OVERVIEW OF IASI-NG STATUS AFTER PDR

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ABSTRACT

The Infrared Atmospheric Sounding Interferometer New Generation (IASI-NG) is a key payload element of the second generation of European meteorological polar-orbit satellites (METOP SG) dedicated to operational meteorology, oceanography, atmospheric chemistry, and climate monitoring.

It will continue and improve the IASI mission in the next decades (2020-2040) in the field of operational meteorology, climate monitoring, characterization of atmospheric composition related to climate, atmospheric chemistry and environment. The performance objective is mainly a spectral resolution and a radiometric error divided by two compared with the IASI first generation ones.

The measurement technique is based on wide field passive Fourier Transform Spectrometer (operating in the 3.5 - 15.5 μm spectral range) based on an innovative Mertz compensated interferometer to manage the so-called self-apodization effect and the associated spectral resolution degradation.

We will present the current architecture and major performance expectations consolidated at the preliminary Design Review from analysis and breadboards testings.

IASI-NG processing overview

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ABSTRACT

IASI-NG System is developed by CNES and currently in phase B. It includes the development and delivery of IASI-NG instruments and Level 0 Processor (ICPU) to be flown on the Metop-SG A Satellites, the development of the Level 1 Processor (L1 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 present paper reports on latest developments of the Level 0 and Level 1 Processor concerning the IASI-NG sounder science data.

IASI-NG instrument generates sampled raw interferogram. The user product is level 1C. This corresponds to geo-located atmospheric spectra, spectrally and radiometrically calibrated, after equalization of the instrument spectral response function and numerical apodisation with a truncated Gaussian function with a full-width half maximum of 0.25 cm^{-1}.

Opposite to the IASI system, IASI-NG level 0 data transmitted to the ground segment consist of uncalibrated, complex raw spectra. In addition to the removal of instrument dependent variations of the spectral response, and to apodisation, radiometric calibration will also be part of the Level 1 processor.

While the successful principles of IASI level 0 and level 1 processing are adopted for IASI-NG, some modifications, on the background of a modified instrument concept, are required in view of the main design drivers (SRF Estimation model accuracy, enhanced performance requirements, computation time constraints).

One key aspect is equalization of the instrument spectral response function and numerical apodisation in one operation. This implies a "quasi-monochromatic", time efficient removal process applied to the response of each spectral channel. The second key aspect is the quality of the SRF estimation process, for IASI-NG supported by additional in-flight measurements (multi-laser metrology, Fabry-Perot device, wave front sensor mode).

The paper presents details on these key aspects.

Scientific perspectives and challenges for IASI-NG

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ABSTRACT

In the framework of the EPS-SG program of EUMETSAT, CNES is currently preparing the IASI-NG (IASI-New Generation) mission that will fly on the ESA Metop-SG satellite series. The preparation of this mission, which has now moved to Phase-C, was a long-term process involving research and operational communities, industry and space agencies. Scientists from 3 communities – NWP, climate and atmospheric composition- first defined the goals of the mission and established the scientific requirements to fulfil these goals (what to measure, with which accuracy, and at what spatial/temporal sampling). They then translated these needs in terms of instrumental specifications (what spectral range, which radiometric performance/spectral resolution, what footprint/horizontal coverage). After the selection of an instrumental concept that fulfilled these specification, the Mertz interferometer proposed by Airbus Defence and Space, iterations started under the umbrella of CNES and EUMETSAT to prioritize the requirements and to relax some specifications if needed.

The first part of this presentation will detail the studies that have been done by the scientific community, in the framework of the ISSWG and MENINGE groups, in order to narrow IASI-NG specifications to an improvement of the spectral resolution (factor of 2 as compared to IASI) and the radiometric noise (factor of 2 in the longwave, better in the shortwave and in some spectral regions particularly important for atmospheric composition), and how these choices led to the definition of a baseline for the instrument.

The second part of this presentation will present the current state of the IASI-NG science plan that is structured around three main objectives: (i) continuity of the Metop series; (ii) improvement of vertical coverage, especially in the lower troposphere; (iii) improvement of the precision and detection threshold of atmospheric and surface components. In particular, we will discuss the status of activities that need to be undertaken in order to validate the scientific results that will be achieved by IASI-NG.