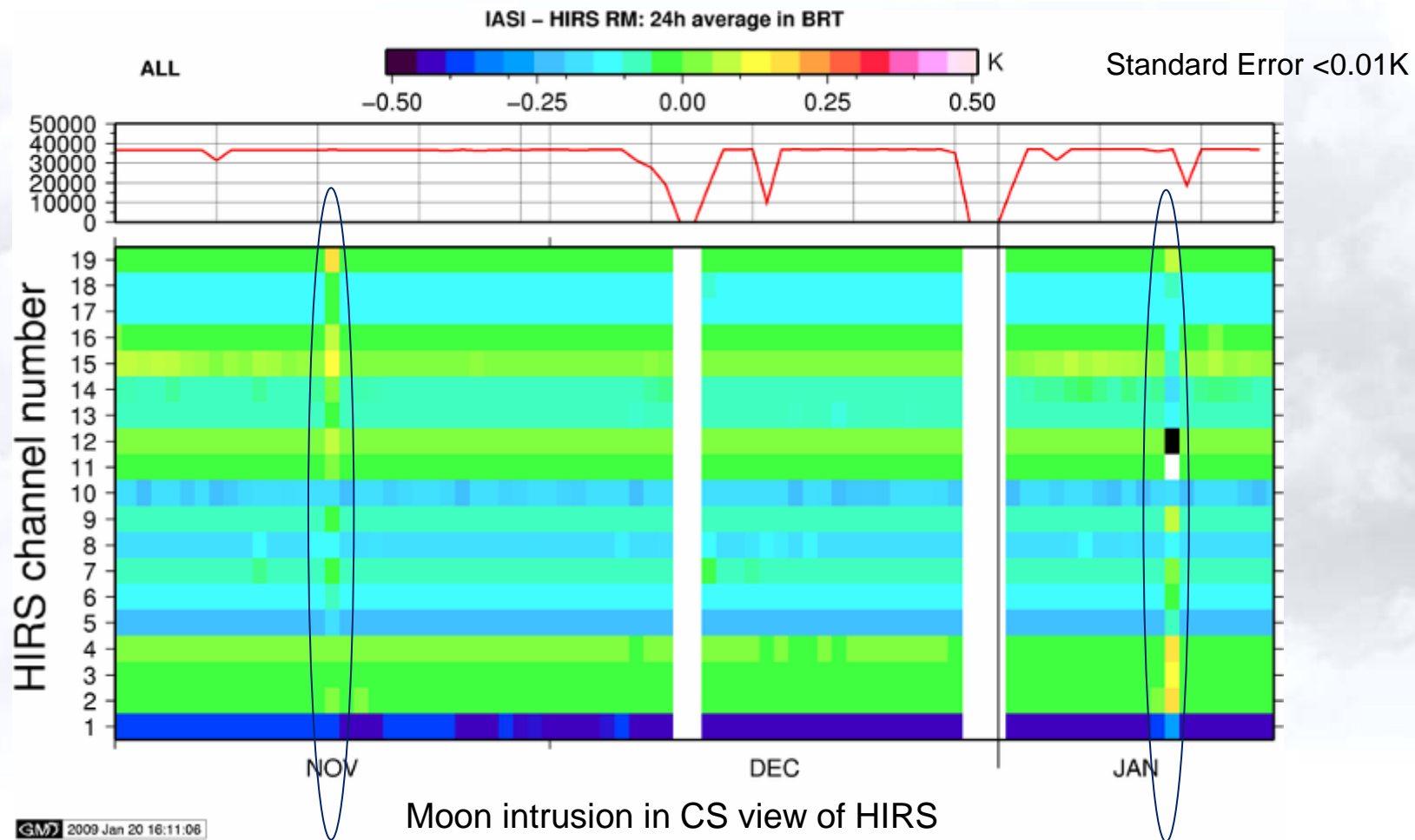


# IASI - HIRS geo distribution of bias ch15

- Bias is not orbit dependent but
- Bias depends on scene temperature

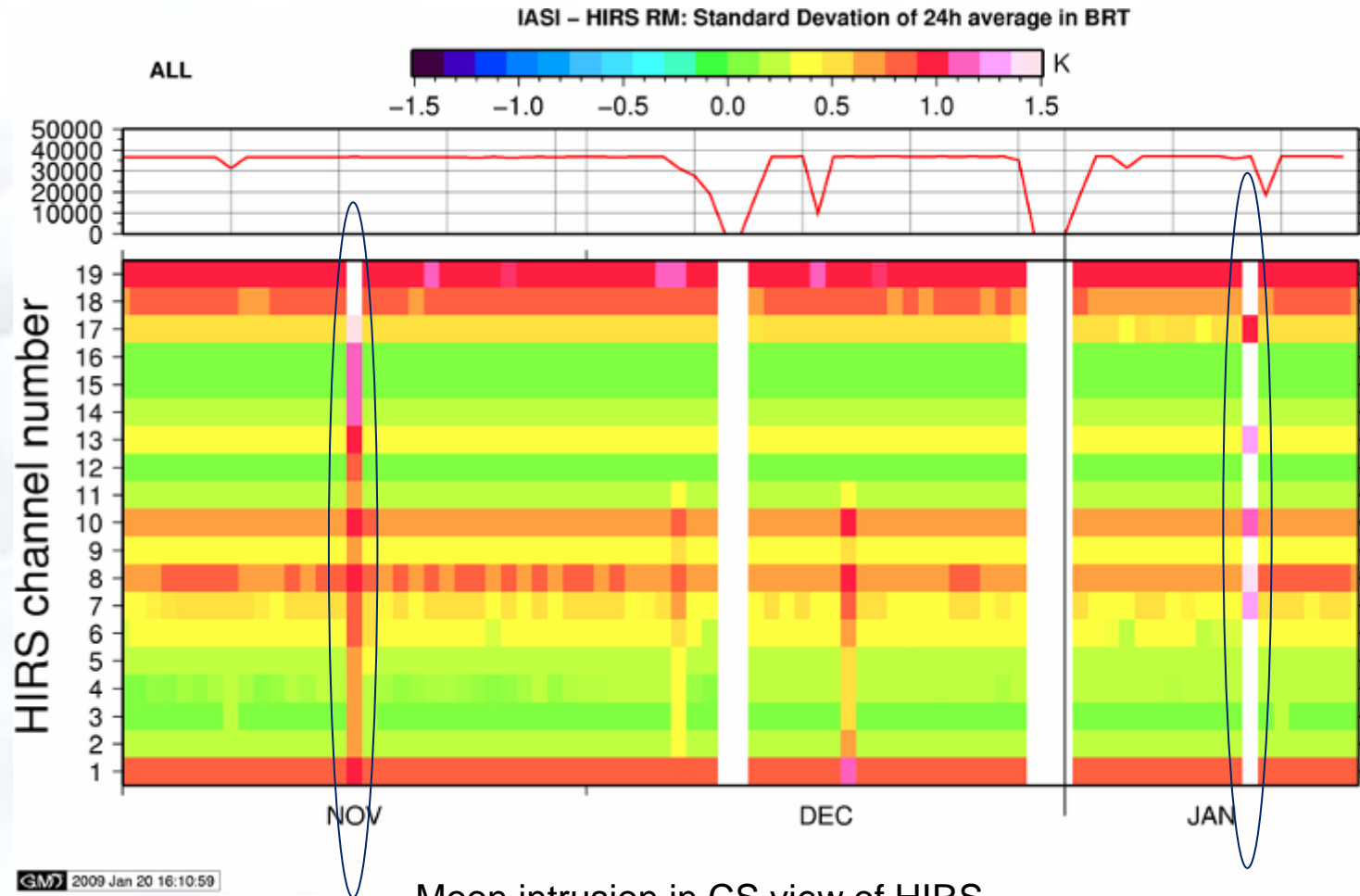


# Radiance Bias IASI-HIRS in BRT at 280K reference temperature





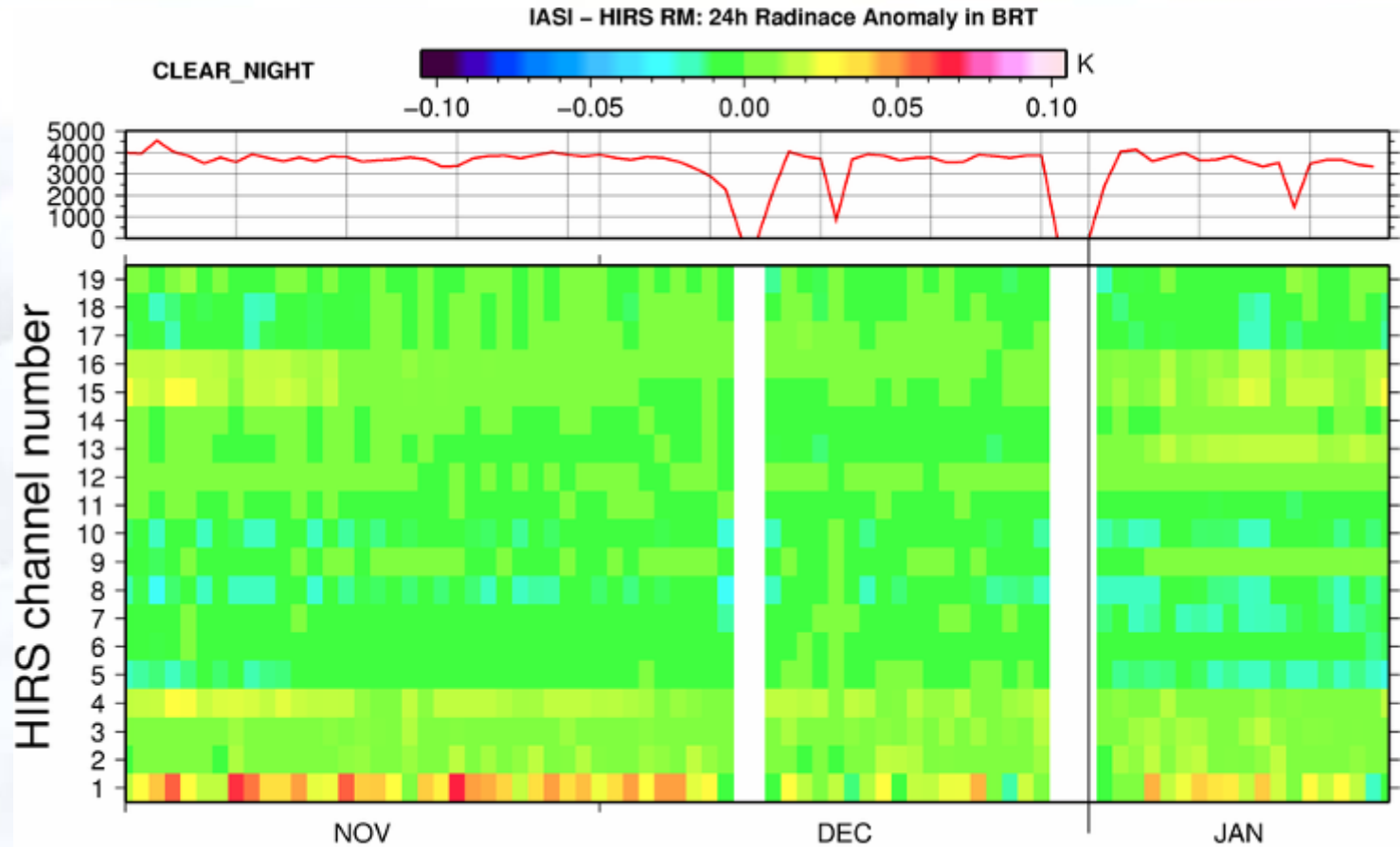
# Standard Deviation of Radiance Bias IASI-HIRS in BRT at 280K reference temperature



Moon intrusion in CS view of HIRS



# IASI-HIRS Radiance anomaly (average bias removed)



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# Conclusions

- Basically, what you can see is no changes in IASI!
- No significant change ( $>0.1K$ ) during period of IASI data Nov'08-Jan'09
  - either relative to HIRS or the NWP.
- The Radiance Anomaly in the CO<sub>2</sub> bands at 4.3 and 14  $\mu m$  do not show a change before and after EQSOL of IASI instrument in 12/2008.
- Similarly stable Biases and STD are shown in the IASI-HIRS monitoring.
- IASI recovered quickly from gaps caused by
  - unexpected EEquipment Switch OffLine in late December
  - data masked out to remove impact of Moon in IASI's space field of view
  - although high variances after each event due less data
  - However, impact of Moon in HIRS's space view is clearly visible
- Need
  - Web displays of near real time monitoring plots
  - GSICS enquiry mechanism



Thank you

Questions and Answers