



CENTRE NATIONAL D'ÉTUDES SPATIALES

## CNES plans

>> Meteorology, Climate and atmospheric chemistry

Highlights in 2008-2010 and perspectives

Didier Renaut, DSP/OT

Thierry Phulpin, DCT/SI/IM

# The main programmes

## ➤ Next european programmes

- ◆ Eumetsat Operational programmes : MTG and Post-EPS
- ◆ ESA Earth Explorer missions : **ADM-Aeolus and Earthcare**
- ◆ ESA Climate change Initiative

## ➤ CNES programmes for meteorology

- ◆ **IASI on Metop (Cnes-Eumetsat)**
- ◆ **Megha-Tropiques (Cnes-Isro)**
- ◆ Priority for the future programmes on **IASI-NG** and **GPM** mission

## ➤ CNES programmes for climate

- ◆ **Parasol, Calipso** and **A-Train (Cnes-Nasa)**
- ◆ Foster 3MI on Post EPS
- ◆ Cross cuttings activities
- ◆ **CHARM/MERLIN**
- ◆ **Microcarb**

## ➤ Support activities

- ◆ **Safire** research aircraft



# 1. IASI on Metop

Interféromètre atmosphérique de sondage dans l'infrarouge

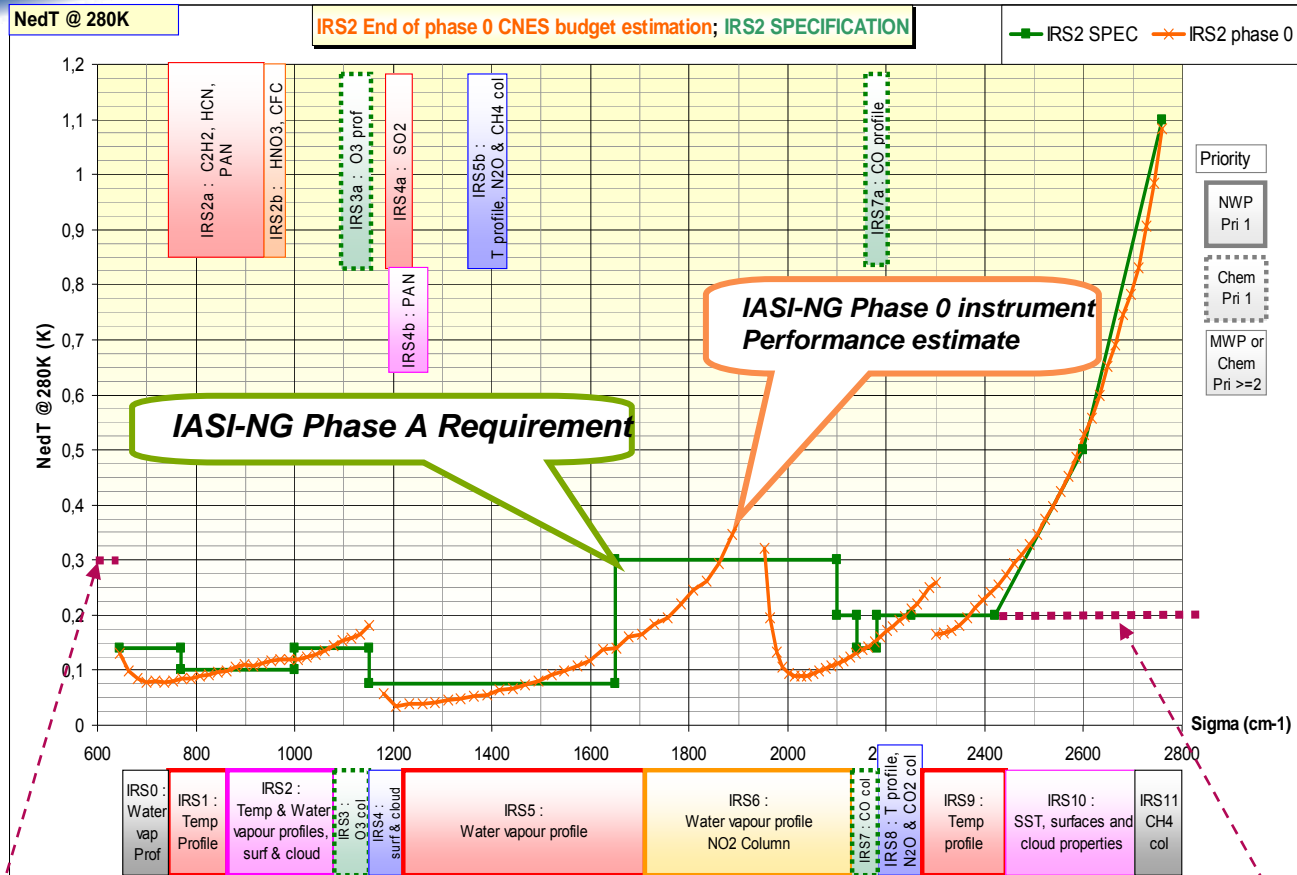
## Schedule (programme for more than 15 years)

- ❑ Launch of Metop-A 19 oct 2006
- ❑ Operational distribution of IASI L1c data 19 juil. 2007
- ❑ Operational distribution of IASI L2 data 29 sept 2007
- ❑ Second international IASI conference janvier 2010
- ❑ Ice decontamination coming in Fall 10
- ❑ IASI on Metop B : TV test July 10
- ❑ Launch of Metop-B avril 2012
- ❑ IASI on Metop C
- Launch of Metop-C October 2016

# Post IASI For Post EPS

## IASI-NG and IRS1

- Phase 0 completed. A new concept has been studied . Strong heritage from IASI but also very innovative to allow to have a factor 2 on the spectral resolution (meeting thus also the needs for Sentinel 5) and the radiometric noise.
- Requirements given by MRD Post EPS
- Science plan will be established by the ISSWG
- Meanwhile a french mission group, MENINGE, set up, for short studies needed for trade offs and write a mission rationale and requirements document. Works in relation with PMET and Sentinel 5 MAG + ISSWG
- Competitive Phase A has started in February 2010.
- CNES concept as reference but industry can define its own concept. Several under study by each company (TAS and EADS-Astrium).
- The best concept of each will be selected in June for further studies.
- Phase A completed in January 2011
- CNES decision in April 2011. Meanwhile meetings to inform ESA and Eumetsat



Fully in accordance with NWP and Chemistry MRD-Breakthrough,  
 Except (NWP priority 4) and (NWP priority 2 and Chemistry priority 3 and 4)

# European context

## 2. ESA Earth Explorer missions

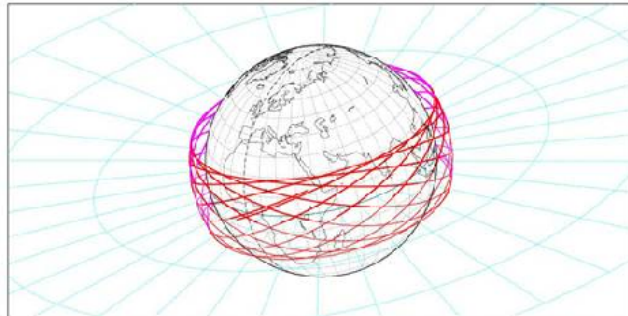
ADM-Aeolus (ESA)	Earthcare (ESA-JAXA)
Doppler lidar for wind profiles (secondary product : aerosols) => NWP, atmospheric dynamics, climate	Radiative budget, clouds and aerosols (imager, Radiative budget, lidar, cloud radar) => climate
Launch : <b>february 2012</b>	Launch : <b>october 2013</b>
Major technical issues with UV laser	Laser from ADM with lesser constraints
French teams involved : CNRM, LATMOS, LSCE, LACY Cal/val campaigns	French teams involved : IPSL, LMD, LATMOS...

# CNES programmes for meteorology

## 2. Megha-Tropiques



Megha-Tropiques  
 Orbit - ref.: Earth  
 Recurrence = [14;-1; 7] 97  
 >>> Time span shown: 14:00 min = 1.00 day  
 Altitude = 865.6 km      a = 7243.700 km  
 Inclination = 20.00 °  
 Period = 101.93 min      \* reviday = 14.13  
 Equat orbital shift = 2492.0 km ( 20.0 °)



Projection: Orthographic    Map centre: 26.0 ° N; 46.0 ° E    Proj. code: 0.00 °  
 Property: none    Aspect: Oblique    MC = LMD  
 1: Azimuthal (2) Glatitude: 10°    [-18.87 / -64.7 / +4.0] GCMat: 99MB-C1    A1Aαξ

Frequencies	Polarization	Pixel size	Main use
18.7 Ghz ± 100 Mhz	H + V	40 km	ocean rain and surface wind
23.8 Ghz ± 200 Mhz	V	40 km	integrated water vapor
36.5 Ghz ± 500 Mhz	H + V	40 km	cloud liquid water
89 Ghz ± 1350 Mhz	H + V	10 km	convective rain areas
157 Ghz ± 1350 Mhz	H + V	6 km	cloud top ice

Table 1 : main characteristics of the MADRAS channels

### ■ CNES+ISRO project

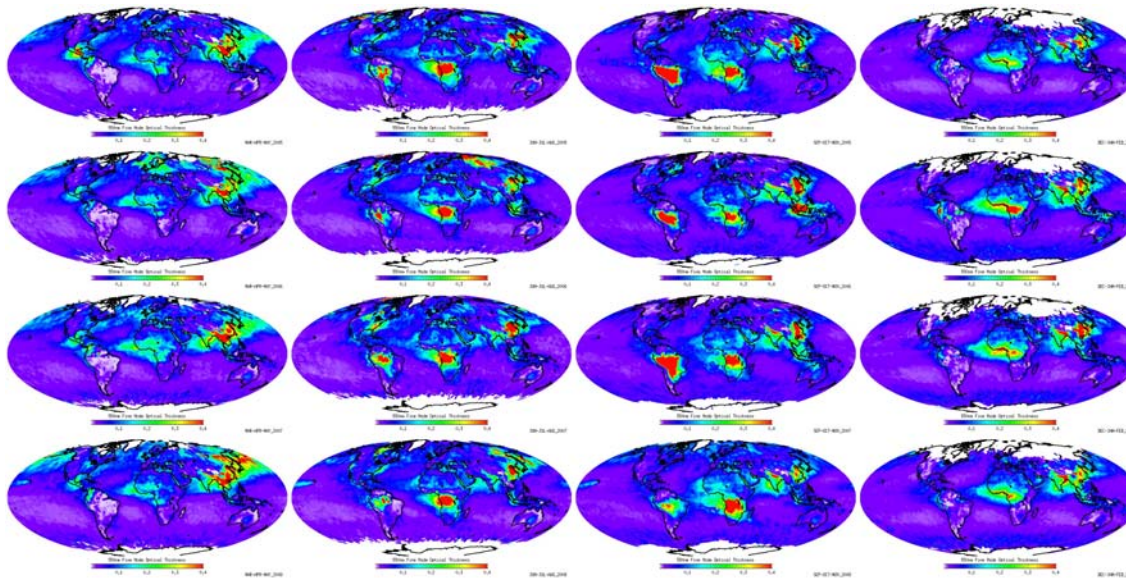
- ◆ Marfeq (microwave part of Madras), developed by with EADS-Astrium, delivered to ISRO in April 2009. Scarab delivered in March 2010. The last CNES instrument (Saphir) shall be delivered by the end of April 2010.
- ◆ Launch of Megha-Tropiques officially in the second semester 2010. Possibly beginning 2011.
- ◆ CNES will receive MT data at Kourou (Guyane) and Hartebeesthoek (South Africa) reception stations. This makes possible the distribution of data in NRT (2-3 hours).
- ◆ Complete definition of ground segment in progress.

# CNES programmes for Climate

## 1. Parasol



- 5<sup>e</sup> anniversary of Parasol on 4 March 2010  
Parasol left the A-Train end 2009 (orbit 4 km lower).
- Mission Parasol extended until end 2011.

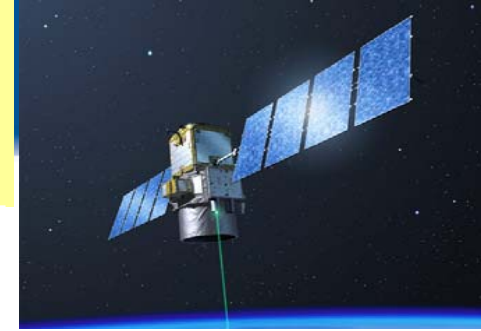


4 years of seasonal AOT means for fine mode aerosols

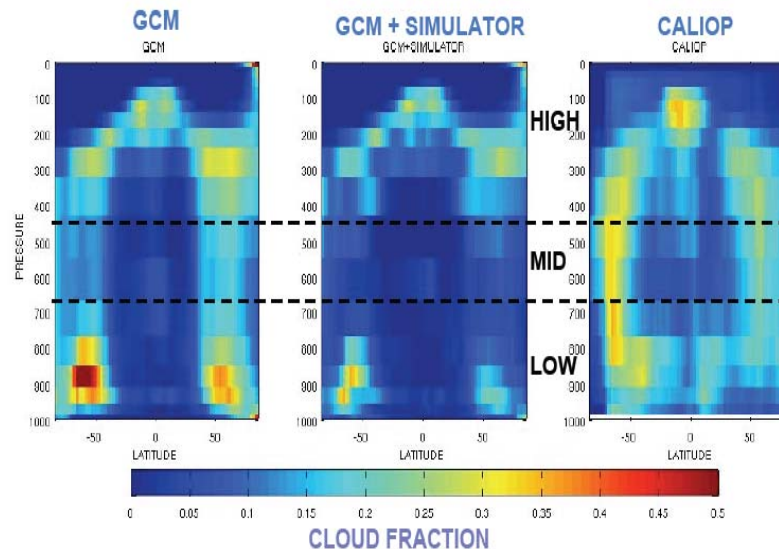


# CNES programmes for climate

## 1. Calipso (NASA-CNES)



- More than 3 years of data (lidar + IR imager + VIS camera)
- Senior review NASA extended the mission (2 more years until end 2011), with CNES support.
- More than 60 publications
- Calipso is now a reference for representation of clouds in climate models (recommandation WRCP for CMIP-5).



Comparaison modèle-Calipso de la couverture nuageuse (© H. Chepfer et al.)

# CNES programmes for climate

## 2. 3MI pour Post-EPS

### Support 3MI studies

Phase 0 CNES completed.

Meeting with ESA

Meeting to be set up with Eumetsat