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An IASI Processing System for Joint Retrieval of Temperature, Humidity, SST, Ozone, and other Trace Gases and its Coupling to a Climate Monitoring System

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The Infrared Atmospheric Sounding Interferometer (IASI) is flown aboard the European operational meteorological satellite series MetOp of EUMETSAT (first satellite recently launched on Oct. 19, 2006). It aims at significant further improvement of temperature and humidity profiling compared to existing operational satellites due to its high spectral resolution ($\lesssim$0.5 cm^{-1} from 645 cm^{-1} to 2760 cm^{-1}). Furthermore, it can deliver ozone profiles, surface skin temperature, column amounts of nitrous oxide (N_2O), methane (CH_4), and carbon monoxide (CO), and cloud parameters. Applications like numerical weather prediction as well as climate studies will benefit from these improvements. The aim of our data analysis preparations is the utilization of the retrieved data for climatological purposes, in particular for simultaneously monitoring climatic changes in the thermal structure of the atmosphere, in upper troposphere moisture, and in SST. An additional application of IASI is the observation of changes in the trace gas composition of the atmospheric species ozone (O_3), methane (CH_4), carbon monoxide (CO), and nitrous oxide (N_2O).

We show the advancements of our joint algorithm relying on the extension of the retrieval system to the species methane (CH_4), carbon monoxide (CO), and nitrous oxide (N_2O). During this process we upgraded the forward model (and adjoint model) RTIASI to version 5.3 in order to obtain the Jacobians of the newly treated trace gas components for usage in the retrieval. The potential of the IASI spectra regarding the vertical resolution of these components is examined. Based on the resulting profiles/columnar contents, the generation of monthly mean fields on a 2.5° lat $\times$ 2.5° lon grid for monitoring climate variability is demonstrated, where strong WegCenter

climatology processing system heritage from radio occultation data processing exists, enabling intercomparison with MetOp/GRAS (GNSS Receiver for Atmospheric Sounding) climatologies. Finally, the inclusion of a cloud detection (cloudy profile elimination) scheme, used for pre-processing the IASI radiance spectra, is adressed.