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Investigating possible contributions of IASI/IASI-NG for bridging the upcoming gap of stratospheric water vapour limb-sounding observations

Satellite instruments operating in limb-viewing geometry provide independent measurements of different parts of the atmosphere (e.g., stratospheric details without tropospheric interferences). Unfortunately, missions like MIPAS, ACE-FTS, or Aura/MLS have already ended or are expected to end several years before respective next-generation missions will be operative (e.g. the current ESA Earth Explorer 11 candidate CAIRT). The thermal nadir measurements of IASI/IASI-NG are guaranteed for 2006 –2040s and could bridge this gap from a temporal viewpoint; however, they represent the whole atmosphere (above the surface or dense clouds), which makes a detection of stratospheric details independently from tropospheric interferences difficult. Here we discuss to what extent IASI/IASI-NG measurements can be used to detect stratospheric water vapour (SWV) anomalies independently from tropospheric water vapour interferences, despite the aforementioned difficulties.

Firstly, we present the update of our MUSICA IASI retrieval processor, which we use for this study. We present a retrieval performance test that demonstrates the capability of IASI/IASI-NG for detecting SWV anomalies. The capability of detecting SWV anomalies with thermal nadir observations can be explained by the thermal contrast between the cool tropopause and the warm stratosphere. Secondly, we document that the anomalies seen in the IASI data following the Ha'apai volcanic eruption in 2022 is in line with the anomalies as observed in the datasets of the two limb-sounders Aura/MLS and ACE-FTS.

We conclude, that due to their long-term availability (from 2006 to the 2040s), the IASI/IASI-NG missions offer valuable possibilities for linking past/present and future limb-sounding SWV data products, thus contributing to reduce the scientific impact of the upcoming limb-sounding data gap.

Topic

Current and past limb and occultation instruments: algorithms, products, validation

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