

A large, curved portion of the Earth is visible in the upper left corner of the slide, showing blue oceans and white clouds against the dark blue background of space.

# **IASI-FM3 on MetOp-C Preparation Status**

# **IASI New Generation Development Status**

**F. Bermudo – CNES**

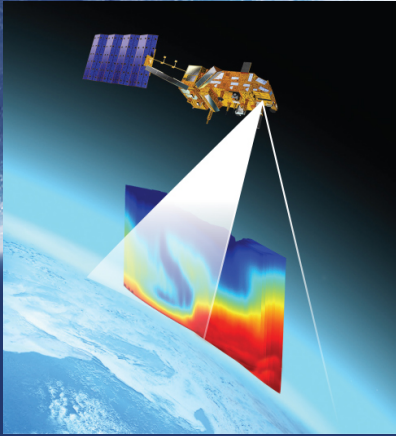
**CEOS AC-VC-14 – NOAA - May 2nd - 4th 2018**

# IASI (Infrared Atmospheric Sounding Interferometer)



CNES-EUMETSAT cooperation

Launch dates : Oct. 2006 (Metop-A), Sept. 2012 (Metop-B), Sept. 2018 (Metop-C)

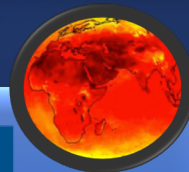


Mission objectives: hyper spectral sounding of the atmosphere in the Thermal Infra Red domain dedicated to

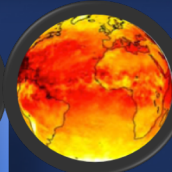
- **Numerical Weather Prediction** => improvement of the knowledge of the humidity and temperature profiles
- **Air Quality Monitoring** => observation/detection of > 20 species
- **Climate** => observation of half of the ECVs of the atmosphere

## Instrument assets on board Metop :

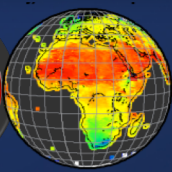
- Twice a day revisit / instrument
- Day & Night, Land & Sea observations
- 12 km @ Nadir x 4 pixels
- Scanning = +/-48.3°
- Spectral coverage = 3.62 – 15.5  $\mu\text{m}$ , 8461 channels
- Radiometric noise ~0.2- 0.5 K



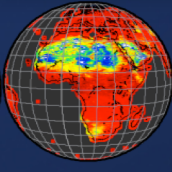
Temperature



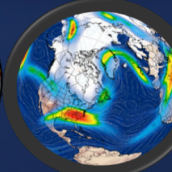
H<sub>2</sub>O



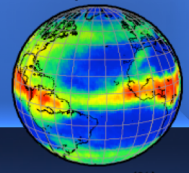
Surface T.



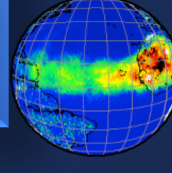
Emissivity



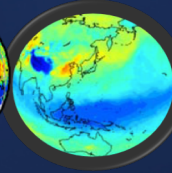
Winds



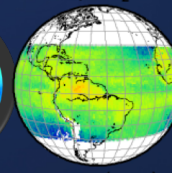
Clouds



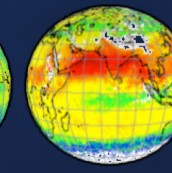
Aerosols



Ozone



CO<sub>2</sub>



CH<sub>4</sub>

- IASI FM3(-R) model will fly on board of MetOp-C
- FM3-R : Refurbished model due to magnets anomaly (delamination) on mechanism motors leading to full rebuilt of the Scan subsystem and Cube Corner Device mechanism replacement
  - Instrument retrofit completed in September 2016
- Full participation of IASI FM3-R in Metop C Payload and/or Satellite test campaign (PLM TV, EMC, mechanical tests) from September 2016 to December 2017
- On going : IASI FM3 participation to SL/Ground segment interface tests and operation preparation
- Coming : mechanism flight locking and final inspection/cleaning of CBS radiator



IASI FM3-R on Metop C with Cold Box radiator protection cover



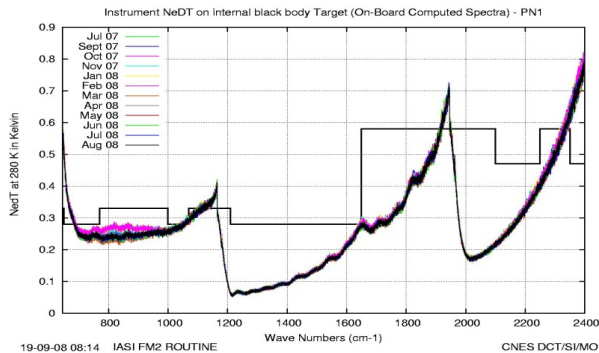
IASI FM3-R on Metop C PLM in ESA Thermal Chamber

# Roadmap to Launch & IASI Commissioning

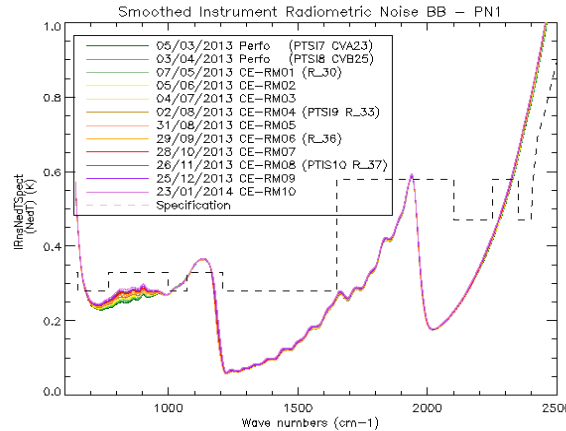
- **SL Transport to Kourou (French Guyana) planned end of June**
- **IASI launch campaign activities :**
  - IASI functional tests during SL Health check test in July
  - Red tags activities, MLI finalization in August
  - Removal of the CBS protection cover bag (against contamination) just before Fairing set up (D-8)
- **Launch with Soyuz planned on 18 September 2018**
- **LEOP Phase (3 days )**
- **Initial On Orbit Verification (IOV) Phase : to check the good health status and switch the instrument to operational mode**
  - Phase 1 : switch-on and decontamination 300K (21 days)
  - Phase 2 : mechanisms release (CCFD & CD) and detector cool-down to operational temperature
  - Phase 3 : interferometer first activation, detectors temperature setting, onboard processing and detection preliminary settings
- **IOV Schedule : 6 weeks of activities further to completion of LEOP phase**



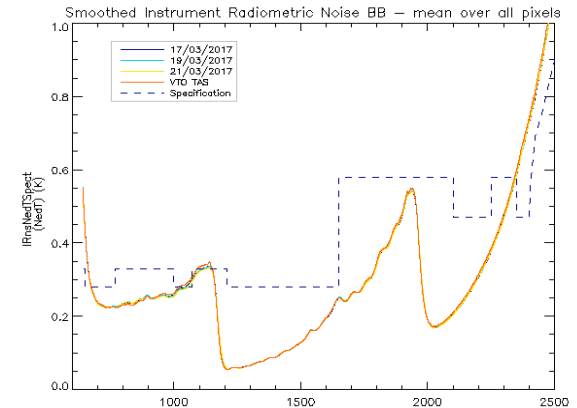
- **CAL/VAL phase :**
  - to fully characterize and calibrate IASI instrument by optimizing the on board / on ground processing configurations
  - to verify IASI level 1 product wrt the performance requirements (radiometry, spectral, geometry)
  - to validate IASI level 1 data quality wrt independent data
- **Schedule : from Launch + 1 month up to Launch + 7 months**
- **Expected in-flight radiometric performances of IASI FM3-R**
  - According to latest FM3-R performances tests similar performances to IASI FM2 (Metop-A) and PFM-R (Metop-B) are expected



IASI-A (FM2) in-flight performance



IASI-B (PFM-R) in-flight performance



IASI FM3-R Performance during MetOp-C TV Test



QUESTIONS ?



# IASI NG mission



CNES cooperation with EUMETSAT, United Kingdom Space Agency, Swiss Space Office and Norway Space Center

Launch dates : **Sept. 2021 (Metop-SG A1), Sept. 2028 (Metop-SG A2), Sept. 2035 (Metop-SG A3)**

**Mission objectives: hyper spectral sounding of the atmosphere in the Thermal Infra Red domain dedicated to**

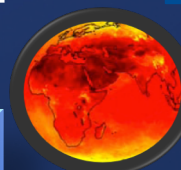
- **Numerical Weather Prediction** => precise humidity and temperature profiles
- **Air Quality Monitoring** => observation/detection of > 20 species
- **Climate** => observation of half of the ECVs of the atmosphere



## Instrument on board Metop SG A Satellites :

- First implementation of Mertz Interferometer in Space
- Day & Night, Land & Sea observations
- Sounding Pixels Size 12 km @ Nadir
- Spectral coverage = 3.62 – 15.5  $\mu\text{m}$
- Spectral resolution 0,25  $\text{cm}^{-1}$  , 16922 channels
- Radiometric noise ~0.1 K

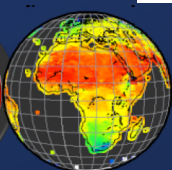
**IASI-NG will provide continuity of IASI mission with Spectral and Radiometric performances improved by a factor of 2 .**



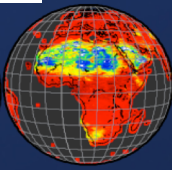
Temperature



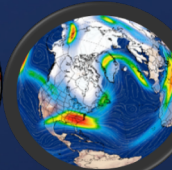
H<sub>2</sub>O



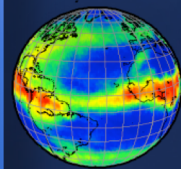
Surface T.



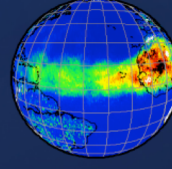
Emissivity



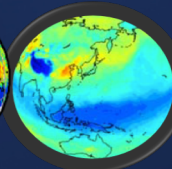
Winds



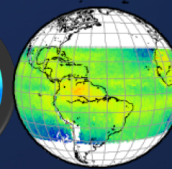
Clouds



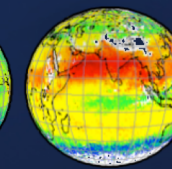
Aerosols



Ozone



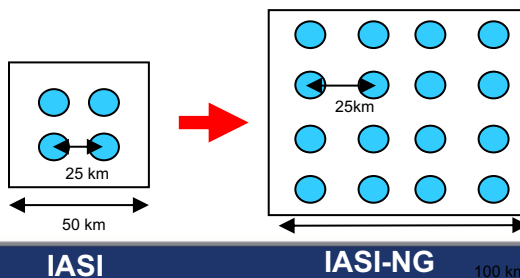
CO<sub>2</sub>



CH<sub>4</sub>

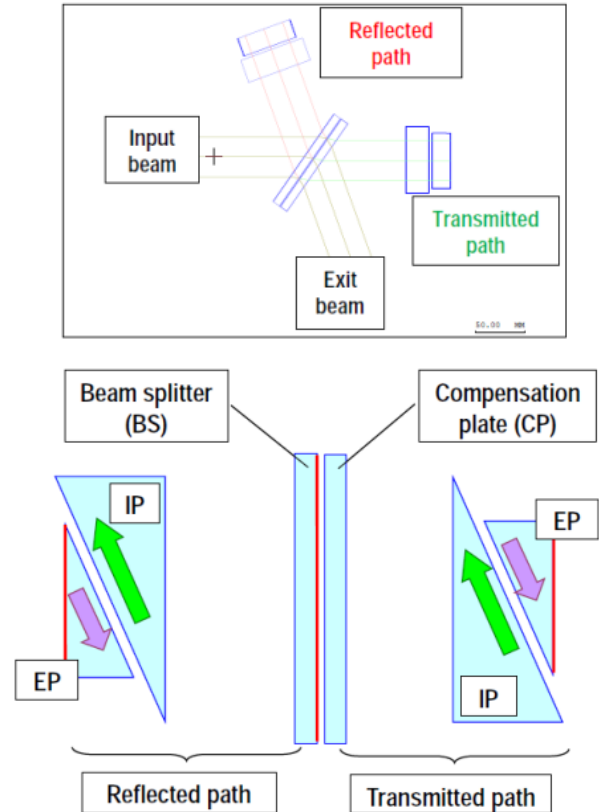
- IASI-NG will improve the IASI performances by a factor of 2 :

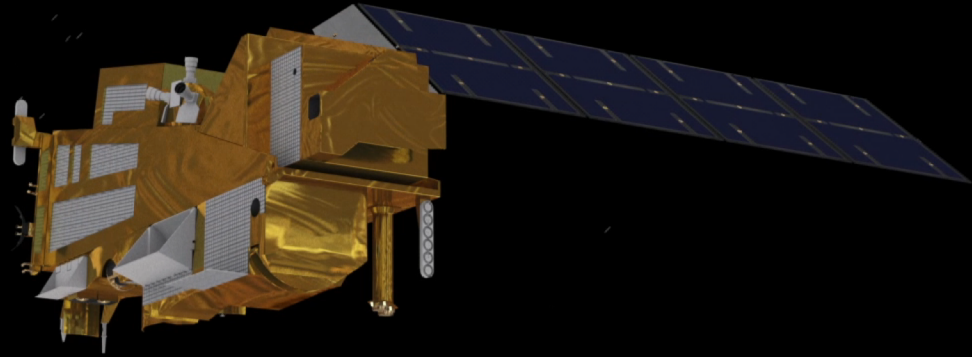
Main figures	IASI	IASI-NG
Radiometric Resolution (NeDT)		IASI/2
Spectral resolution	0.5 cm <sup>-1</sup>	IASI/2 (0.25 cm <sup>-1</sup> @L1C)
Absolute Radiometric Calibration	< 0,5K	IASI/2 (<0,25K@280K)
Spectral bands	3 bands	4 bands
Number of sounder pixels per acquisition	4 pixels	16 pixels
Ground Pixel diameter	12 km	12 km
Ground sampling	25 km	25 km



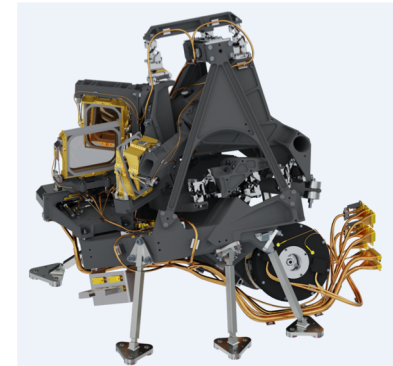
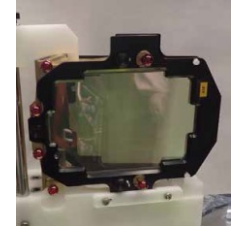
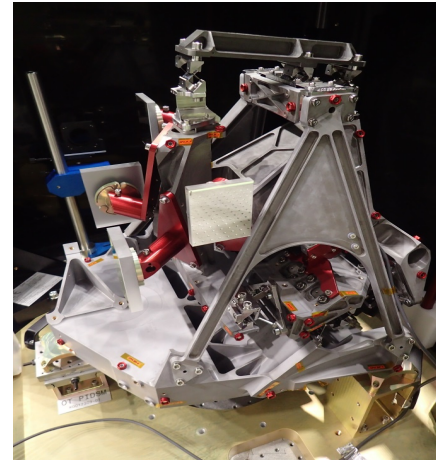
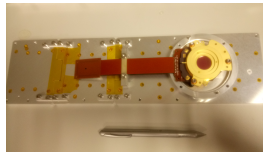
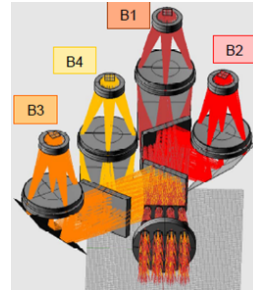


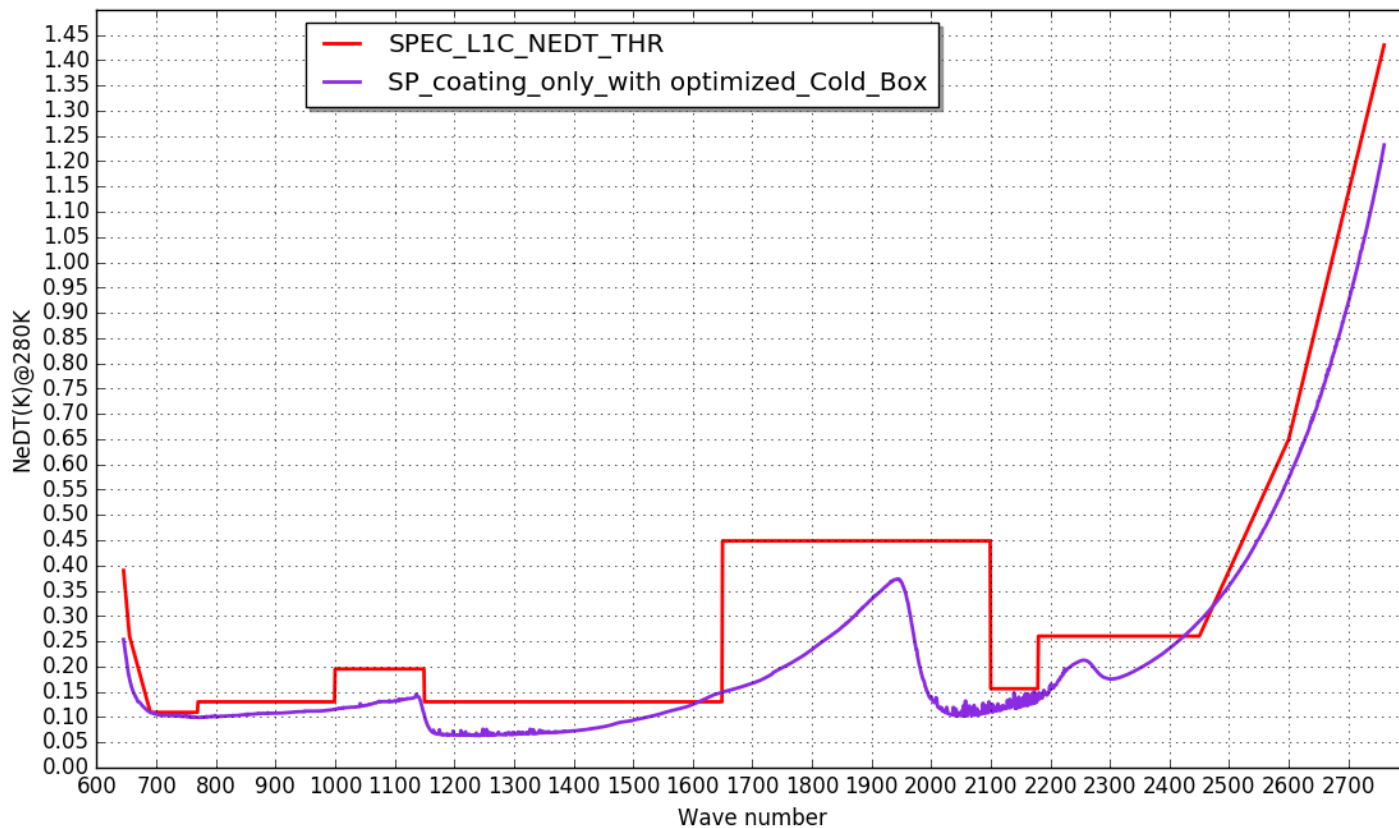
- IASI NG instrument concept is based on a Mertz interferometer allowing a field compensation (self- apodisation correction)
  - Field compensation is achieved by introducing optics with correct optical index
  
- A single “dual-swing” mechanism translates two pairs of prisms proportionally and creates simultaneously the OPD change and the self- apodisation compensation.
  - The external face of the external prisms is used as a mirror
  - An appropriate motion ratio allows both OPD generation and field compensation
  - All-KBr design, with very good transmittance over the whole spectral range (3.62 – 15.5  $\mu\text{m}$ )





- EM Instrument activities started with several EM subunits already under integration and tests
- Focal Plane Cryostat Assembly :  
Cryostat integration and TV test performed with stabilized temperatures close to predictions  
Focal Plane with EM detectors integration started
- Interferometer :  
Duals Swing Mechanism assembled & aligned and KBr Prisms bonded on their support arm

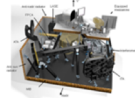




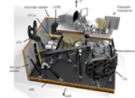


EM INSTRUMENT

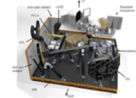
PFM



PFM



FM2



FM3



Metop SG A SL AIT and Launch campaign

Launch  
Sept. 2021



EUMETSAT

EPS SG PAYLOAD DATA ACQUISITION AND PROCESSING VALIDATION

L1C POP V1

L1C POP V2

L1C POP V3

Level 1C Operational Processor

Science Data Algorithms

QUESTIONS ?



**THANK YOU FOR YOUR ATTENTION**