IASI-NG L1 processing: new algorithms to calibrate a new instrument

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The development of the IASI-NG System, under responsibility of CNES, includes the development and delivery of IASI-NG instruments (to be flown on the Metop-SG A Satellites serie, the development of the Level 1 C Processor (L1C POP) as part of the EPS-SG ground segment, and the development of a Technical Expertise Centre (IASTEC) in charge of the in-flight calibration, validation and continuous performance monitoring.

The IASI-NG instrument represents a major technological gap compared to the IASI Fourier transform spectrometer. In order to be able to deliver data with both a twice lower radiometrical noise and a twice better spectral resolution, the IASI-NG interferometer design is based on the Mertz principle and uses movable prisms to compensate the so-called self-apodization effects. This change of instrumental concept and our ability to send together to the ground the real and imaginary part of the spectra lead to major changes in the definition of the IASI-NG algorithms compared to the IASI ones and generally to an increase in their complexity.

This paper presents the processing chains involved in the radiometric and spectral calibration of the IASI-NG spectra. The overall scheme of calibration is shown and a focus is put on major evolutions induced by the new IASI-NG instrumental concept. Logically, this new concept impacts mainly the algorithms in charge of the instrumental spectral response function estimation (ISRF-EM). Indeed, in order to preserve the IASI user-friendly approach and to deliver spectrally consistent data, the instrumental spectral response function (ISRF) of the spectrometer is continuously estimated on-ground and removed by the level 1 processing.

This estimation relies on both an instrumental model and observable parameters coming from five metrology beams, a Fabry-Perot interferometer or absorption features in the atmospheric spectra. We will describe the two main parts of this algorithmic chain dedicated to the estimation, on one part, of the spectral shift and on the other part, of the shape of the ISRF. The correction of these two
effects is done simultaneously in the on-ground processing by local deconvolution. The estimated ISRF is then removed and replaced by a perfect Gaussian function. This correction is applied to each interferogram and for each wavenumber because of the high chromatic effect (i.e. the variation of the relative spectral shift with the wavenumber) due to the use of refractive optical components to create opd. A status will be made on the algorithms definition and the first end-to-end validation studies on the whole processing chain conducted by the IASI-NG L1C team will be shown.