# Establishing essential climate variable data records from 3 successive Metop/IASI

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## ABSTRACT

Since its first launch onboard Metop-A in October 2006, and then onboard Metop-B in September 2012 and Metop-C in November 2018, IASI contributes to the establishment of robust long-term data records of several essential climate variables. Owing to its launches onboard 3 successive Metop platforms, IASI has the potential to monitor the evolution of these variables over two decades, to assess potential trends, and to detect signatures of specific climate events, such as ENSO or other sources of climate variability. To fulfill these objectives, it is mandatory that each successive IASI instruments are spectrally and radiometrically well characterized individually and among themselves.

We will show that the IASI instruments display exceptional spectral and radiometric stabilities, and that the 3 instruments agree at the level required for climate monitoring, far beyond its original specifications. Results will be presented at both level1 and Level 2. For Level 1, we will rely on IASI radiance monitoring and intercomparison with companion instruments done in the framework of the Global Space-based Inter-Calibration System (GSICS) of WMO. For Level 2, we will focus on five essential climate variables that are retrieved at LMD: (i) clouds: physical and microphysical properties; (ii) greenhouse gases: mid-tropospheric integrated content of $CO_2$, $CH_4$ and CO; (iii) dust aerosols: AOD, altitude, and radius; (iv) continental surface characteristics: skin temperature and spectral emissivity; (v) outgoing longwave radiation. We will highlight the crucial need of constant monitoring and understanding of any change at instrument level, in order to avoid any spurious signal.

Use will be made of the processing chain of satellite observations that has been developed for many years at LMD and that includes: permanent validation and improvement of the GEISA spectroscopic database and of the radiative transfer code 4A (which are respectively the official database and code for IASI Cal/Val activities at CNES), development of dedicated cloud and aerosol detection schemes, retrieval processes, and validation activities.

As the suite of long time series of climate variables retrieved from IASI continues to expand, we will argue that IASI has already demonstrated that it can and will play a major role in the monitoring and understanding of climate evolution and variability.