



IASI L0/L1 NRT Monitoring at EUMETSAT: Comparison of Level 1 Products from IASI and HIRS on Metop-A

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EUMETSAT



Outline

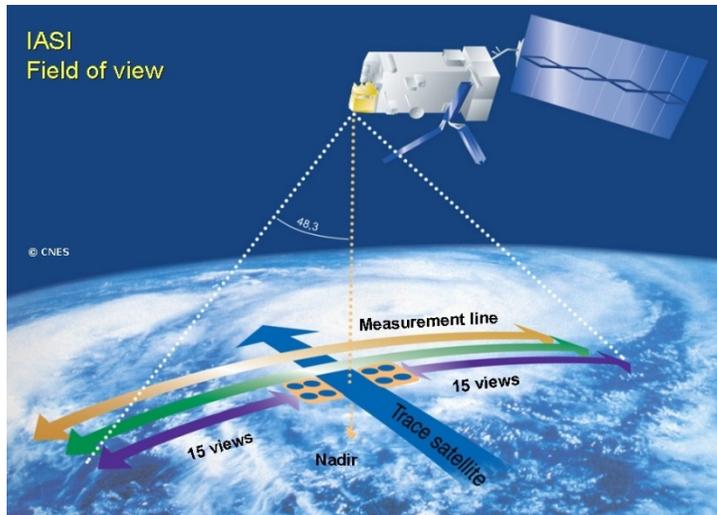
1. Introduction
2. IASI L1 product quality
3. IASI L1C inter pixel differences
4. IASI – HIRS radiance monitoring set-up
5. Results from IASI and HIRS L1 radiance comparison
6. Summary and Conclusions



1. Introduction

IASI (Infrared Atmospheric Sounding Interferometer):

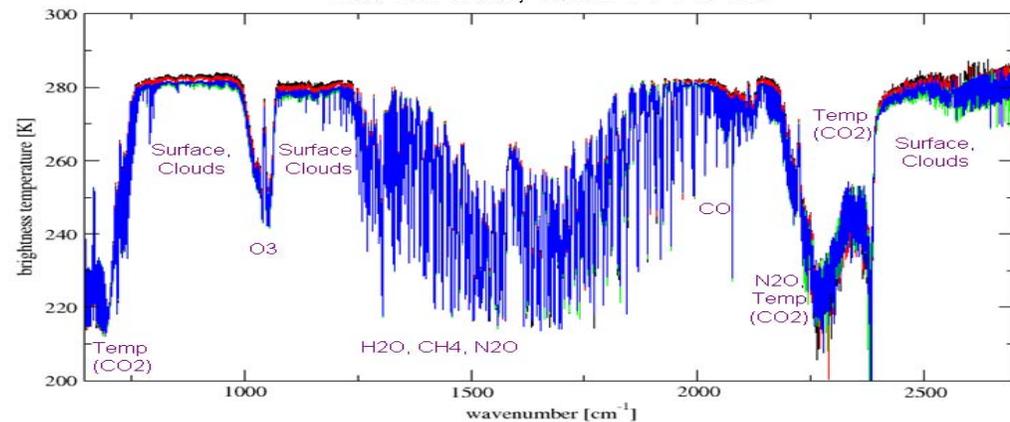
- Covering the range 645 cm^{-1} to 2760 cm^{-1}
- with 8461 spectral samples and
- 4 instantaneous field of view (IFOV)
- a spectral resolution 0.5 cm^{-1} of the IASI L1C product
- On-board the Metop-A satellite in sun-synchronous 09:30 morning orbit



ITSC-17 April 2010

First IASI Level 1C Spectra

29/11/2006, 13:42:11 UTC



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Generated by the IASI L1 PPF and Cal/Val Facility

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1. Introduction

IASI L0/L1 NRT monitoring:

- IASI L0/L1 NRT product quality monitoring was started in April 2007 at EUMETSAT headquarter during IASI Cal/Val phase
- Near real time reports on data quality are used to support of decisions on product dissemination

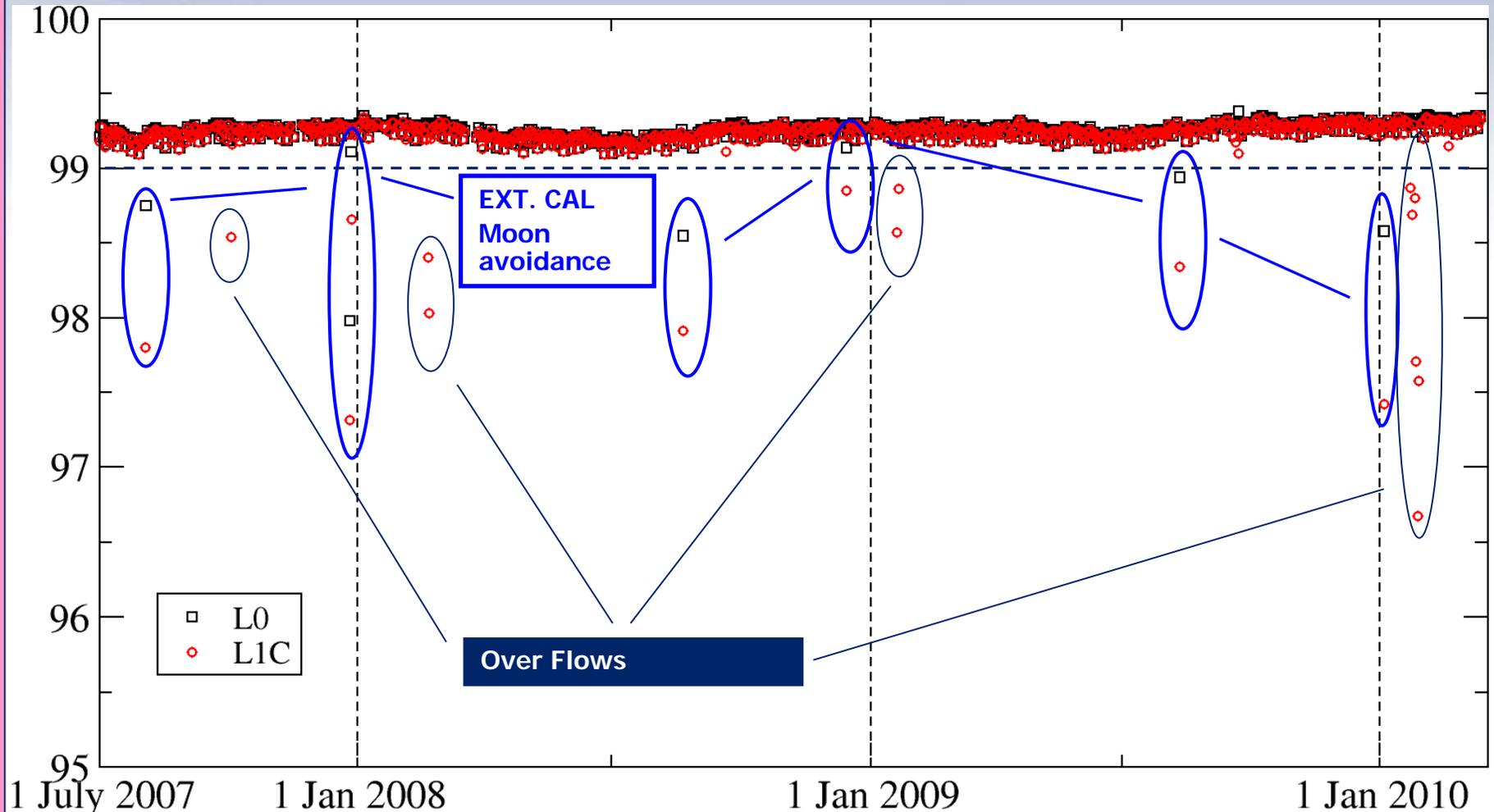
The monitoring consists of the combination of:

- IASI quality and processing parameters and the
- Radiance monitoring based on forecast data and AVHRR L1B data and the
- Comparison of HIRS L1B with IASI based pseudo HIRS channels using HIRS spectral response functions

2. IASI L1C product quality since July 2007 (OPE)

IASI Operational Phase

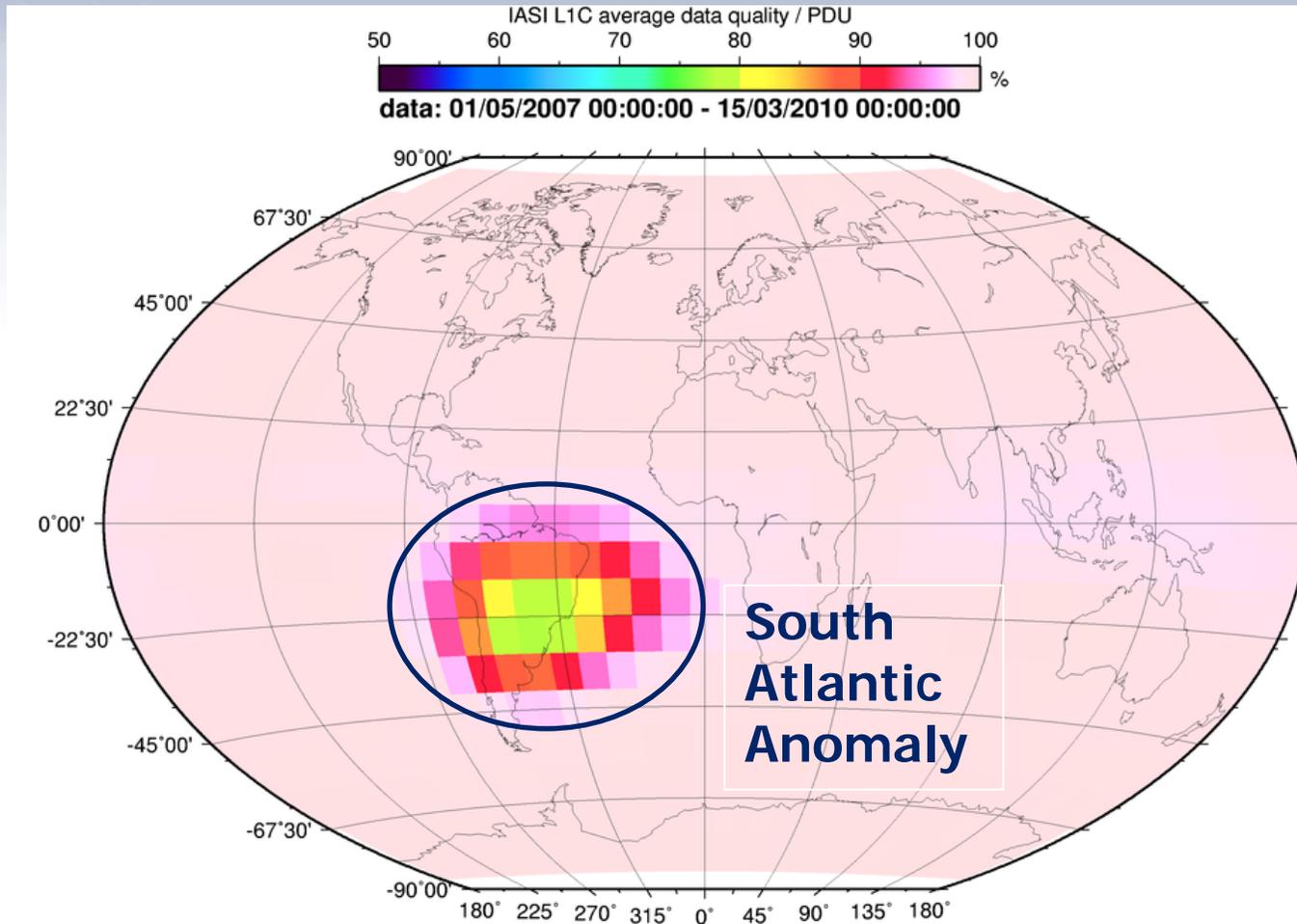
Daily average of L0/L1 data quality [%]



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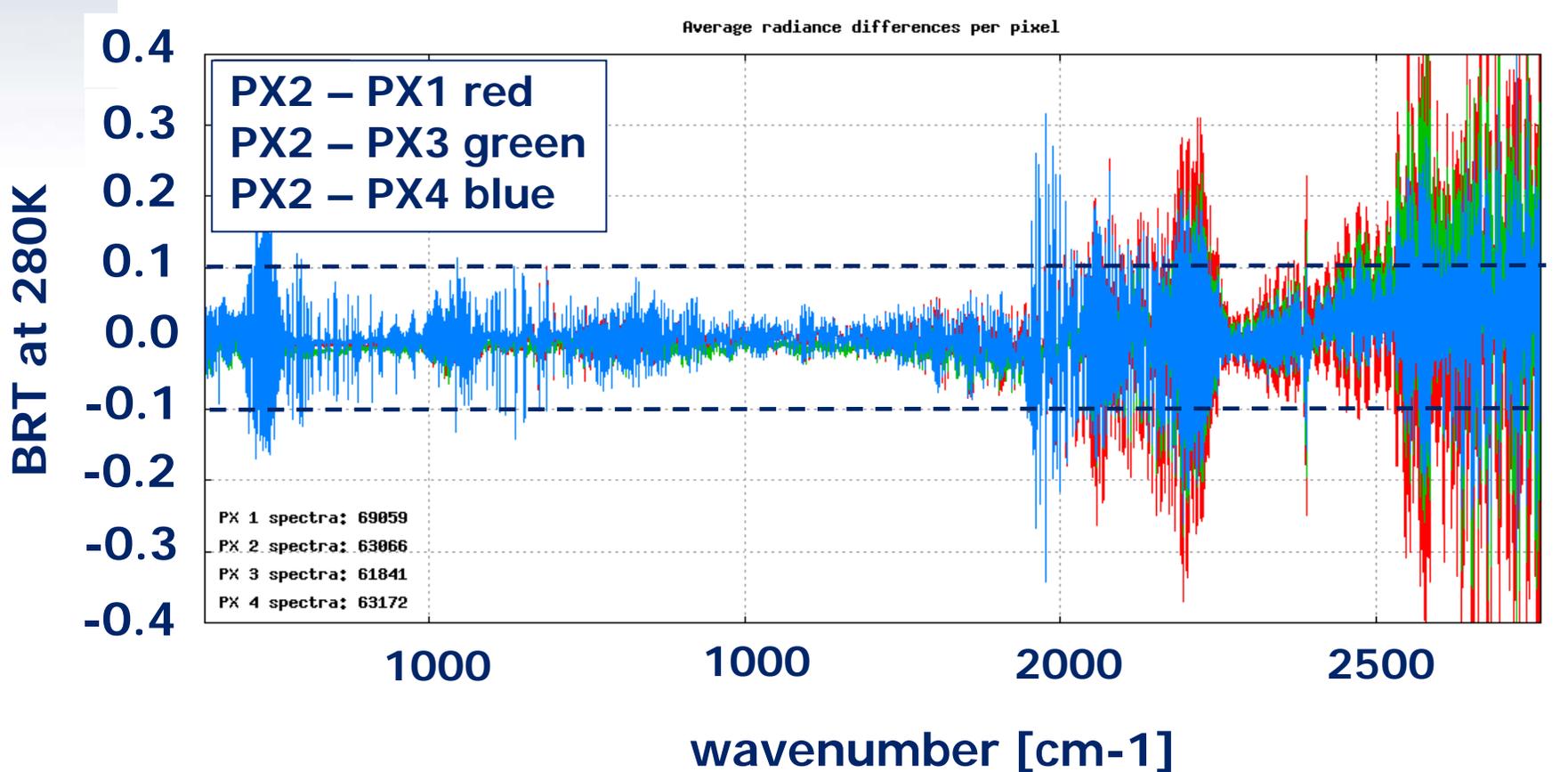
2. IASI L1C product quality: geographical distribution



GMD 2010 Mar 23 22:03:32

3. Average double differences between the 4 IASI pixel (IFOV)

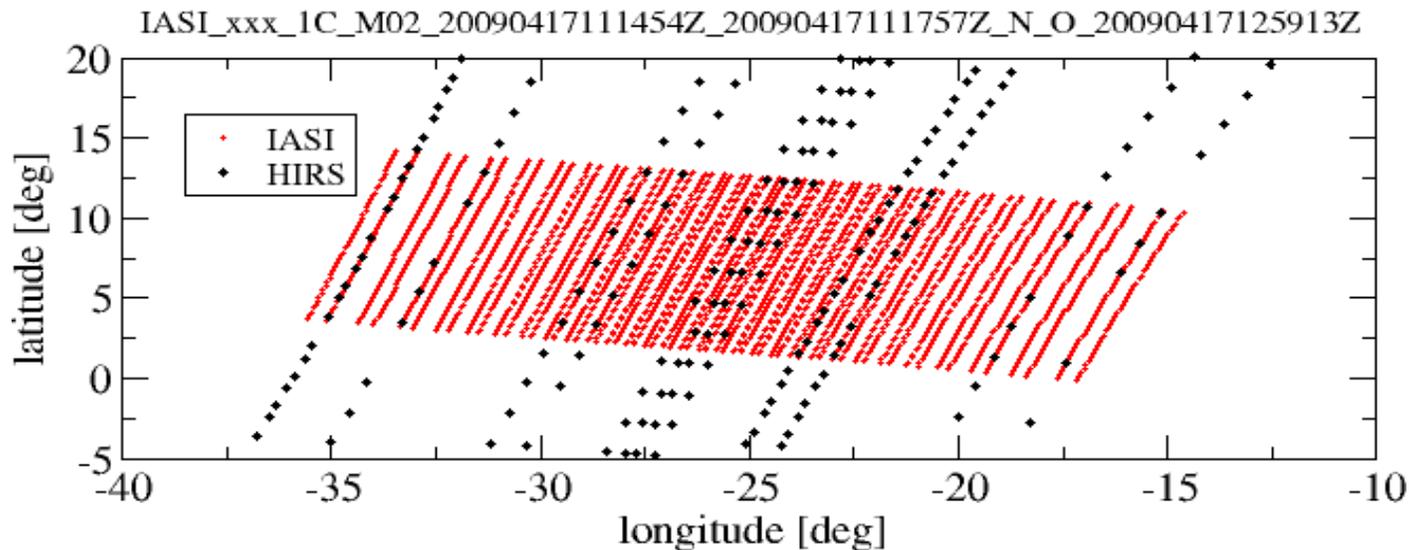
$$(\text{Obs-Cal})_{\text{PX2}} - (\text{Obs-Cal})_{\text{PXi}}$$



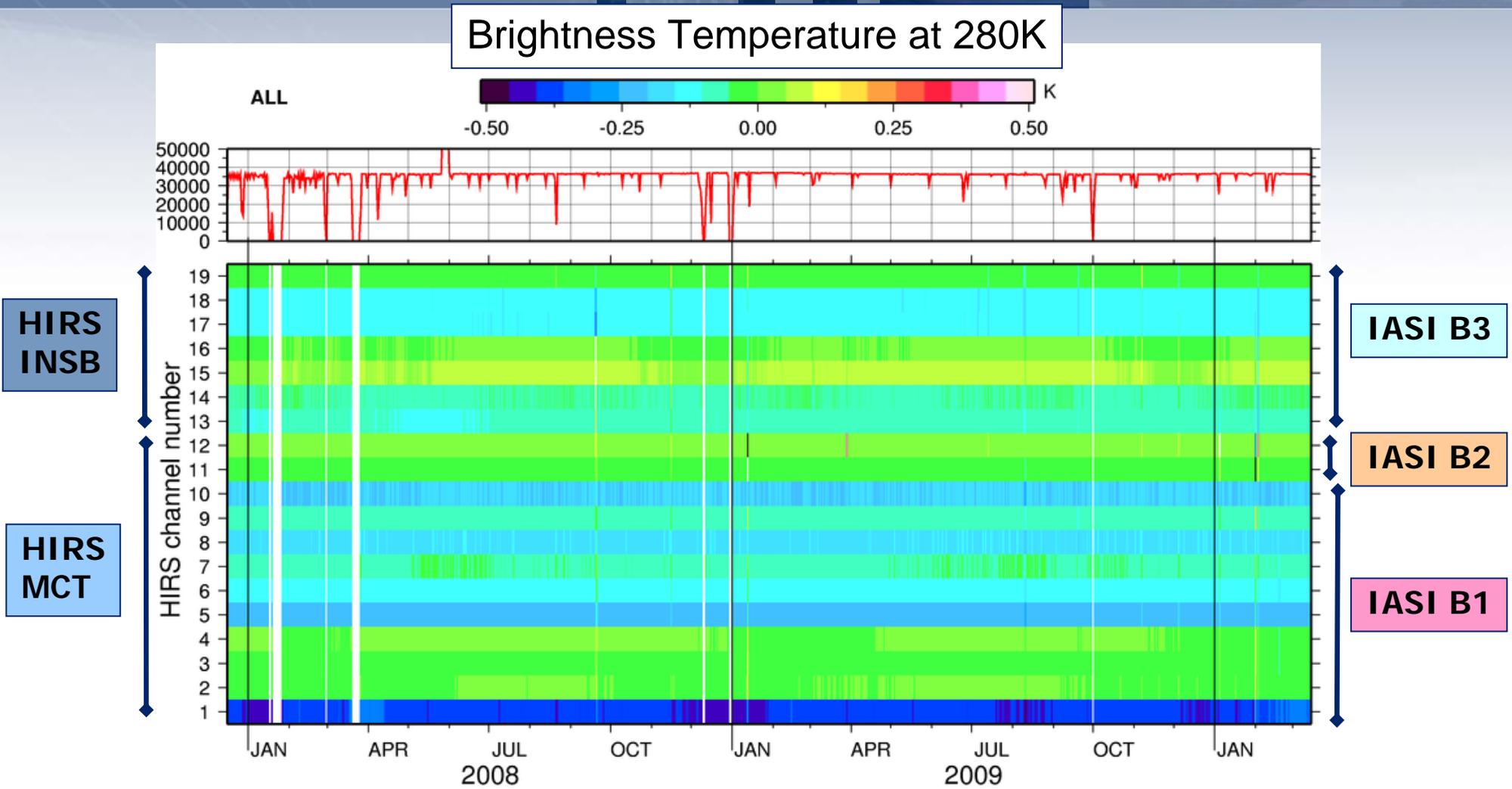


4. IASI - HIRS radiance monitoring set up

- IASI and HIRS co-location criteria is 3 km distance
- All situations (land, sea, day, night, etc.) are collected
- HIRS spectral response function convolved with IASI L1C provide the HIRS pseudo channels
- Cloud cover of IASI FOV based of co-located AVHRR L1B cloud flag
- IASI versus HIRS NRT monitoring started end of May 2008



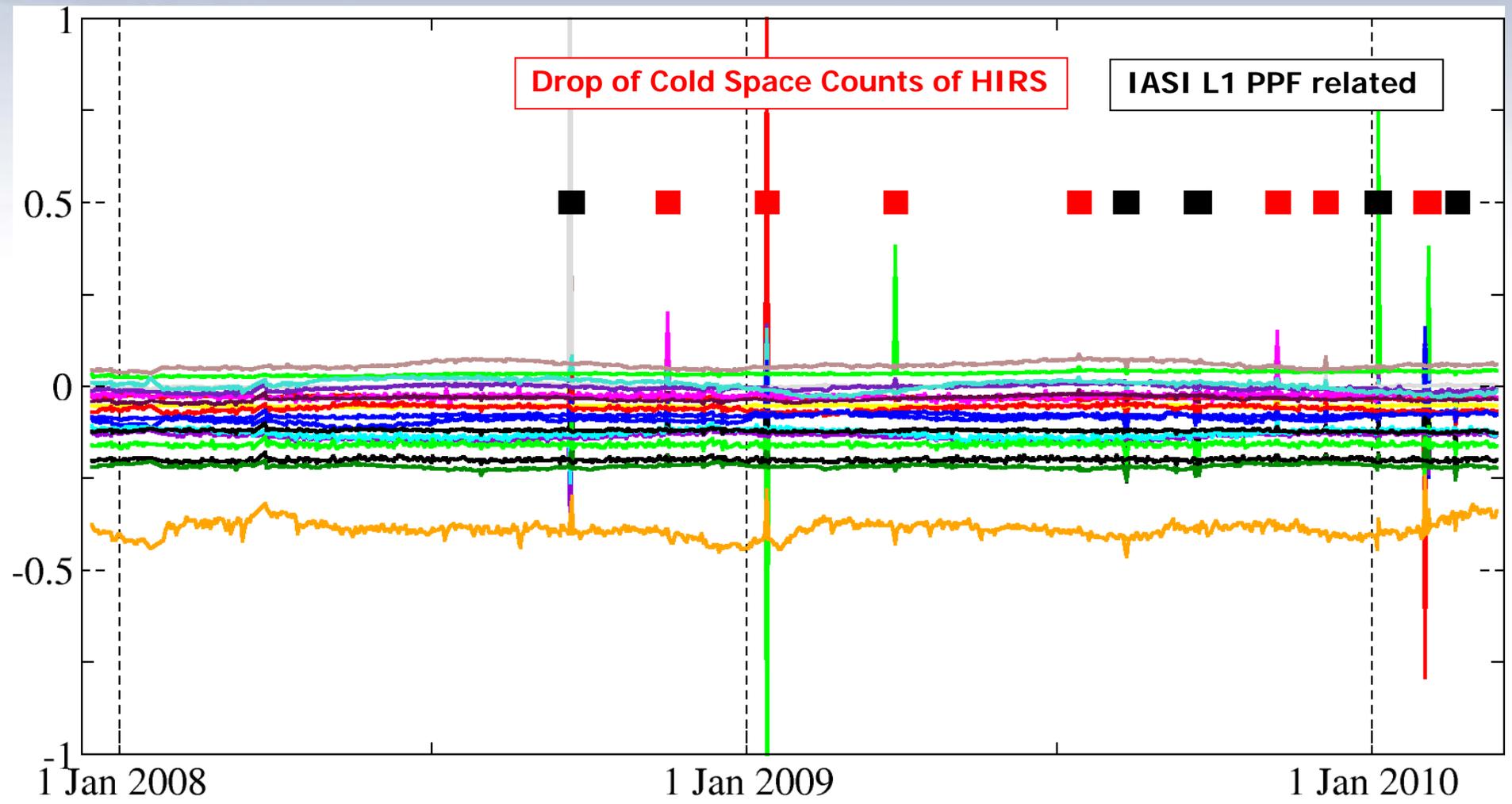
5. Results of IASI and HIRS L1 radiance comparison





5. IASI – HIRS: 24 h average channels 1 to 19

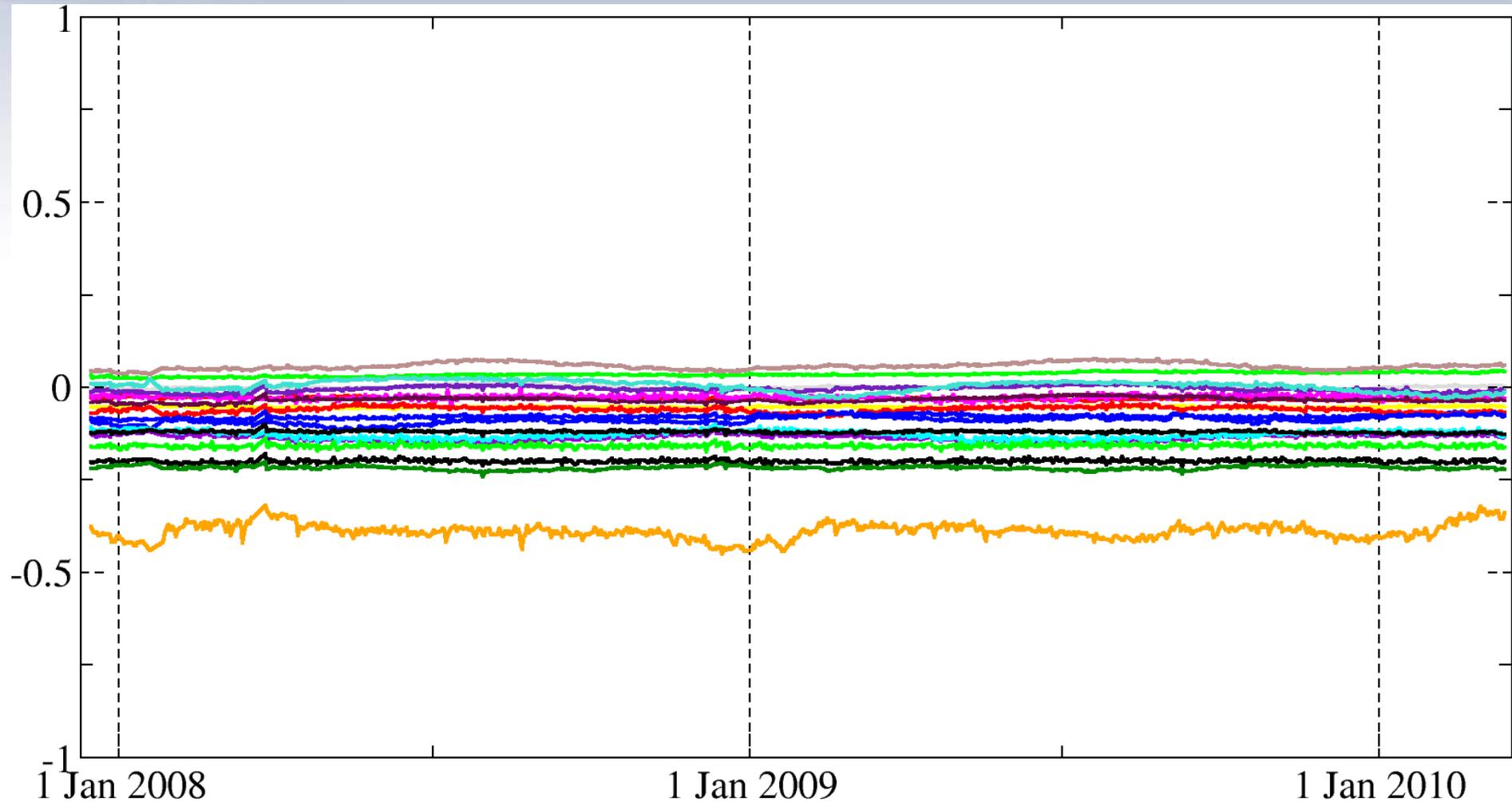
Radiance Difference in BRT at 280K [K]





5. IASI – HIRS: 24 h average channels 1 to 19

Radiance Difference in BRT at 280K [K]



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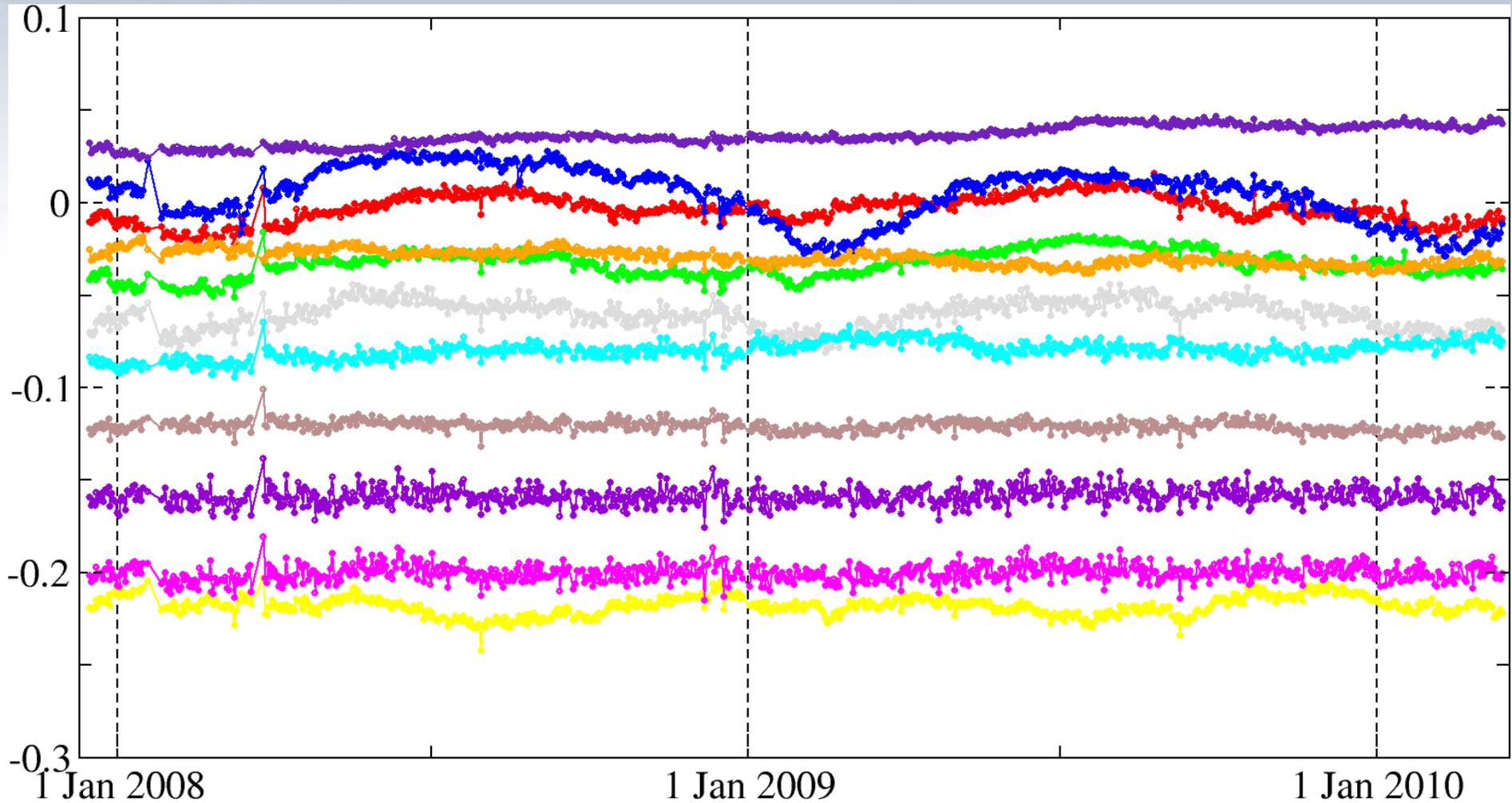
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5. HIRS MCT detector channels 2 to 12

Radiance Difference in BRT at 280K [K]



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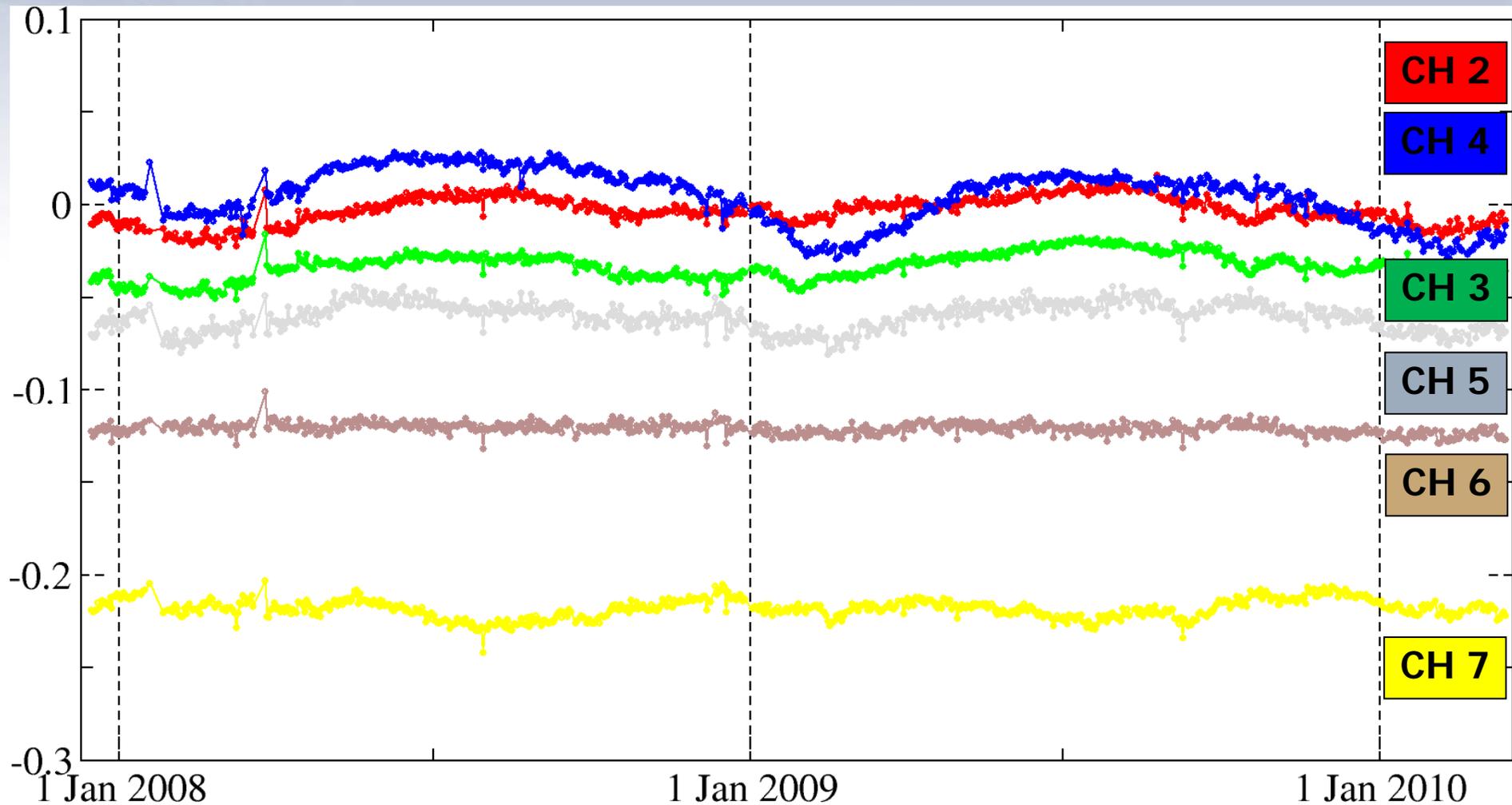
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5. HIRS MCT detector channels 2 to 7 (CO₂ band)

Radiance Difference in BRT at 280K [K]



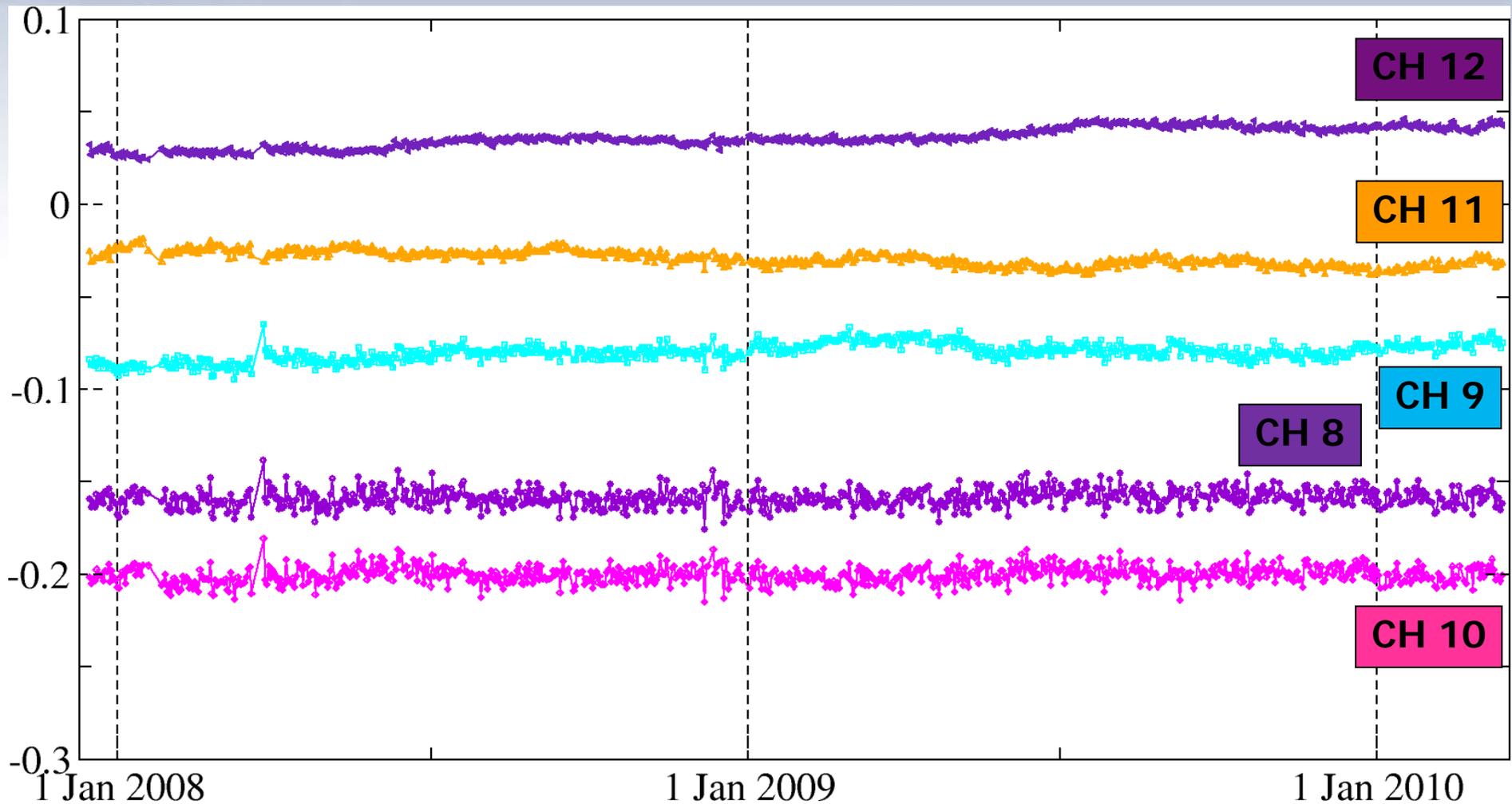
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5. HIRS MCT detector channels 8 to 12 (SURF, O3, H2O)

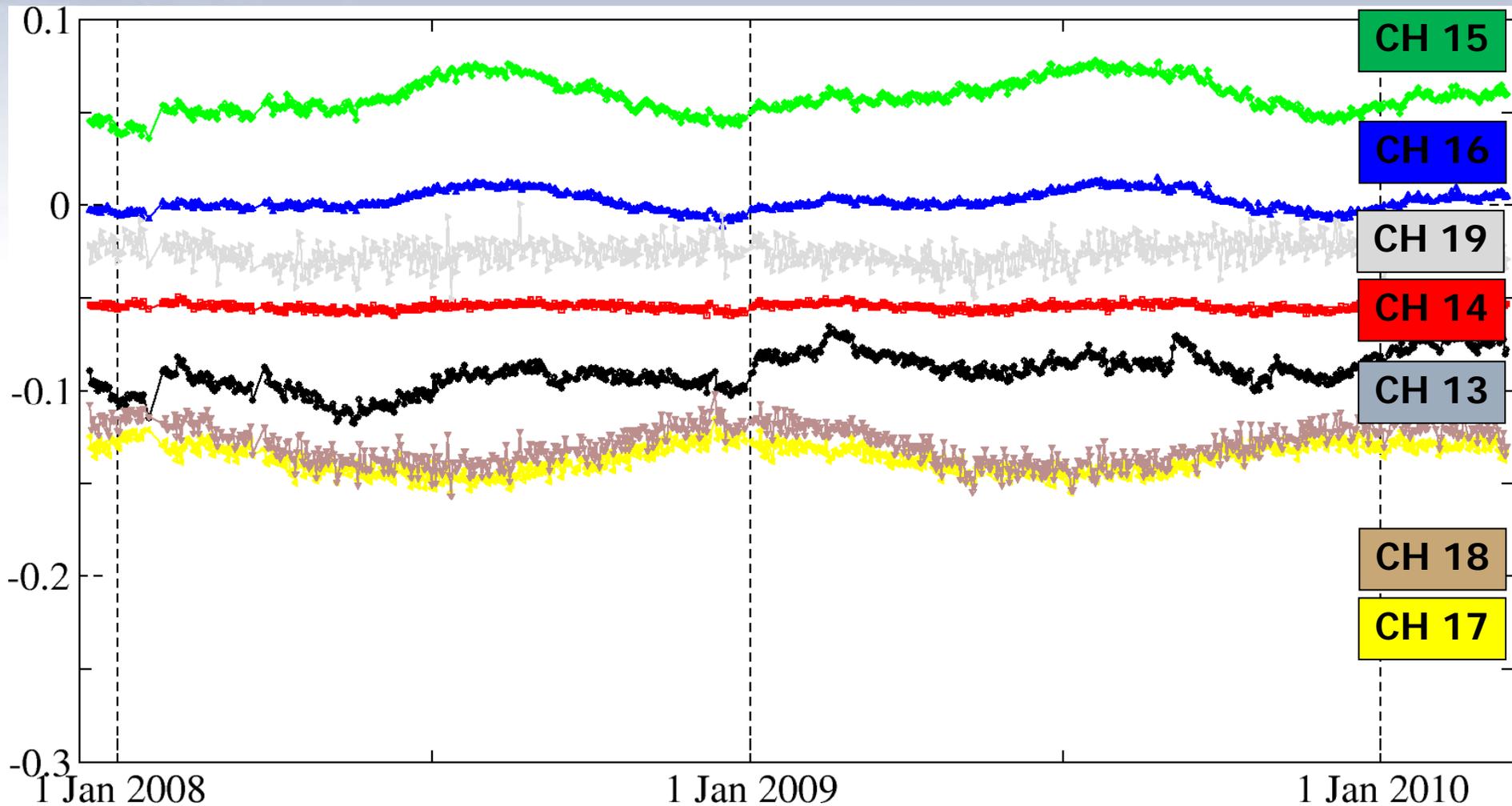
Radiance Difference in BRT at 280K [K]





5.HIRS INSB detector: channels 13 - 19

Radiance Difference in BRT at 280K [K]



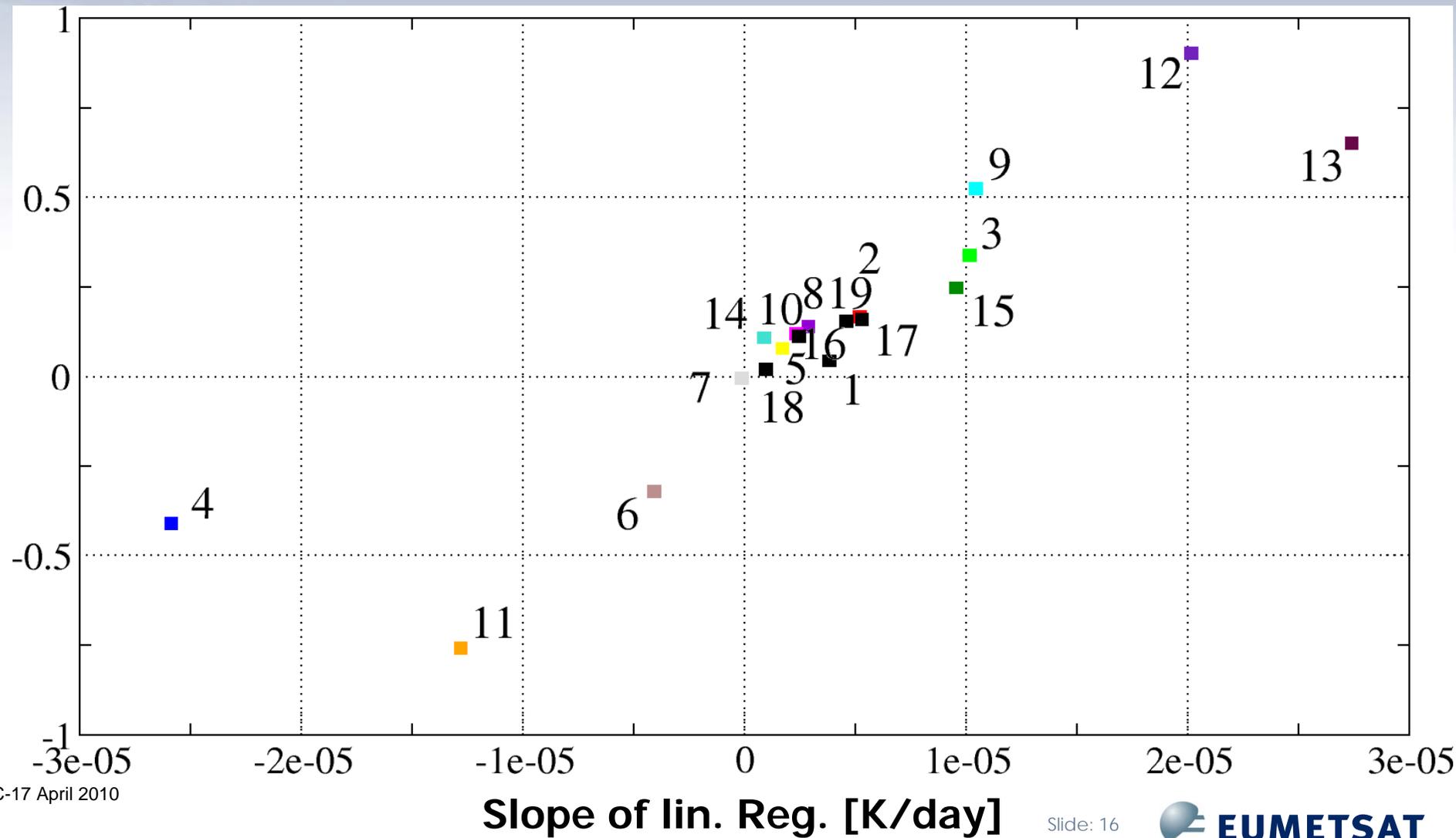
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5. Results from linear Regression: Channel 1-19

Correlation coefficient of lin. Reg. []





6. Summary and Conclusions: IASI L1

- IASI L1 product quality is stable and above 99%
- Systematic radiance bias changes in the operational phase were not related to the IASI instrument.
- The excellent instrument stability and accuracy of the spectral calibration reveals a small radiance differences between the 4 IASI pixel on a few number of IASI channels mainly in Band 3.
 - A on-ground parameter update is scheduled for April 2010.
- Degradation of IASI L1 products for few minutes on the 19/20th Sept. 2008, 10/11th Aug. 2009, 4/5th Jan. 2010, and on 20th Feb. 2010 were related to IASI L1 PPF.
 - A software patch is in preparation for May 2010 (part of Day-2 IASI L1 PPF upgrade).



6. Summary and Conclusions: IASI-HIRS comparison

- IASI – HIRS L1 product comparison shows very good agreement all differences are well within specifications.
 - Very stable in-orbit performance is observed with HIRS Ch: 8, 10, 14, 19 bias changes less than 10 mK over 2.5 years.
 - HIRS CO₂ channels show seasonal variation of radiance bias (only channel 6 and 14 are stable).
 - HIRS Ch. 4 bias with 50 mK amplitude for 24h and 0.5 K for individual IASI-HIRS measurements.
 - HIRS WV channels 11 and 12 both compared to IASI Band 2 show linear trend with opposite sign.
 - The IASI decontamination in March 2008 had no impact on radiance bias.
- The annual radiance bias variation is related to the imperfect knowledge of the HIRS spectral response function of Channel 2-5, and 15-18.
- A general non-linear response of the HIRS instrument/detectors has not been concluded due very stable behaviour of ch. 8, 10 and 14.
- The behaviour of channel 11, 12 and 13 required further investigations



HIRS spectral response functions: Channel 1 to 19

