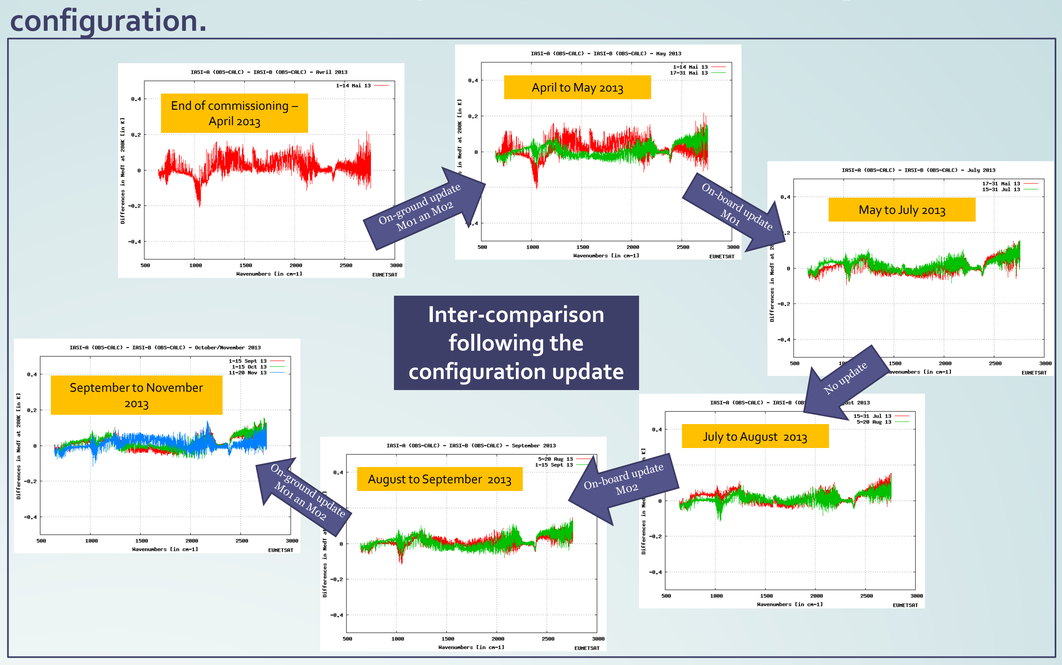
INTER-COMPARISON BETWEEN IASI AND OTHER MULTI-SPECTRAL INSTRUMENTS

One Year of Dual-Metop Data

Dorothée Coppens, Bertrand Théodore and Dieter Klaes
EUMETSAT, Eumetsat-Allee 1, 64295 Darmstadt, Germany

IASI

Taking advantage of dual Metops, the operational monitoring has been extended to produce inter-comparisons between the two IASI, using double differences between IASI-A (Obs-Cal) and IASI-B (Obs-Cal). This inter-comparison has been developed during IASI-B commissioning and is now part of the monthly monitoring of the two IASI, providing self-consistency checks. This is always done between on-board and on-ground processing configuration updates. All spectra used have been taken by night, over sea, excluding the polar regions. The scheme below shows IASI-A – IASI-B differences from April 2013 (end of commissioning) to the actual configuration.

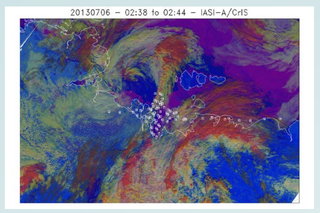


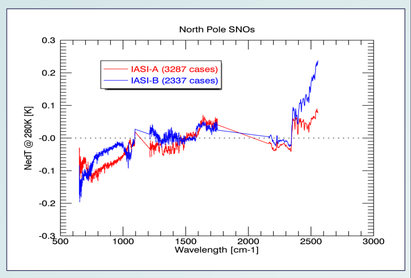
The difference in NedT at 280K remains between ± 10^{-1} K (the specification for Obs-Cal is 0.1K at 280K), which shows a good radiometric consistency between the two IASI. One can follow the configuration evolution quite accurately, giving a status of the two IASI inter-calibration. The last configuration update gives the best fit between the two instruments. Note that this monitoring is done for 15 days per month, taking into account any configuration change.

CrIS

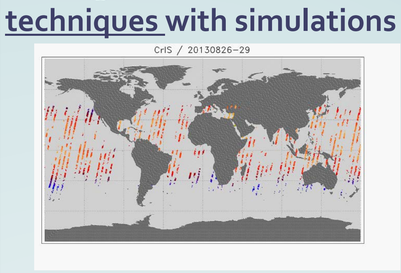
In the frame of its agreement with NOAA, EUMETSAT is distributing products from the Cross-track Infrared Sounder (CrIS) instrument to the users via the EUMETCAST network. Both spectral characteristics and spatial resolution make CrIS very similar to the IASI instruments flying on both Metop. The inter-calibration aims at monitoring the quality of the CrIS products disseminated as well as providing a new calibration reference using IASI. This inter-comparison is performed using two approaches:

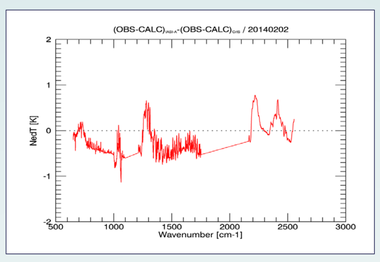
✓ A <u>direct comparison simultaneous nadir overpasses</u> (SNOs) with 2 minutes time and 6.5 km distance differences every 7 weeks at +/-70° lat. The figure below shows an example for the north pole, with IASI-A in red and with IASI-B in blue.





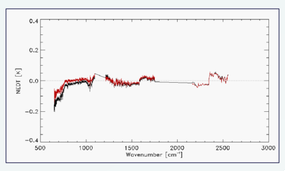
✓ Using the <u>double differences techniques</u> with simulations





The (Obs-Calc) differences are not as good as the ones from SNOs. More cloud filtering needs to be done. We see that, in general, CrIS is slightly warmer than IASI in band 1, with some remaining non-linearity. A new comparison, shown on the figure below, has been done with a new version of the products, and one can notice an improvement (red curve).

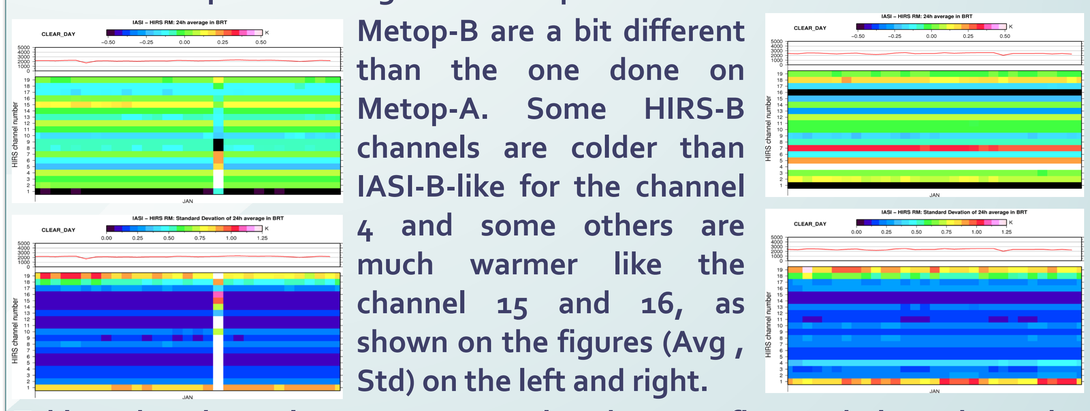
We can notice also that in general, there is a very good agreement in band 2 (BT diff. < 0.07 K). Conclusions on band 3 are difficult.



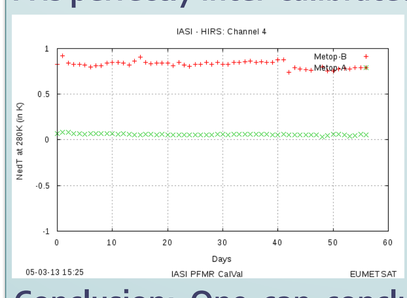
IASI with

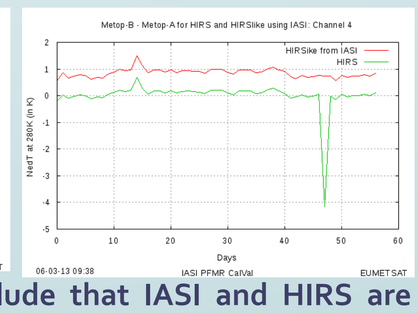
HIRS

The radiance comparison of IASI and HIRS on-board Metop is performed on all pixels with a distance smaller than 3 km between IASI and HIRS. All sky conditions are included (clear, cloudy, day and night). The radiance differences IASI - HIRS are given in NedT at 280K. On the figures below are shown the average and standard deviation for all HIRS channels in clear situations for day and night conditions, Metop-A and the left and Metop-B on the right. The comparison between HIRS and IASI on Metop-B are a bit different than the one done on Metop-A. Some HIRS-B channels are colder than IASI-B-like for the channel 4 and some others are much warmer like the channel 15 and 16, as shown on the figures (Avg , Std) on the left and right.



Taking the channel 4 as an example, the two figures below show the comparison between daily averaged ($IASI_{HIRS}$ – HIRS) for each Metop (left), and daily averaged differences between same instruments for both Metop (right). We see that ($IASI_{HIRS}$ – HIRS) for Metop-B presents a bias of 0.8 K. The figure on the right shows that the difference observed in the case of Metop-B is coming from the HIRS pseudo channels using IASI. Because IASI-A is perfectly inter-calibrated with IASI-B as it is shown at the top left of this poster, it means the difference observed is coming from the HIRS instrument Spectral Response function used.





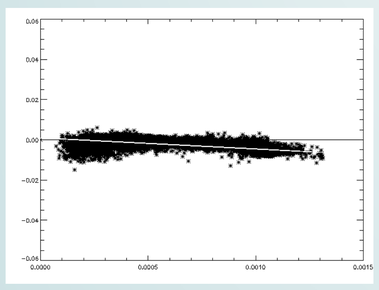
<u>Conclusion:</u> One can conclude that IASI and HIRS are well correlated for Metop-A and Metop-B (except some channels). To have meaningful comparison for those channels, an update of the Spectral Response Function would be needed.

AVHRR

With the launch of the second Metop, the operational IASI monitoring has been extended to make systematic comparisons between AVHRR on each Metop with pseudo AVHRR channels using IASI. The figures below show an example for the two IR channels, the two Metops, during five days, from 1st of March to the 5thof March 2014. The differences are given in radiances (Y axis has been multiplied by 1000).

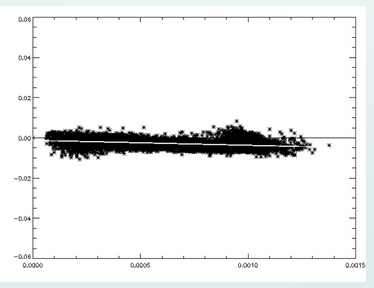
Channel 4

Metop-A



Ch 4	slope	Y-intercept
M02	-5.52929	0.000977684
M01	-2.50335	-0.00118306

Metop-B



Channel 5

Metop-A

Ch 5	Slope	Y_intercept
M02	-4.89576	0.00107940
M01	4.1248	-0.00382163

Metop-B

This has been done regularly during Metop-B commissioning. The four curves give always the same trend. It appears that one channel, the channel 5 on Metop-B, looks to be a bit out of family or is it the only one well represented ? This is under investigation on NOAA side.

Contact: dorothee.coppens@eumetsat.int
bertrand.theodore@eumetsat.int

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