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IASI-NG
A more precise look on the Earth Atmosphere

IASI-NG L1C PROCESSING: OVERVIEW OF THE SOUNDER PROCESSING ALGORITHMS

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The IASI-NG L1c processing performs the **radiometric and spectral calibration of the measurements**, in order to provide the users with L1c spectra free from instrumental effects. The radiometric calibration is similar to IASI and relies on Cold Space (CS) and internal Black Body (BB) views. Concerning the spectral calibration, the complexity of the Mertz interferometer architecture makes it necessary to perform a dynamical estimation of the Instrument Spectral Response Function (ISRF), using metrology laser measurements. This new feature has led to **major evolutions of the processing algorithms**.
The processing chain has three main parts :

- the **science data processing**, where the atmospheric spectra are spectrally and radiometrically calibrated
- the **ISRF estimation**, that computes an estimation of the SAS (Self Apodization Sampled function, Fourier transform of the ISRF) from metrology data and an ISRF model
- the **spectral shift estimation**, an asynchronous chain to estimate the residual spectral shift on the data and update the ISRF model

SCIENCE DATA PROCESSING

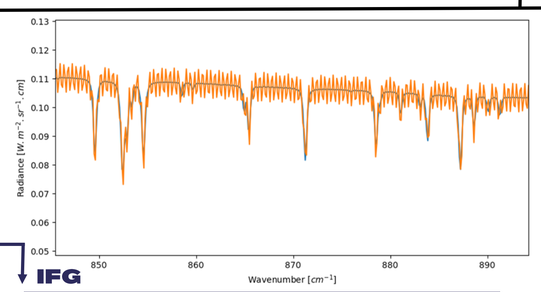
Instrument TM

SPC

Spike detection and correction

Spike position and amplitude estimation, spectrum correction

SPC

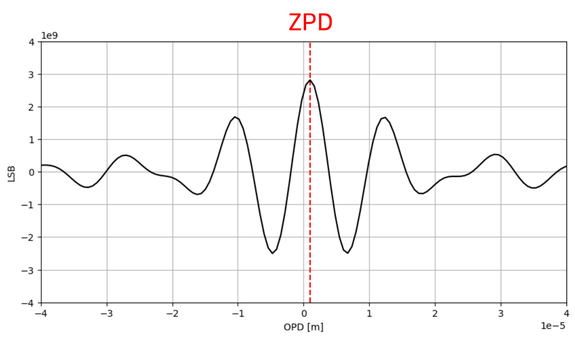


IFG

Science ZPD estimation

Linear fit of the spectrum phase

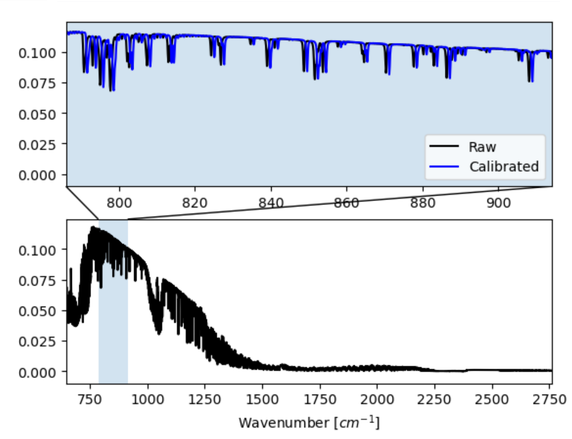
ZPD



Interferogram resampling

On the L1c OPD grid, around ZPD

SPC



Spectral calibration

Spectrum deconvolution with the estimated SAS functions

SAS

Instrument TM

Sat. orbital position

SPC (BB,CS)

Radiometric calibration coefficients estimation

With BB and CS views, using internal BB and scan mirror models, accounting for parasitic fluxes. Temporal averaging of the coefficients

Slope
Offset

SPC (EV)

Radiometric calibration

Linear calibration of Earth-View complex spectra

Band merging

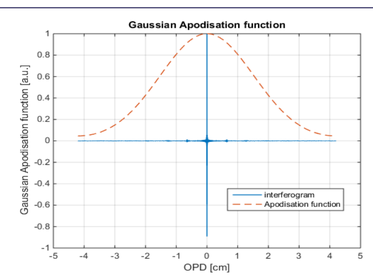
Linear combination of the four band spectra

IASING L1c product

IFG

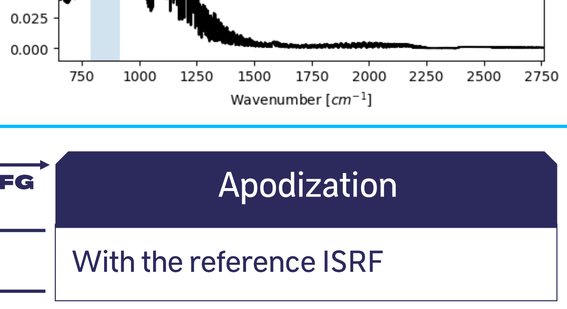
Apodization

With the reference ISRF



$S_{physical}(\sigma)$ [W.m^{-2}.sr^{-1}.cm]

$S_{numeric}(\sigma)$[counts]

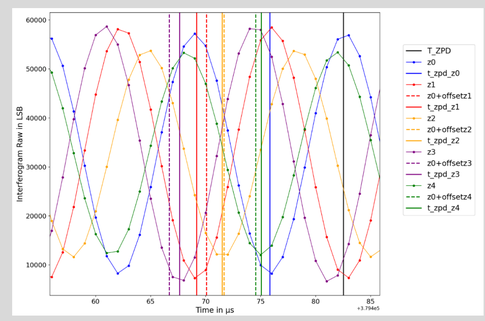


ISRF ESTIMATION

MET

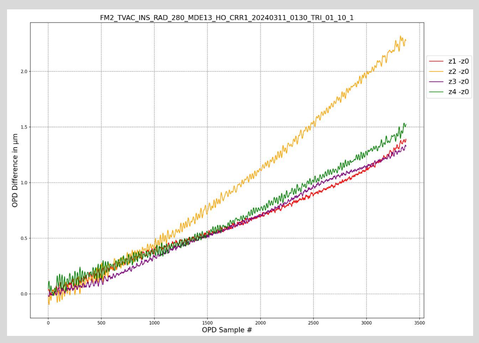
Metrology signals formatting

Time synchronization with science data, phase unwrapping, conversion to OPD



Metrology ZPD estimation

Fringe selection of the metrology interferogram using the science ZPD



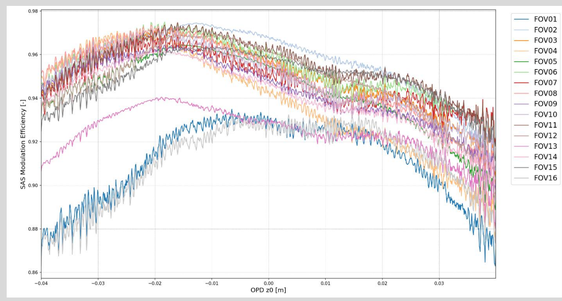
Metrology resampling

On a downsampled L1c OPD grid, around ZPD

Doppler speed

SAS computation

Linear combination of the metrology OPDs with modelled coefficients



$$SAS(\sigma, Z_0) = \iint_{FoV} \iint_{pupille} \rho(\sigma, \vec{r}_{field}, \vec{r}_{pup}) \times \exp\left(-2i\pi\sigma\left(\sum_{i=0}^{5} C_i(\sigma, \vec{r}_{field}, \vec{r}_{pup}, Z_0).Z_i - Z_0 + zpd\right)\right).d\vec{r}_{field}d\vec{r}_{pup}$$

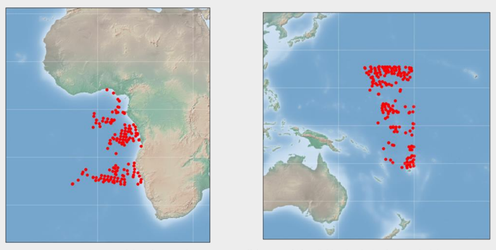
ISRF coefficients

SPECTRAL SHIFT ESTIMATION

L1c SPC

Spectrum collection

In tropical zones, over sea, cloud-free, night acquisition

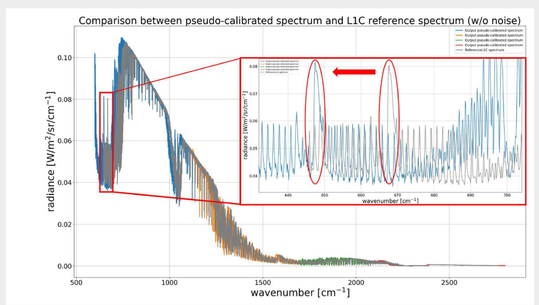


Positions of clear-sky spectral measurements off the coast of Africa (left) and in the Pacific Ocean (right).

Mean SPC

Spectral shift estimation

Shift estimation by comparing the mean spectrum to a reference simulated spectrum



Spectral shift law

ISRF model coefficients update

Update of the ISRF model coefficients

Modelled ISRF coefficients