

Investigating possible contributions of IASI/IASI-NG for bridging the upcoming gap of limb sounding observation capabilities

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Satellite instruments that measure the atmosphere in limb-viewing geometry are very successful in observing vertical profiles in and above the UTLS (upper troposphere/lower stratosphere), thus providing a unique data pool for investigating the impact of the UTLS on weather and climate. Unfortunately, missions like MIPAS, ACE-FTS, or Aura/MLS have already ended or are expected to end in several years before respective next-generation missions will be operative (e.g. the current ESA Earth Explorer 11 candidate CAIRT). Here we give some examples and discuss to what extent IASI/IASI-NG can bridge this upcoming observational gap.

Firstly, we present the update of our MUSICA IASI retrieval processor, which we use for this study. The update consists in fitting spectral signatures from 1142-1585cm⁻¹ and in simultaneously retrieving vertical profiles of six different trace gases, the HDO/H₂O trace gas ratio and atmospheric temperature. We give a brief overview on the quality of the data obtained with our new processing version.

Secondly, we investigate two events for which different scientific studies have reported a significant alteration in the UTLS and the stratosphere: the Australian wildfires in 2020 and the Hunga Tonga-Hunga Ha'apai volcanic eruption in 2022. We document the anomalies we see for these two events in different MUSICA IASI products, with a focus on H₂O, N₂O, SO₂, and PAN between 300hPa and 10hPa. In addition, we compare the MUSICA IASI data products to collocated observation of the two limb-sounders Aura/MLS and ACE-FTS.

We conclude, that due to their long-term availability (from the 2000s to the 2040s), the IASI/IASI-NG missions offer valuable possibilities for linking past/present and future UTLS limb-sounding satellite data products, thus reducing the scientific impact of missing limb data products in the next decade.