IASI on Metop-B geometric calibration

S. Gaugain [(1)], **E. Péquignot** [(1)], **V. Lonjou** [(1)]
[(1)] Centre National d'Etudes Spatiales (CNES), Toulouse, France

e-mail: sebastien.gaugain@cnes.fr, eric.pequignot@cnes.fr, vincent.lonjou@cnes.fr.

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IASI mission

The IASI (Infrared Atmospheric Sounding Interferometer) instrument was launched for the first time with the Metop A satellite in October 2006 and the second time with Metop B in September 2012. It was financed by CNES and EUMETSAT. IASI is a Michelson interferometer used for atmospheric sounding. It can be used to measure spectra in the infrared range, covering wavelengths ranging from 3.62 µm to 15.5 µm (from 645 cm^{-1} to 2760 cm^{-1}). The instrument is constituted by 4 pixels of 12 km each. The contribution of IASI lies mainly in weather forecasting, atmospheric composition and climate monitoring.

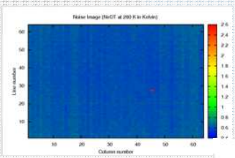
Performance objectives for meteorology are 1K for temperature and 10% for humidity, with a vertical precision of 1 km. This requires a good overall instrument calibration

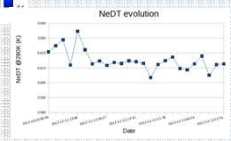
Importance of geometry

IASI has an integrated imager called IIS (Integrated Imager Subsystem). The Metop satellite also carries an AVHRR (Advanced Very High Resolution Radiometer) instrument which is very well geolocated and used as a reference. For each scan position of IASI, a relative co-registration of IIS raster in AVHRR raster is performed.
The objective of IASI geometric calibration is to geolocalize IASI pixels. Geometric calibration has an important impact on other calibrations of the instrument either spectral or radiometric, and also on the determination of the cloud fraction in IASI products.

Radiometric calibration of IIS

- ✓ Radiometric calibration is a preliminary step of geometric calibration. This is done in external calibration mode, pointing the instrument on the black body, and leads to the computation of the NeDT of each pixel over an orbit portion.
- ✓ It is then possible to follow the average NeDT over time
- ✓ There is one dead pixel (in red on the noise image). Data for this pixel are interpolated and available in L1 products
- ✓ Fulfilled requirement: the NeDT shall be less than 0.8K at 280K



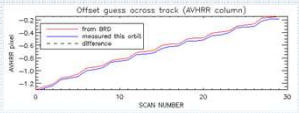


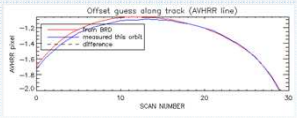
Geometric performance of IASI B

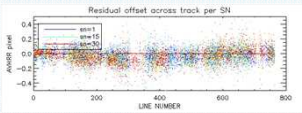
➢IIS/AVHRR geolocalisation

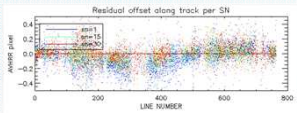
Geolocalisation of IIS is performed for each acquisition. In case this algorithm does not converge (in case of homogeneous scenes), an offset guess is applied.

The comparison between the guess an the computed value gives the error committed when the algorithm does not converge.



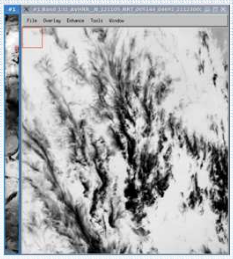






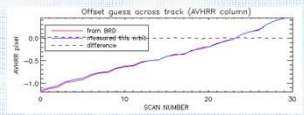
➢IIS/sounder geolocalisation

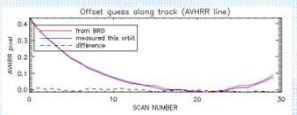
The IIS/sounder Y and Z offsets are computed on ground with a dedicated algorithm (ISC109) after a manual selection of heterogeneous scenes. This algorithm tries to find the best fit between IASI pixels and IIS image, integrating the image with the IPSF coefficients and the spectrum with the IIS spectral response function.

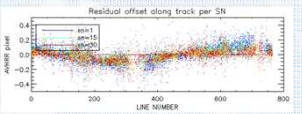


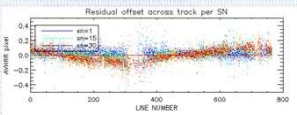
AVHRR image used to locate heterogeneous scenes

Comparison with IASI A









The results are similar to those of IASI-B

We can notice that the curve of the offset guess along track is inverted.

Conclusion

IASI B is performing well in terms of geometry, with results quite similar to those of IASI-A

See also …

Poster session:

[1] ***"IASI Technical Expertise Centre",*** *J. Chinaud et al.*