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Assessment of methane using the IASI instrument

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Methane (CH_4) plays a key role in the atmosphere due to its strong absorption in the infrared region (making it the second most important anthropogenic greenhouse gas after carbon dioxide). Moreover, its reaction with the hydroxyl radical affects the cleansing power of the troposphere. Owing to the fact that its sources and tropospheric variability are still not well determined, uncertainties are introduced in its global budget and hence its impact on climate change is poorly quantified. Satellite observations are able to provide global distributions in shorts lapses of time and therefore help us detecting spatial and temporal variation of atmospheric methane concentrations.

The recently launched Infrared Atmospheric Sounding Interferometer instrument (IASI) has begun to release its huge flow rate of data in May 2007. This Fourier Transform interferometer, which measures the thermal infrared radiation in a nadir-like geometry provides a global Earth coverage twice a day. Owing to the extended spectral range of IASI (from 645 to 2760 cm^{-1}), methane can be retrieved from the radiance spectra in two different absorption bands (the ν_4 bending mode around 1306 cm^{-1} and the ν_3 stretching mode around 3020 cm^{-1}).

We present global distributions of methane retrieved from level 1c IASI data by using the Optimal Estimation Method. We show that the inclusion of some absorption lines belonging to the CH_4 ν_3 mode in the retrieval process provides enhanced sensitivity near the Earth's surface. Characterizations in terms of vertical sensitivity and errors are also discussed.