

A step towards IASI-NG: Simulation of orbits and first impact assessment compared to IASI

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I. Introduction

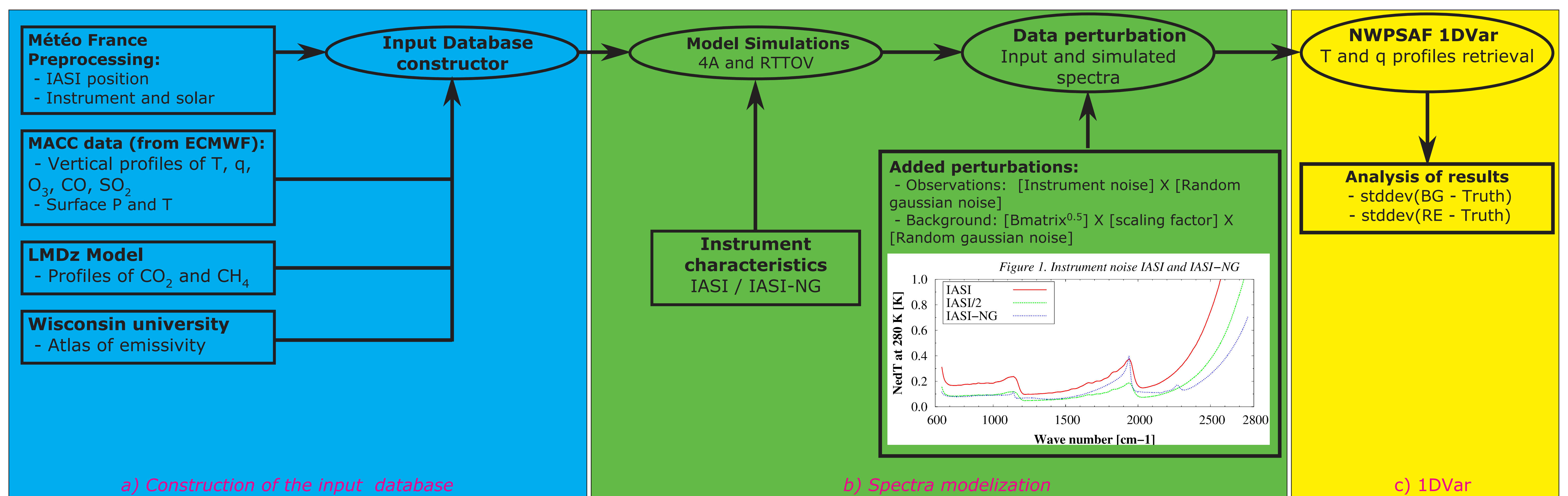
The hyperspectral infrared sounder IASI has already demonstrated its high capabilities for both Numerical Weather Prediction (NWP), atmospheric composition and climate studies. As the second generation of the European Polar System (EPS-SG) is being prepared, a new generation of IASI has been designed and will be on board EPS-SG: IASI-NG. IASI-NG will benefit from an increased design compared to IASI: double spectral resolution and radiometric noise decreased by a factor 2. In order to get ready to use this new instrument and to evaluate its impact on various applications, a series of simulated data are being built up. This presentation will describe the way the IASI and IASI-NG data have been simulated, as well as the selected dates. Then, from these new spectra, the first assessment studies will be described, with a specific focus on the clear cases to begin with.

IASI / IASI-NG comparison

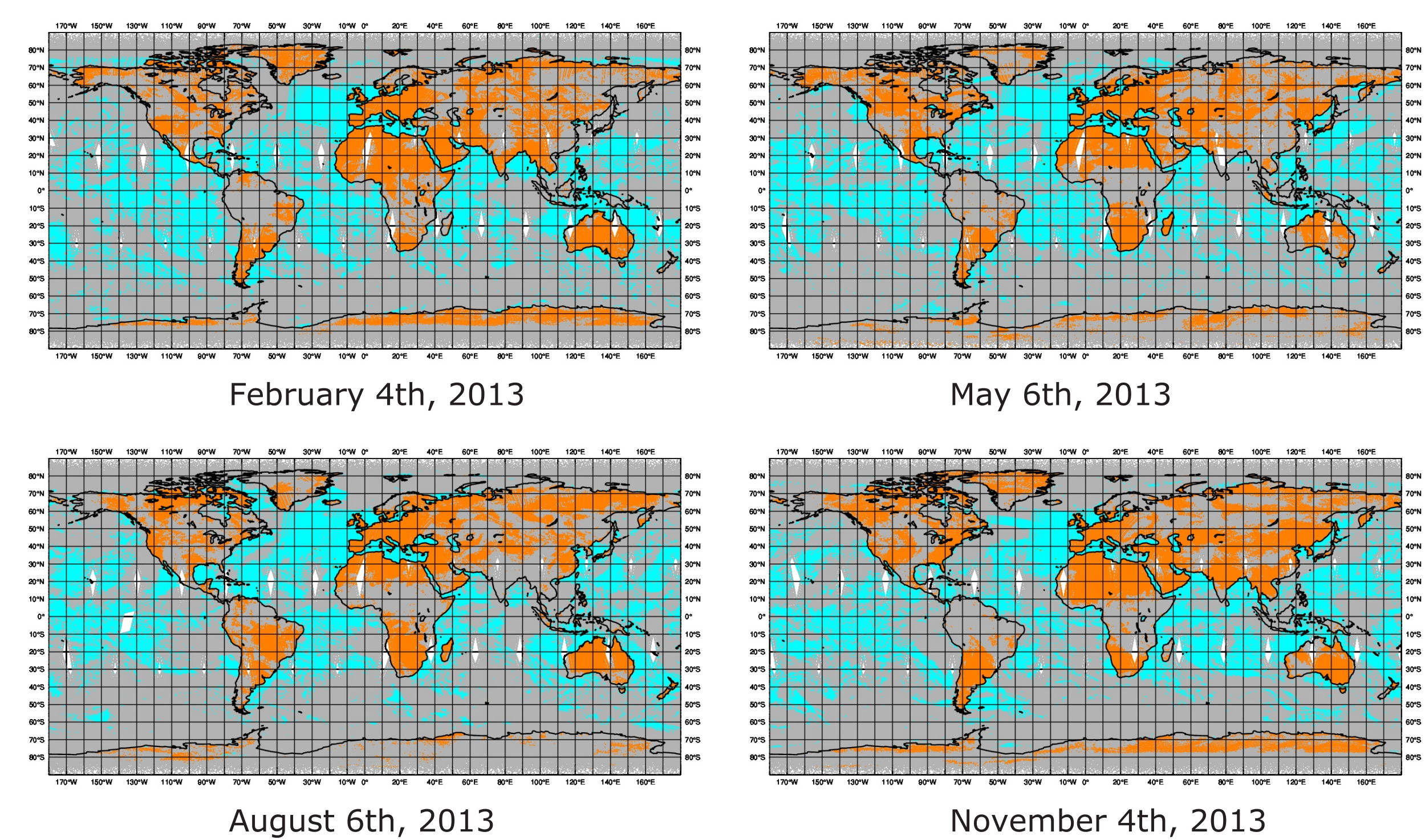
	IASI	IASI-NG
Spectral range	645 - 2760 cm^{-1}	
Spectral resolution	0.25 cm^{-1}	0.125 cm^{-1}
Num. of channels	8461	16921
Noise	See figure 1	
Pixel size	12 km	

II. Observing System Simulation Experiment (OSSE) construction

Four dates in the middle of each season from 2013 have been selected: February 4th, May 6th, August 6th and November 4th. The full orbit for each one of these dates are going to be computed for a total of 5.242.448 simulations for each instrument. The experiment is carried out into three steps: a) Construction of the input database containing all the required information, b) Simulations of the spectra for both IASI and IASI-NG will be carried out to generate the input data for NWP-SAF 1D-Var Software, both input data and spectra are perturbed before running the last step, and c) Both perturbed input data and spectra are introduced into 1DVar to compare the impact of IASI-NG new characteristics in the retrievals. At the current stage, a total of 318.391 spectra, under clear skies over sea conditions, have been simulated.

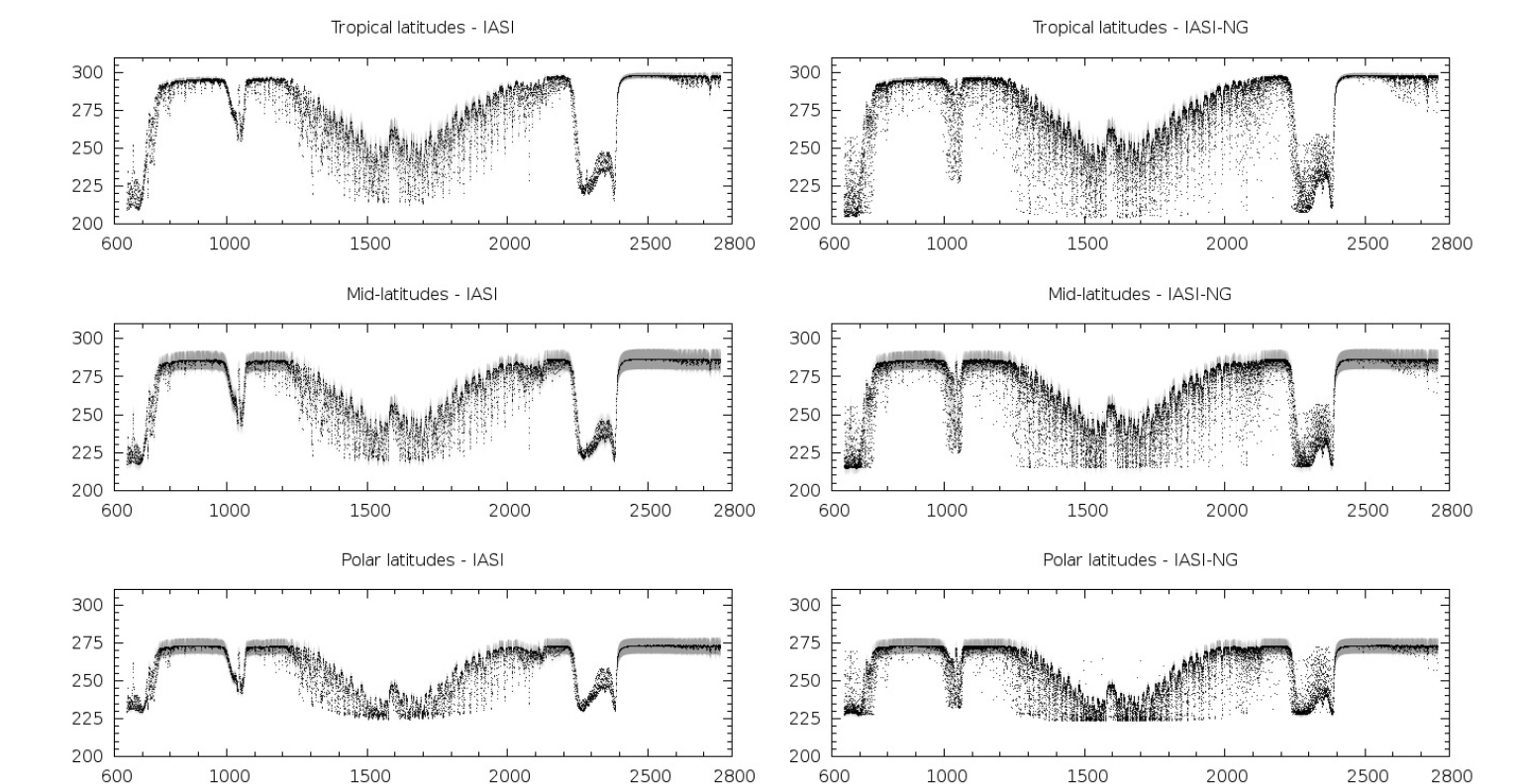
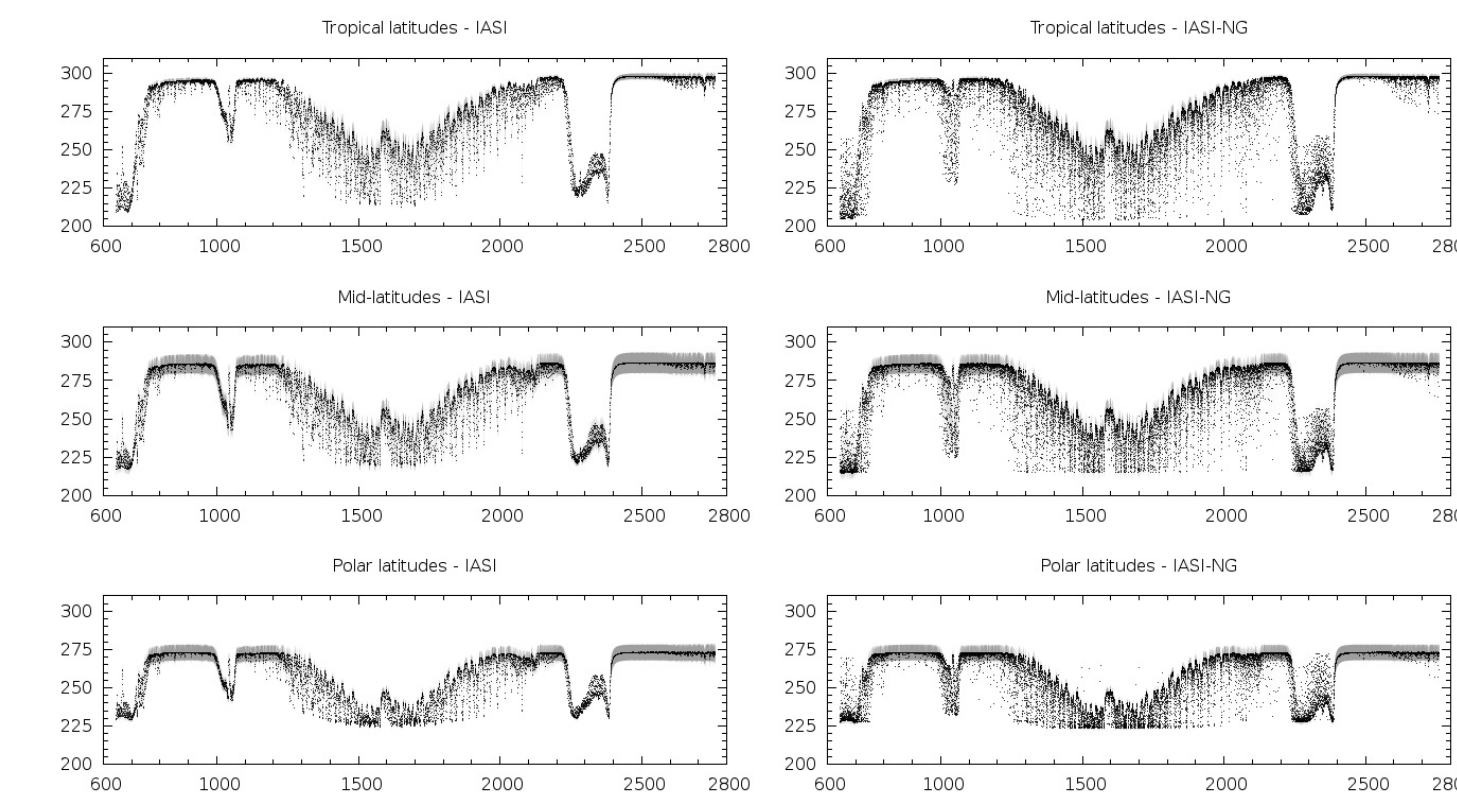


III. Localizations



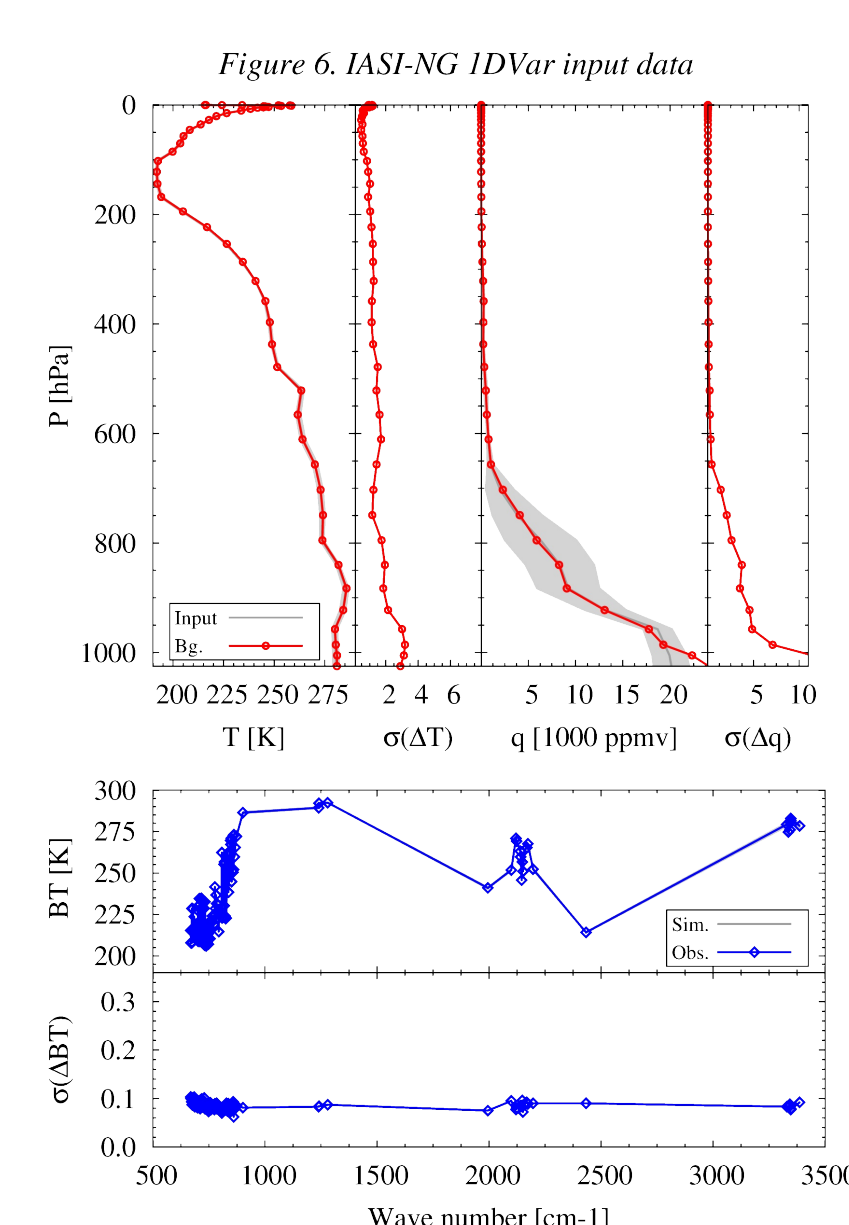
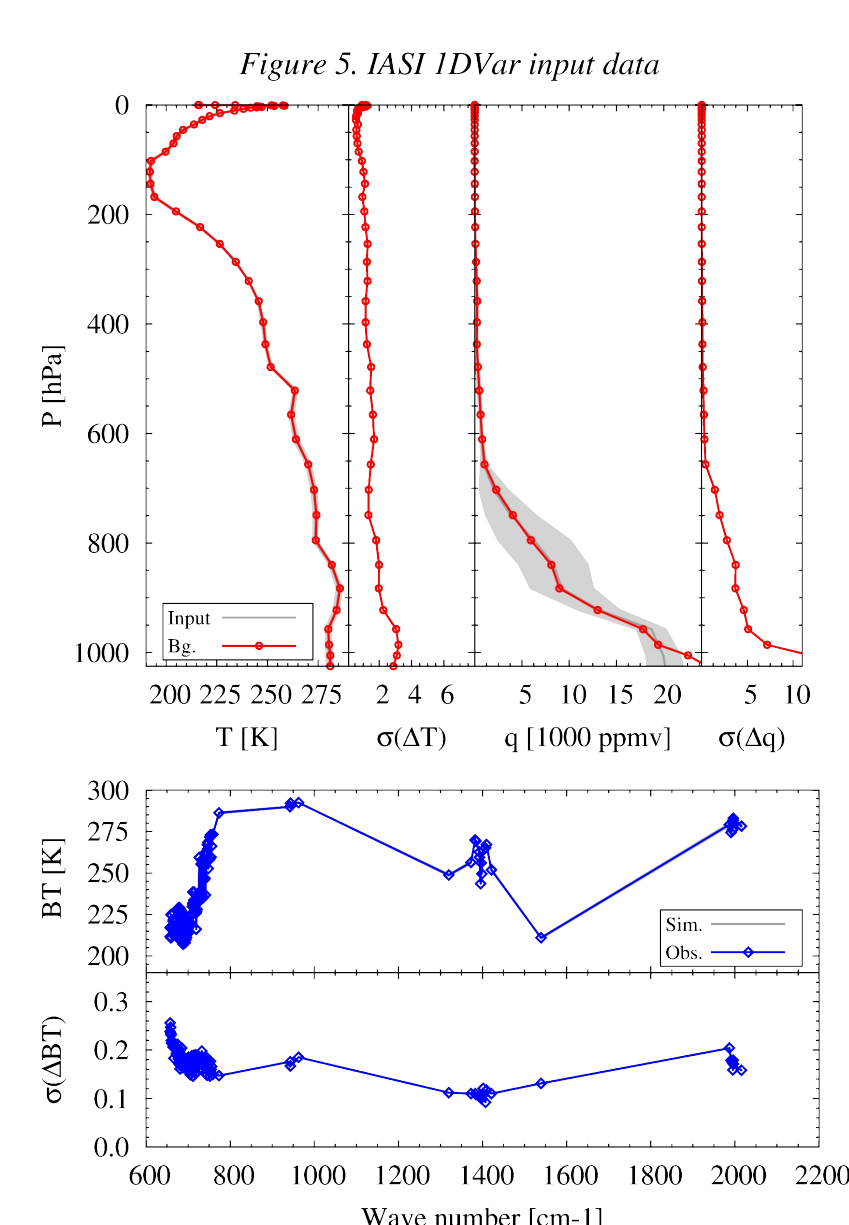
IV. Spectra simulations

The Clear sky over sea simulations have been classified into day/night (figures 3 and 4 respectively) and tropical/middle/polar latitudes (top/middle/bottom) for both instruments. The higher spectral resolution from IASI-NG produces sharper peaks in the spectrum.



V. 1DVar input data

Input profiles used in the model simulations have been considered as the Background profiles (BG) for 1DVar, and the simulated spectra constituted the observations performed by the satellite instruments. Background data were perturbed by using the square root of the eigenvectors from the 1DVar B-matrix multiplied by two, and the instrument noise multiplied by a random gaussian noise was added to the observations.



VI. Conclusion and future works

- An OSSE experiment is being conducted to assess the impact of IASI-NG, in comparison with IASI one, on NWP models, atmospheric composition and climate studies.
- IASI and IASI-NG spectra have been simulated for four dates in the middle of each season meaning around 318.391 cases for each instrument.
- Retrievals using Météo-France operational Channel Selection for IASI & proxy channel selection for IASI-NG will be carried out first.
- Channel selection methods will be applied to IASI-NG on this dataset in order to prepare its utilisation in global & mesoscale NWP models

Acknowledgements

The authors benefited from the RTTOV model and 1D-VAR software developed in the framework of the NWP-SAF of EUMETSAT and thank Pascal Brunel for his help.

References

C. Crevoisier et al. (2013): Towards IASI-New Generation (IASI-NG): impact of improved spectral resolution and radiometric noise on the retrieval of thermodynamic, chemistry and climate variables. Atmos. Meas. Tech. Discussion, Vol. 6, pp. 11215-11277