The IASI-NG mission

After the success story of IASI, CNES and EUMETSAT have decided to develop the next generation of atmospheric sounder, in the frame of the EPS-SG program. IASI-NG is an interferometer, that will scan the atmosphere in the infrared wavelengths, with a radiometric noise and a spectral resolution twice smaller than for IASI.

See F. Bermudo’s poster for IASI-NG program overview

In this collaboration, CNES is in charge of the development of the IASI-NG system, including the instrument but also the processing chain (in the space and ground segments). This Level 1 processing enables the transformation of raw interferograms to fully calibrated spectra (level 1C), correcting various instrument effects.

The Level 1 processing chain

1) Pre-processing part

- Internal imager geometry and acquisition modes
- On-board/ground sharing is driven on-board and on-ground processing
- In the on-board processing, this task is performed within the IMA
- In the on-ground processing, this task is performed within the Metimage
- Radiometric and geometric correction of the IMA and Metimage images

The main goal of this pre-processing part is to "regularize" the acquired spectrum, in:
- Correcting the spike when possible
- Accurately estimating the Zero Path Difference of the corresponding interferogram
- Apodizing the interferogram

2) Core part

- Radiometric calibration
- Resampling
- Uncompressed spectra
- Raw target (FP)

In the core part of the OGP science, the ISRF (estimated by the ISRF-EM chain) is removed and the radiometric calibration of the spectrum is performed, using Black Body and Cold Space views.


1) Principle of the instrumental response removal

In the IASI-NG level 1 processing, the ISRF is estimated for each spectrum acquisition through the SAS function (which is the Fourier transform of the ISRF).

This estimation is based on:
- A model of the instrument, called ISRF-Generator
- The exploitation of 5 metrology beams
- A Fabry-Perot interferometer and a database of atmospheric spectra, enabling the estimation of the spectral shift of the instrument
- A Doppler correction, based on the exploitation of Navsat data and a prediction model

2) Schema

3) SAS estimation

The estimation of the SAS function is based on the following equation:

\[
O_{PD}(\theta, r, X) = \frac{k_{(\text{Laser})} \times d_{\text{Int}}(\theta, r, X) + \delta O_{PD}(\theta, r, X)}{k_{(\text{Laser})} \times d_{\text{Int}}(\theta, r, X) + \delta O_{PD}(\theta, r, X)} + C_{\text{A}(\theta)} \times \text{att}g(r) + C_{\text{A}(\theta)} \times \text{att}g(r) + \text{att}g(r)
\]

Development of the Ground Segment

The IASI-NG Ground Segment is composed of:
- IDS, a functional simulator of the instrument (dev’ started in May 2016)
- IRIS, the scientific simulator of the system (dev’ started in May 2016) used for prototype and validation purposes
- L1cPOP, the operational Level 1 processing (dev’ started in January 2017)

- On-Ground Processing science, in charge of corrected the acquired spectra
- On-Ground Processing ISRF- Estimation Model, will estimate the Instrument Spectral Response Function of the instrument for each acquisition
- On-Ground Processing image, dedicated to the processing of the image data

Current system performances budget

System Performances Budget

The System performance budget includes contributions coming from the instrument, the satellite, the on-board and on-ground processing. The imperfection of the data are assessed at level 1C and are compared to the mission requirements, in terms of:
- Radiometric performances
- Spectral performances
- Geometric performances

This current budget is based on the best knowledge of the instrument design given by Airbus Defense and Space.

It has been established for a typical case, over an homogeneous scene.

A future version of this budget should be provided early next year, with updated performances of the detectors and for heterogeneous scenes as well.