Validation of the IASI CH₄ and N₂O products using ground-based FTS: Preliminary results at the Izaña Observatory (28°N, 17°W)



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IASI (Infrared Atmospheric Sounding Interferometer) is a key remote sensor for EUMETSAT's contribution to climate monitoring, since it offers a unique combination of long-term data availability, high quality, global coverage, and good measurement frequency. IASI operationally measures H₂O and O₃ profiles as well as total column amounts of H₂O, O₃, CH₄, N₂O, CO₂ and CO. Within the project VALIASI (VALidation of IASI level 2 products, supported by EUMETSAT) the validation of the IASI/MetOp-A operational atmospheric trace gas products (2007-2012) will be carried out by using ground-based **FTS** (Fourier Transform Spectrometer) trace gas data as reference.



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Comprehensive long-term validation for IASI trace gas products using one single measurement techniques as reference



IASI

• We use IASI_L2 N₂O and CH₄ Total Column (TC) on MetOp-A (over sea and cloud-free), which have a target uncertainty of 20% [August et al., 2012] (V4: 2008-September 2010 and V5: September 2010-onwards).

The Izaña Atmospheric Observatory IZO (28°N, 17°W)

observatory, located at 2.37 km altitude above a tradewind temperature inversion layer acting as a barrier for local pollution. So, it offers excellent conditions for remote sensing of the atmosphere. IZO FTS contributes to the NDACC (Network for Detection of Atmospheric Composition Change) and TCCON (Total Carbon Column Observing Network) since 1999 and 2007, respectively.

of Tenerife Island is a subtropical high mountain

• The knowledge of the IASI vertical sensitivity is indispensable for a comprehensive IASI validation. On the right, CH₄ averaging kernel example from the IASI_MUSICA retrieval [Schneider and Hase, 2011; Schneider et al., 2013] (not IASI_L2 retrieval, since not operationally available).

FTS

• FTS N₂O and CH₄ Volume Mixing Ratio (VMR) profiles are retrieved with the algorithm PROFFIT [Hase et al., 2004] from NDACC solar absorption spectra between 2480-2945 cm⁻¹. FTS detects two independent N₂O and CH₄ partial columns (DOFS-2) corresponding to the troposphere and the stratosphere.

• FTS N₂O and CH₄ TCs are calculated by integrating the FTS VMR profiles from 2.37 km to 85 km, with a theoretical precision of better than 1%. The N₂O and CH₄ partial columns between sea level and 2.37 km are obtained by extrapolating the N₂O and CH₄ VMR profiles obtained by the FTS.

Day-to-Day Intercomparison

Monthly and Annual Cycle Intercomparison



✓ FTS is a powerful tool to validate IASI_L2 products: high precision, high measurement frequency and good vertical resolution.

✓ For IASI-FTS N₂O and CH₄ intercomparison:

1) Significant improvement for IASI_L2 V5. The scatter (±1 Std Dev) of the relative differences time series between IASI_L2 and FTS Total Columns is reduced about half from IASI_L2 V4 to V5: from 3.9% to 1.5% for N₂O and from 3.0% to 1.2% for CH₄.

2) IASI-FTS N₂O and CH₄ Total Columns are not correlated, but there is a reasonable correlation between the CH₄ FTS concentrations in the tropopause region (10-14 km) and IASI_L2 Total Columns. In subtropical region N₂O and CH₄ IASI_L2 Total Columns mainly reflect the variability of the tropopause region.

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REFERENCES

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Validation Strategy



Longitude [*]

Temporal Criterium: ±1h So restrictive to guarantee optimal validation conditions

Spatial Criterium:

±1° around IZO

No significant

influence of spatial

coincidence criterium



Coincidence Time [min]