Validation of IASI OPS-LRS and comparison with global data

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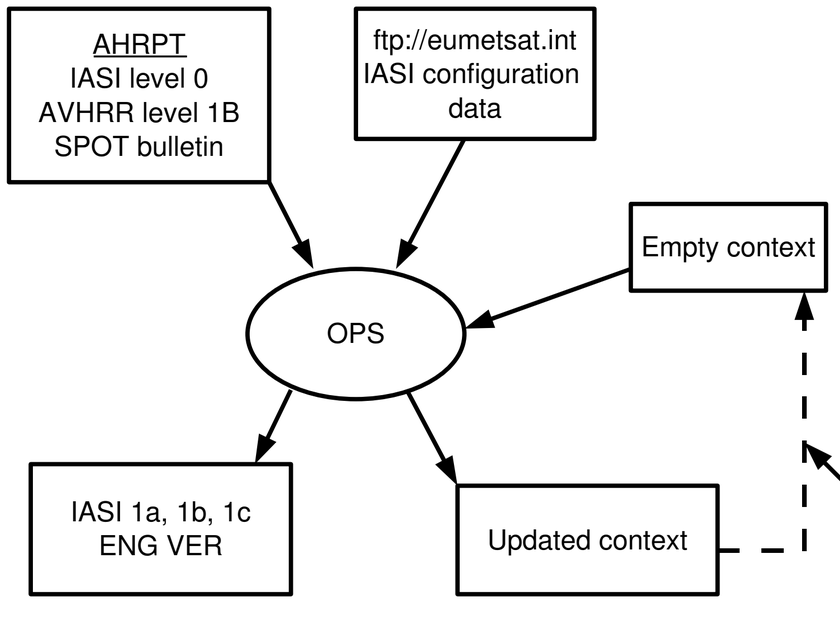
Introduction

OPS-LRS is a pre-processing package for IASI distributed and maintained by the EUMETSAT NWP SAF, and based on the original OPS code provided by the CNES. OPS-LRS processes local received level 0 data and produces level 1c radiances.
Global pre-processing takes place at EUMETSAT. The spectra produced there are available later than local 1c data because of the time constraints on data processing.
The differences between these two sources of IASI 1c data are presented in this poster.

IASI local pre-processing issues



OPS-LRS software / original OPS:
- AAPP navigation / MetopLib navigation
- Free mathematical libraries / ESSL library

Context file:
The context file contains historic data required by the pre-processing. It is saved before the OPS stops, and re-used when the OPS re-starts. Some IASI parameters are quite noisy and require time series to eliminate the noise.
When starting at time t, the OPS requires the context which was issued at time t – 1.
An outdated context cannot be used. Therefore:

Local processing always starts from an empty context file

Differences between OPS and OPS-LRS on a test data set provided by CNES (orbit 3704):

```
Titre  differences fichiers iasi 1c en Tb
nombre de classes   17
valeurs initiales   202860936
valeurs conservées  202860936
min        -0.014218970384035856
max        0.010158436686594996
moyenne    -2.0016341132532822E-11
stdev      1.2269195115630816E-6
rms        1.2269195117263415E-6

histogramme :
                                nvals     cumul  pourcent
[     inf   -10.000[              0
[ -10.000,  -5.000[              0   0.00000    0.0000
[  -5.000,  -1.000[              0   0.00000    0.0000
[  -1.000,  -0.500[              0   0.00000    0.0000
[  -0.500,  -0.300[              0   0.00000    0.0000
[  -0.300,  -0.200[              0   0.00000    0.0000
[  -0.200,  -0.100[              0   0.00000    0.0000
[  -0.100,  -0.050[              0   0.00000    0.0000
[  -0.050,  -0.025[              0   0.00000    0.0000
[  -0.025,   0.025[ 202860936   1.00000  100.0000
[   0.025,   0.050[              0   1.00000    0.0000
[   0.050,   0.100[              0   1.00000    0.0000
[   0.100,   0.200[              0   1.00000    0.0000
[   0.200,   0.300[              0   1.00000    0.0000
[   0.300,   0.500[              0   1.00000    0.0000
[   0.500,   1.000[              0   1.00000    0.0000
[   1.000,   5.000[              0   1.00000    0.0000
[   5.000,  10.000[              0   1.00000    0.0000
[     sup   10.000[              0
[ bad qual flag 1 [             24
[ bad qual flag 2 [             24
```

Average and extreme values very low

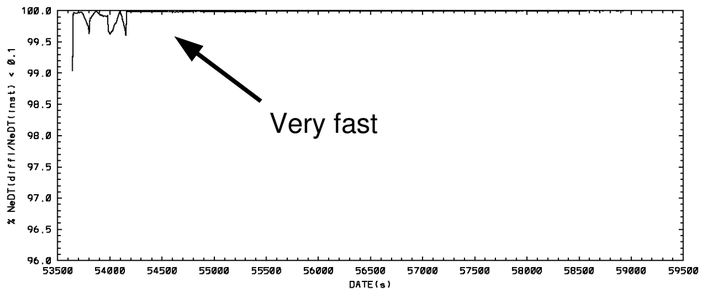
Same quality flags

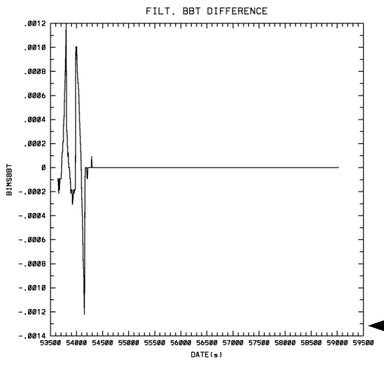
OPS and OPS-LRS yield identical results when run with the same data

Convergence between local and global

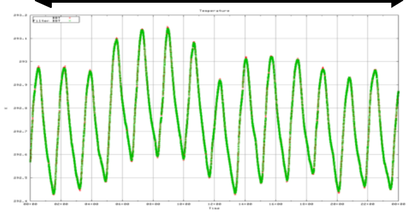
(Simulation of global using an initialized context)

1A





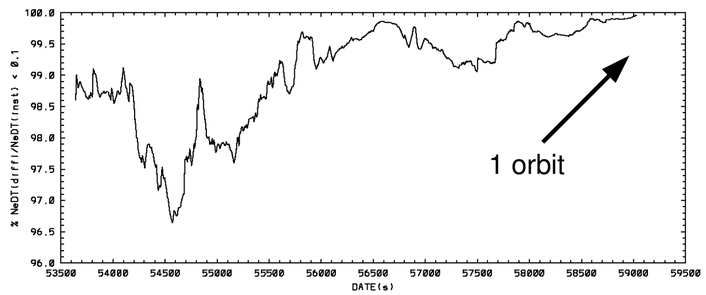
1 day

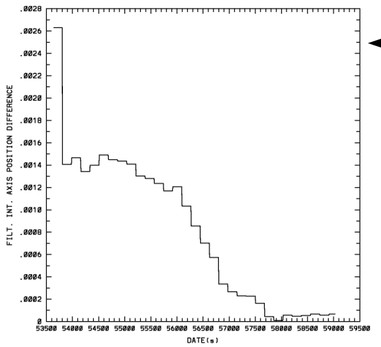


Parameters of the context file :

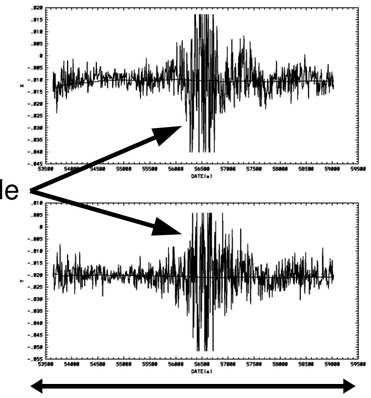
- BBT (varies smoothly)
- Interferometer axis position (noisy, hard to predict)

1C



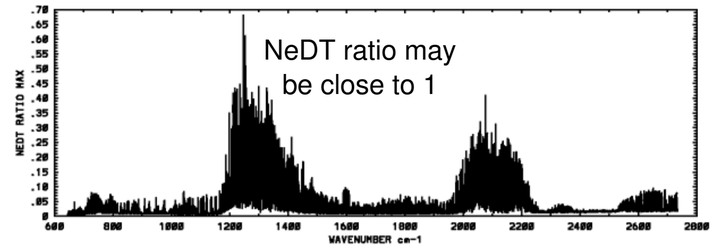


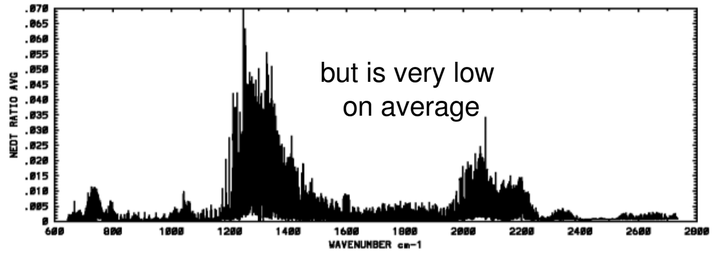
Cold pole

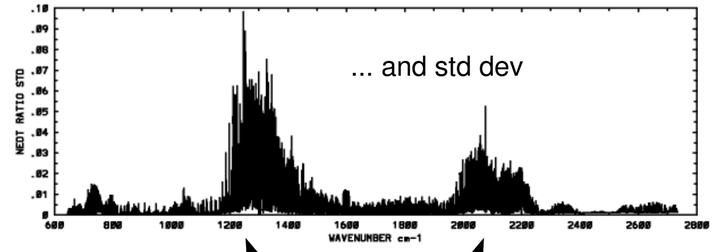


More than 95% of radiances differences are < 0.1 x NeDT(instr), but strict convergence requires 1 orbit

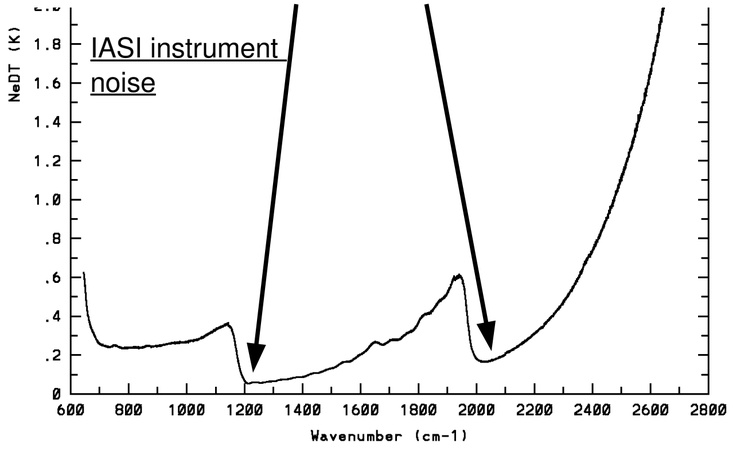
Error statistics (by wavenumber)







Largest NeDT ratio where IASI noise is very small



Conclusion

- The two software packages OPS and OPS-LRS give **identical results** when provided with the same data.
- Differences between local and global processing are explained by the **interferometer axis position history** contained in the **context file**.
- These differences are small; but **are they small enough** ?

  This question can only be answered by a NWP data assimilation system; we shall compare the impact on retrieved profiles.
- It is admitted by CNES that the interferometer axis moves very little. Using a fixed value in the context for the interferometer axis position would lessen dramatically the differences between the global and the local processing; would this be acceptable ?