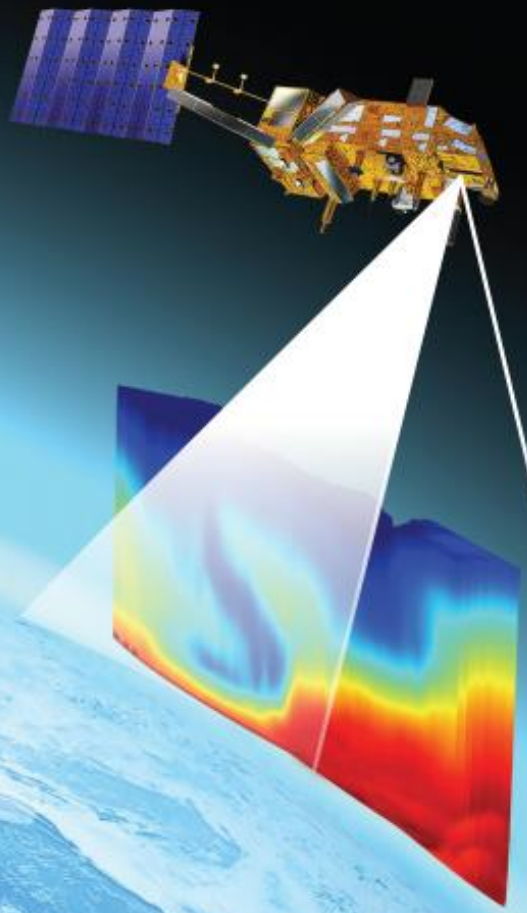
# Status of IASI instruments onboard Metop-A and Metop-B satellites

**Laurence Buffet**[(1)]
Colette Villaret[(1)]
Elsa Jacquette[(1)]
Olivier Vandermarcq[(1)]
Patrick Astruc[(2)]
Stephan Anstötz[(3)]

(1) cnes
(2) ThalesAlenia Space
(3) EUMETSAT

**IASI 2016**

**11-15 April 2016** Antibes Juan-les-Pins



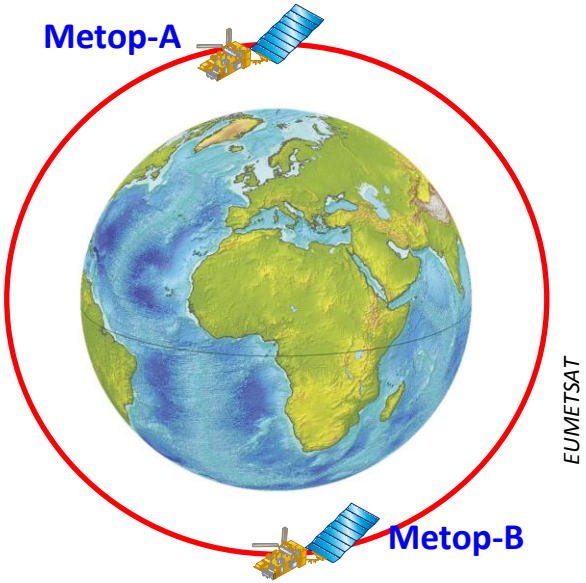
## 2 operational instruments

- **IASI-A since July 2007** (launched October 2006)
- **IASI-B since April 2013** (launched September 2012)

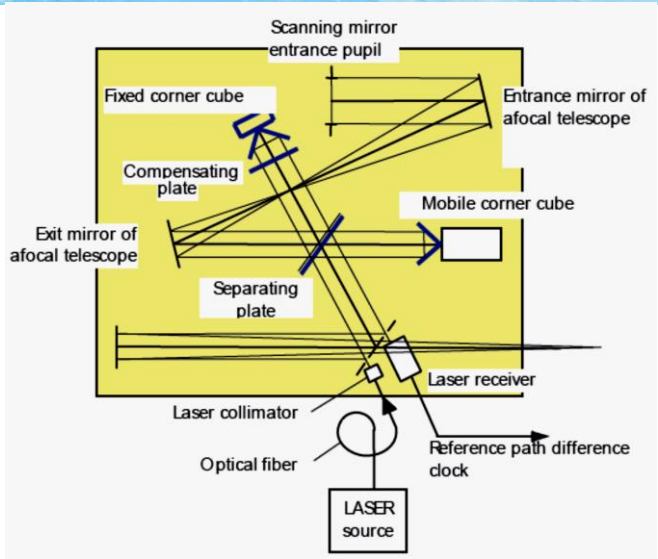
Mission extended for IASI-A : specified lifetime was 5 years

Both instruments deliver **very good performances**, **similar** between each other and with a **very good stability in time.** We also aim at maintaining a maximal operational **availability** for both instruments.

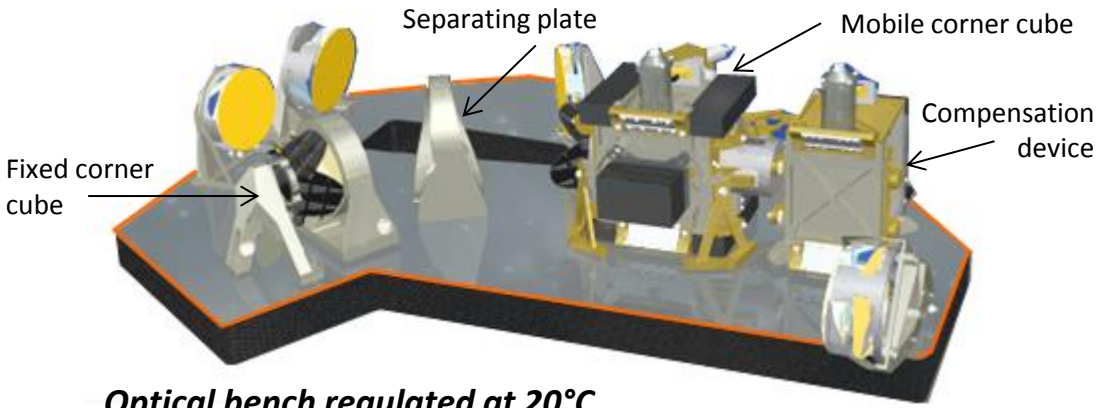
➔ **Performance status : poster S1-03 (Claire Maraldi)**




A **constant quality of distributed data** is guaranteed via an accurate monitoring of instrument performance indicators done by IASI TEC at CNES on L1 products. In addition, all the instrument housekeeping telemetries are ground monitored by EUMETSAT.

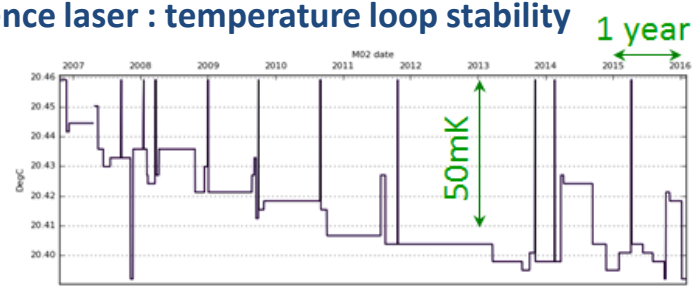



# Interferometer stability (1/2)

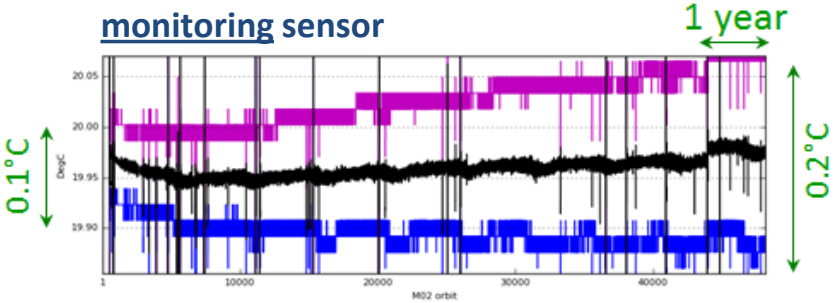



***Optical bench regulated at 20°C***

## Reference laser : temperature loop stability

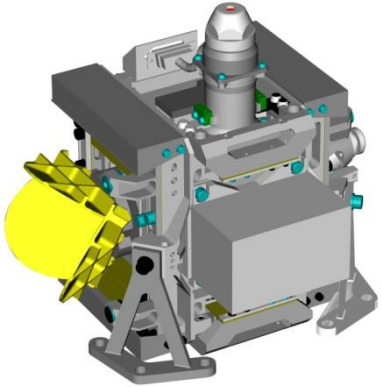


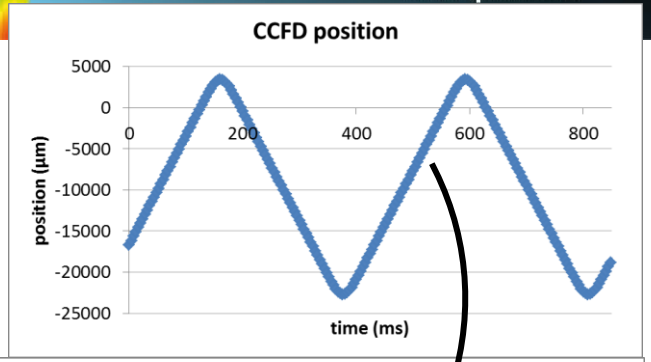

## Example of optics area temperature monitoring sensor

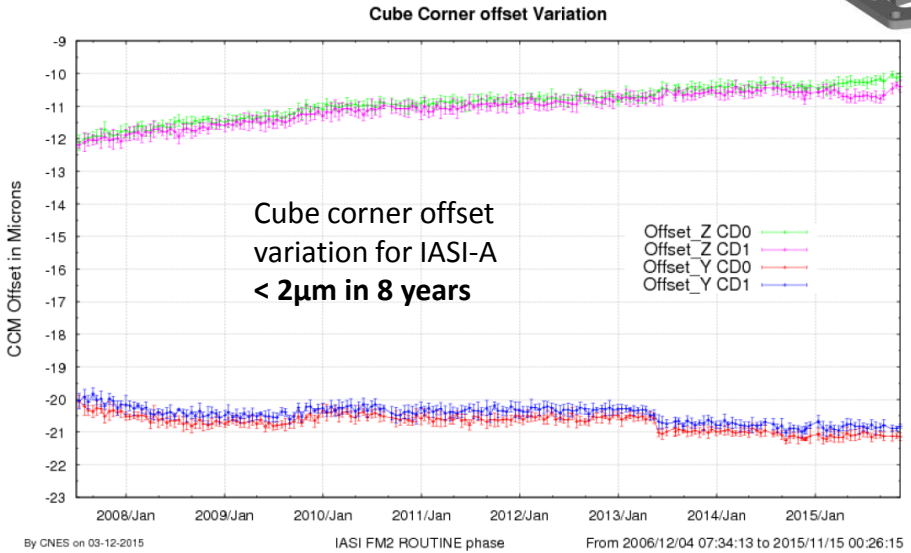


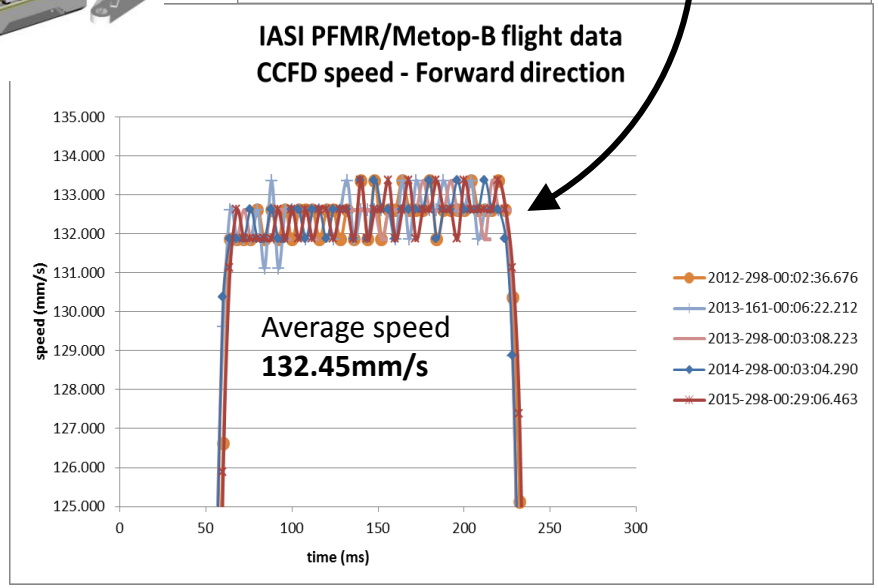
# Interferometer stability (2/2)

- **Stability of Corner cube mechanical performance**
  - Stable speed profile in both directions
- **Stability of Corner cube alignment**
  - Very low drift for both IASIs





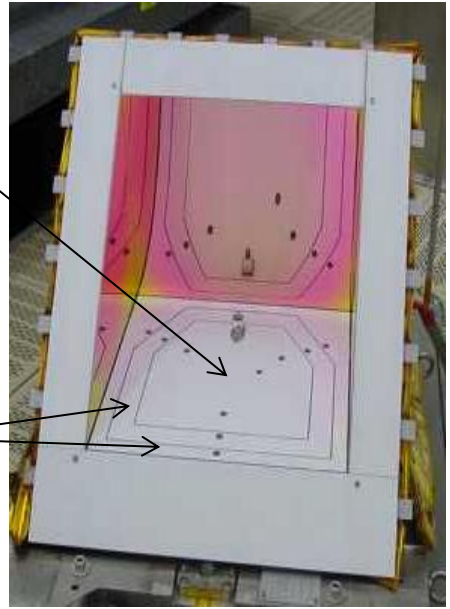



# Detectors temperature stability

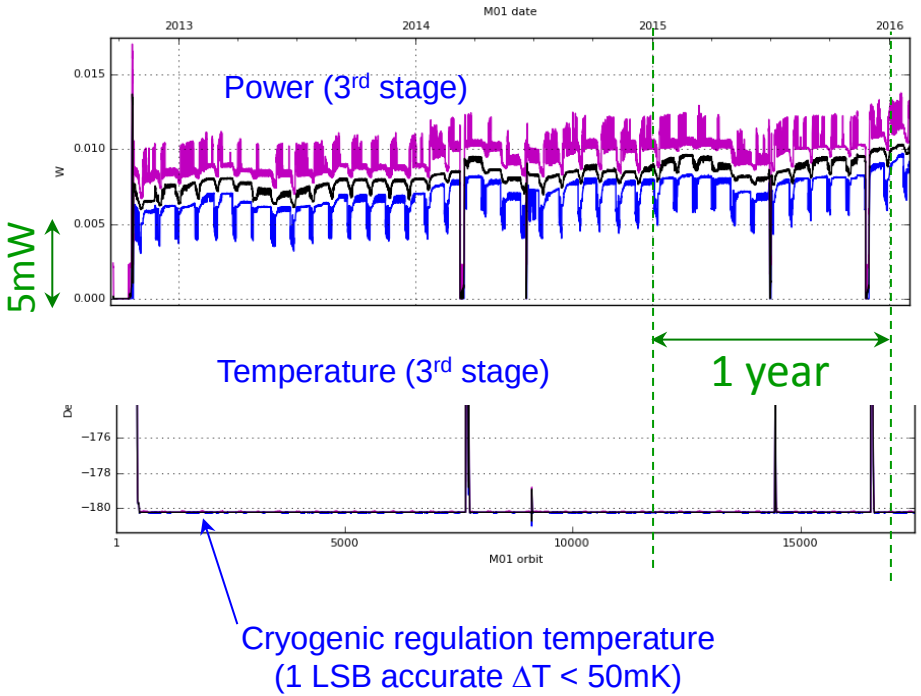
**CBS : 3 stages passive cryo-cooler**

3rd stage regulated temperature (=detector location stage) : perfectly stable at the target (close to 90K)

2nd and 1st stages unregulated temperature (decoupling stages) : stable (evolution <+0.2°C per year)



**Example of IASI-B**

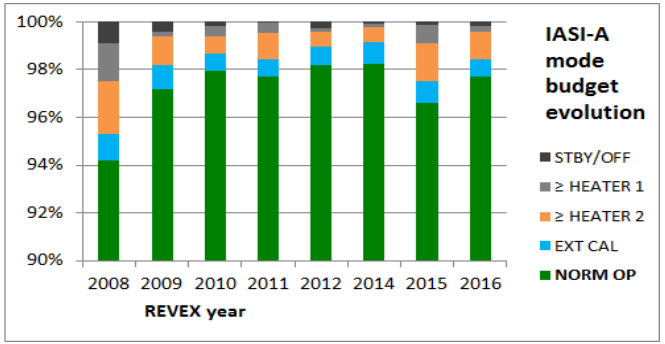


# Instrument availability

Instrument in **Normal Operation mode** ≈ 97% for each IASI

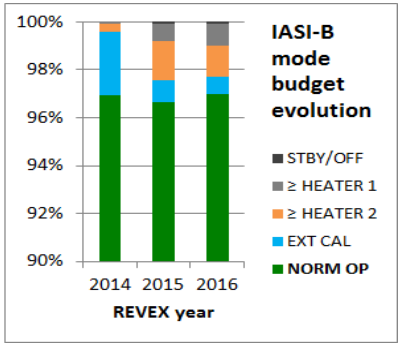
**and**

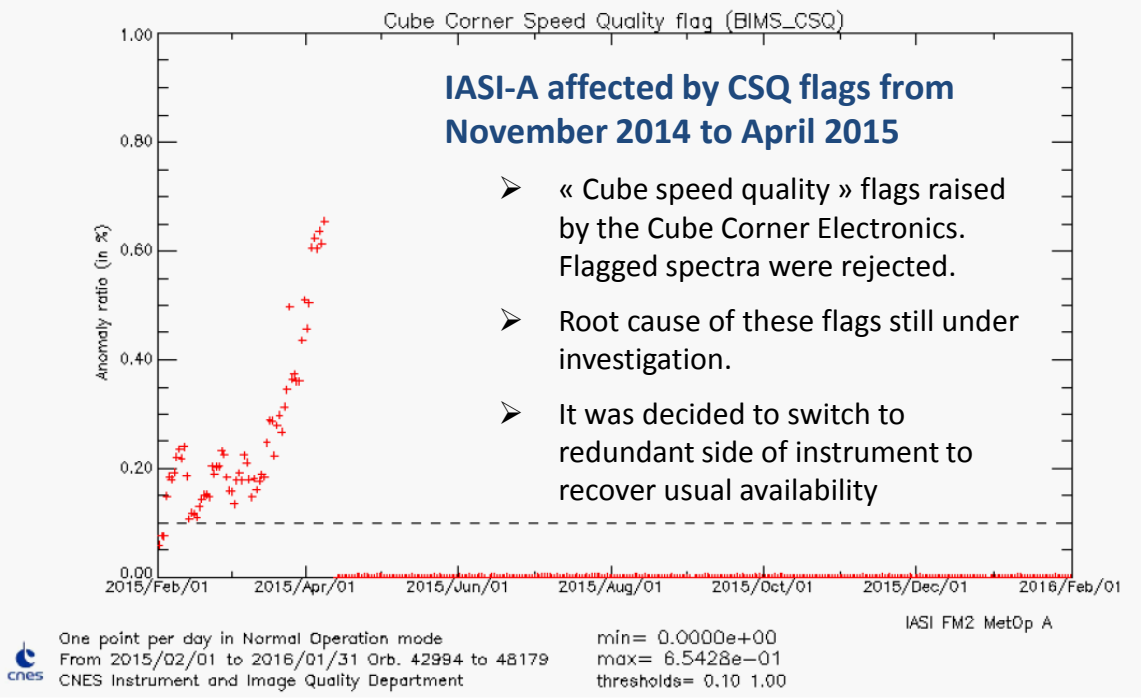
Quality of L0 spectra : usually ≤ 0.5% rejected spectra (mainly due to spikes in B3)




*Main outage contributors*

- Decontamination
- Anomalies
- Routine calibration
- External events



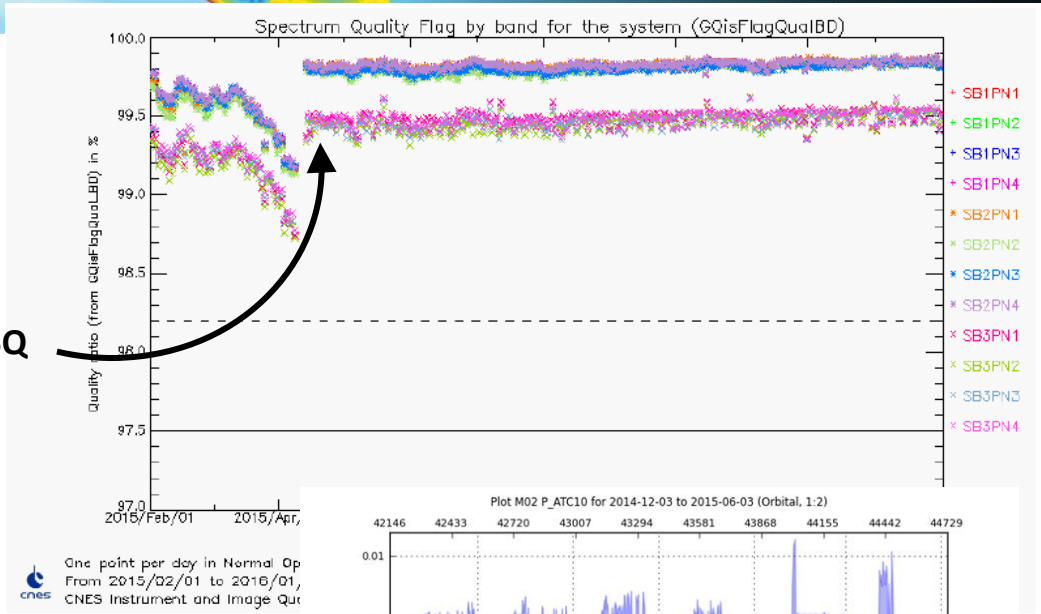

**IASI-A affected by CSQ flags from November 2014 to April 2015**

- « Cube speed quality » flags raised by the Cube Corner Electronics. Flagged spectra were rejected.
- Root cause of these flags still under investigation.
- It was decided to switch to redundant side of instrument to recover usual availability

# Main changes onboard since 3rd IASI conference (2013)

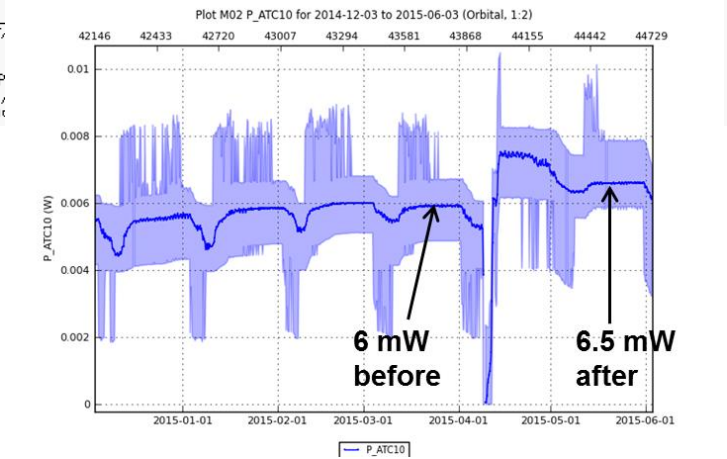
## IASI-A switched to redundant side (April 2015)

➔ Availability much improved : **almost no more CSQ flags**, availability restored to its maximum.




- First time IASI-A was operated on redundant side
  - Redundant thermal control
  - Redundant electronics

- **Performance identical on redundant side**
  - Detectors regulation target adjusted in order to have the same physical temperature to maintain B1 radiometric performance.
    Regulation power adjusted close to minimum margin (~6mW) as it was on nominal side.
  - Small effect on IASI Line Of Sight because of use of redundant position encoder for scan mechanism : taken into account for geolocation via IIS/AVHRR offset guess update

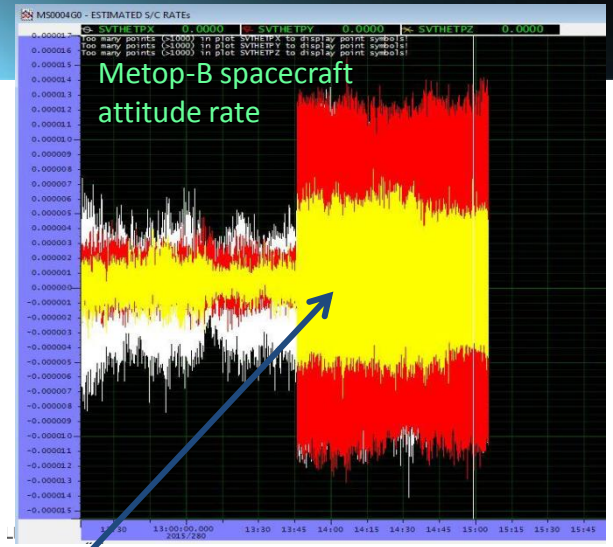


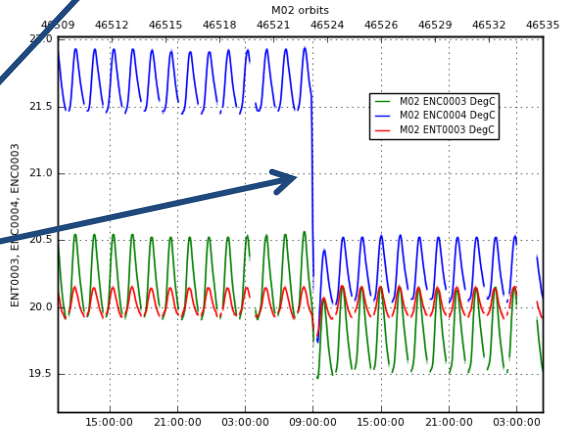
# Main changes onboard since 3rd IASI conference (2013)

## Compensation Device stopped permanently for both IASI's since October 2015

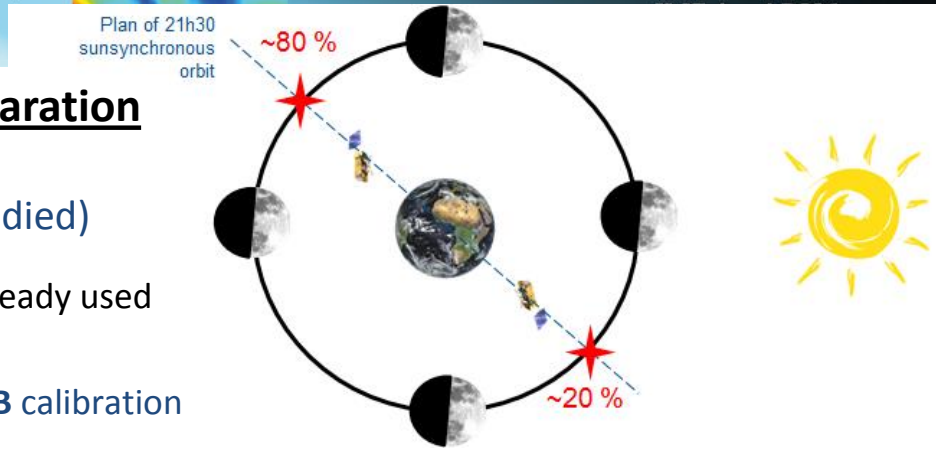
### ➔ Effect on IASI performance: poster S1-08 (Elsa Jacquette)

- Compensation Device mechanism was designed to compensate for Cube Corner mechanism exported efforts towards the satellite, in a configuration with LFD released (which is not the case for both IASI's)
- CD stop was not an option in original IASI design. A bypass solution was found to make the CD stop.
- **CD stop configuration was tested first on IASI-A** in November 2014 and found to have a **positive impact on IASI performance** (suppression of « ghost » effect due to separating blade microvibration in the interferometer), and an **acceptable effect on Metop satellite AOCS**. Thus a **permanent stop** was decided and **performed in October 2015**.
- Visible via instrument telemetries
  - small local decrease of CD temperature
  - no side effect on CCFD and optical bench thanks to thermal regulation



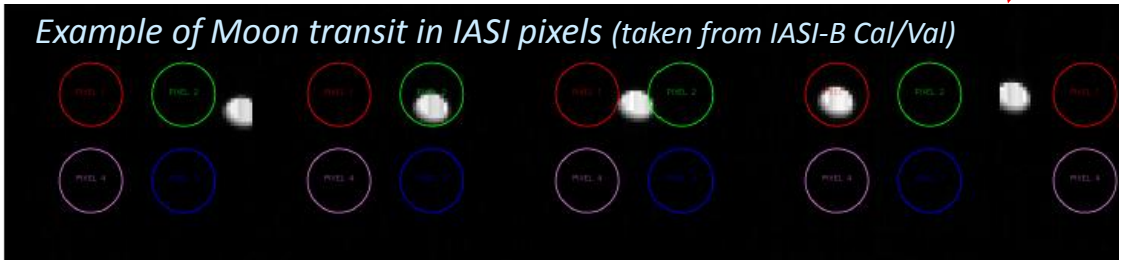



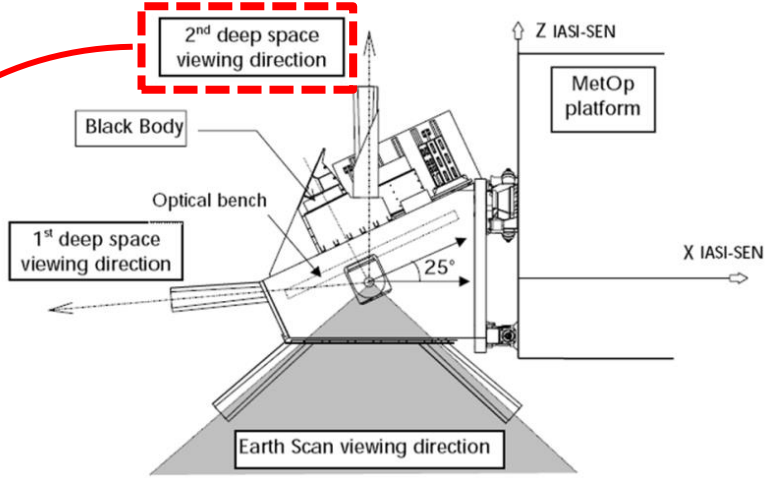
# Some proposals for IASI-A End of Life test preparation




## **Acquisition of Moon** in Cold Space view (to be studied)

- Possibility to test **new calibration methods for TIR** already used in VIS and SWIR.
- Could be extended to **inter-compare IASI-A and IASI-B** calibration using the Moon (relative calibration).
- Derive IR spectra of the Moon and thus **scientific information about the Moon** (surface temperature and composition). Proposal to characterize Moon in TIR domain is supported by GSICS.

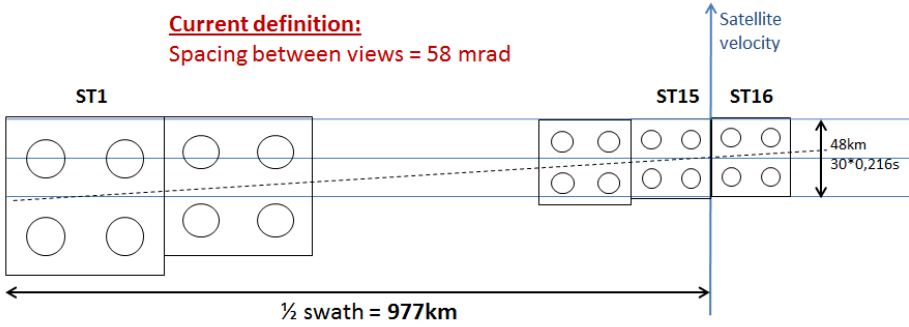


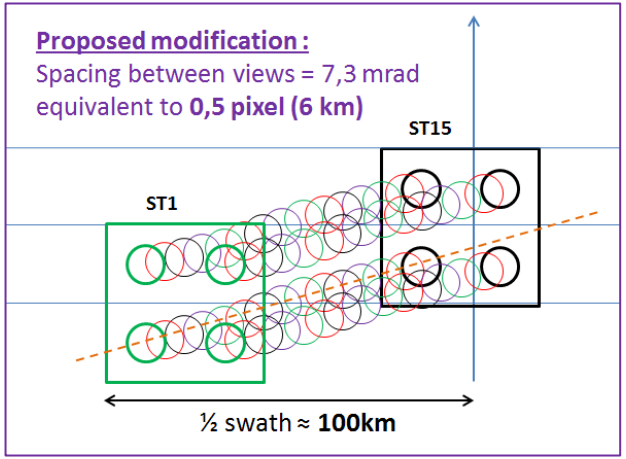



# Some proposals for IASI-A End of Life test preparation

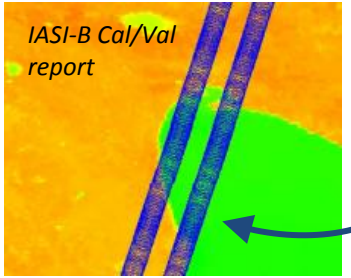
## Local improvement of spatial sampling and possibly spatial resolution (to be studied)

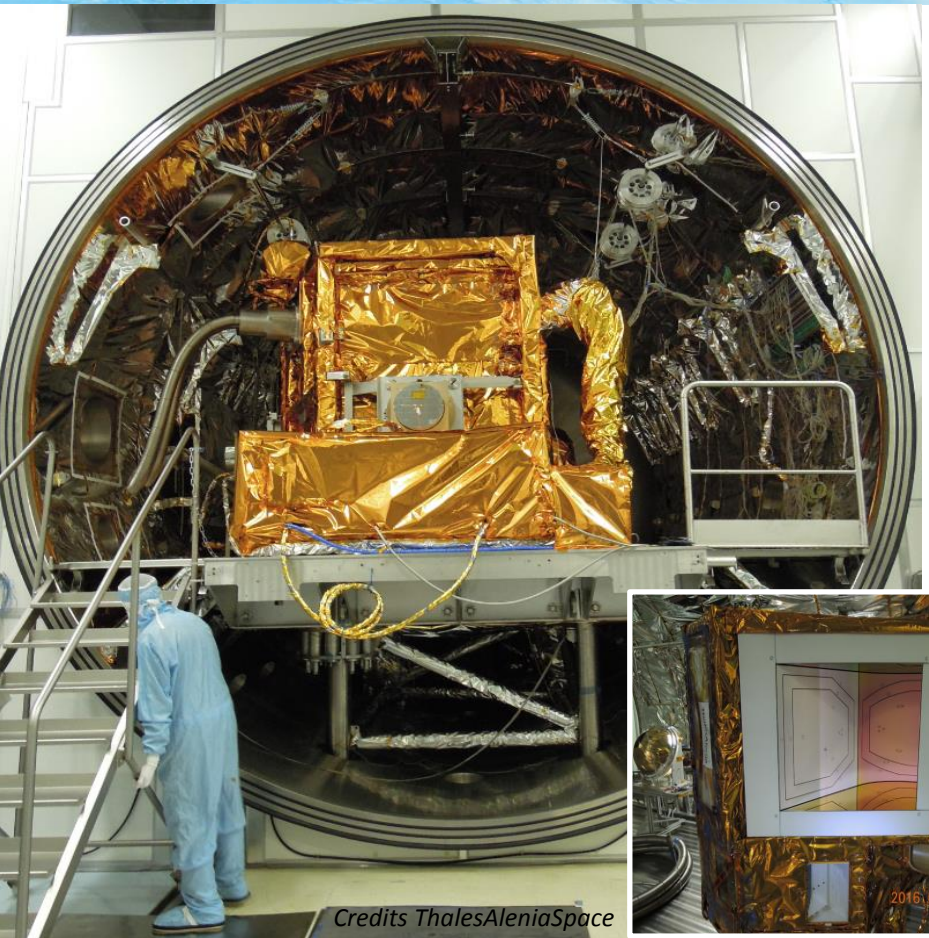
- **Reduction of swath and increase of spatial sampling** by scan parameter modification.
- Final objective: **possibility of improvement of spatial resolution by ground processing of overlapping acquisitions** ("supermode" like)



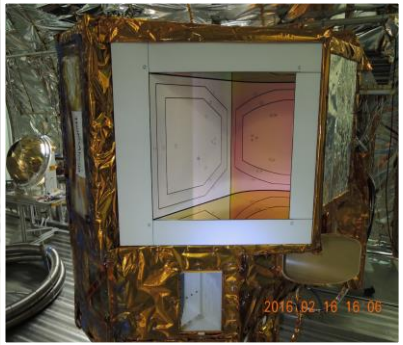




- Concept to be analysed in detail
  - Need of sufficient accuracy of pointing and geolocation
  - Need of sufficient knowledge of instrument IPSF
- A first study could be done on available data from nadir acquisitions during monthly External Calibration (oversampling along satellite velocity)





Credits ThalesAleniaSpace




# Third IASI model to be delivered

- **IASI FM3 retrofit** : replacement of old NdFeB magnets inside scan and corner cube mechanisms, by new magnets less sensitive to corrosion
- Delicate intervention on corner cube mechanism implied **interferometer realignment:** successfully performed
- Instrument acceptance campaign achieved at TAS. Instrument final performance validated by **Optical Vacuum Test in January 2016**.
  - **Very good radiometric and spectral results,** not affected by the retrofit operation

**➔IASI FM3R will be ready for reintegration on Metop-C PLM in September 2016, followed by satellite AIT campaign then launch in October 2018**