



# CNES Activity Report

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**Working Group on Calibration and Validation**



## SUMMARY

- Calibration Monitoring of in-Flight Missions
- Preparation of future Missions
- Involvement in CEOS/WGCV activities



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## **‘SMOOTH’ CALIBRATION MONITORING OF CNES IN-FLIGHT MISSIONS**

- Pléiades 1A & 1B (High Resolution Imaging)
  - Accurate geometric and MTF calibration monitoring
  - Radiometric calibration monitoring mainly based on lunar and desert calibration
- IASI A & B (IR Atmospheric Sounding)
  - On-board spectral and radiometric calibration
  - Intercalibration activities : IASI-A/IASI-B ; IASI/AIRS ; IASI/CRIS
  - Preparing IASI-C ground characterization: METOP-C launch Oct. 2018
- Megha-Tropiques: Saphir (MW Sounder), Scarab (optical scanning radiometer)
  - Saphir intercalibration with other GPM instruments
  - Scarab/Ceres intercalibration
- IIR (3 band IR Radiometer) on-board Calipso
  - Intercalibration with MODIS
- SMOS – Calibration and performances monitoring



## PARTICIPATION IN OTHER MISSIONS CALIBRATION MONITORING

- Airbus D&S SPOT-6&7 satellites
  - Absolute calibration over La Crau
  - Calibration monitoring using deserts
- Support to ESA for Sentinel-2 and Sentinel-3 calibration
  - In-flight commissioning and routine monitoring
  - All calibration methods: La Crau (S2), deserts (S2&3), Rayleigh scattering (S2&3), sun glint (S3), clouds (S3), Antartica (S3)
- Exchanges with NASA for Landsat-8 calibration
  - Mainly desert calibration monitoring
- Support to Eumetsat for 3MI ground characterization and future in-flight calibration monitoring



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## IASI-NG – NEW GENERATION OF INFRARED SOUNDER ON-BOARD METOP-SG

- Mission goal
  - Continuity of IASI mission for meteorology, atmosphere chemistry and climate
  - Improvement of measurement precision: 1 K for temperature, 10% for humidity
- Instrument Concept
  - Fabry-Perot interferometer
  - Many technical innovations
  - Spectral resolution and signal-to-noise ratio improved by a factor of two
- Launch: end of 2021
- 3 models continuity up to 2040





## MERLIN - METHANE REMOTE SENSING LIDAR MISSION

- Mission goal  
Global information on atmospheric Methane concentration (CH<sub>4</sub> column density) with accuracy better than 2% and with a spatial resolution of 50 km along track
- Instrument Concept  
First spaceborn integrated path differential absorption LIDAR instrument (laser wavelength around 1.645  $\mu\text{m}$ )
- French/German partnership
  - CNES platform : Myriade
  - DLR instrument
- Launch: end of 2020
- Phase C/D agreement to be signed mid-September

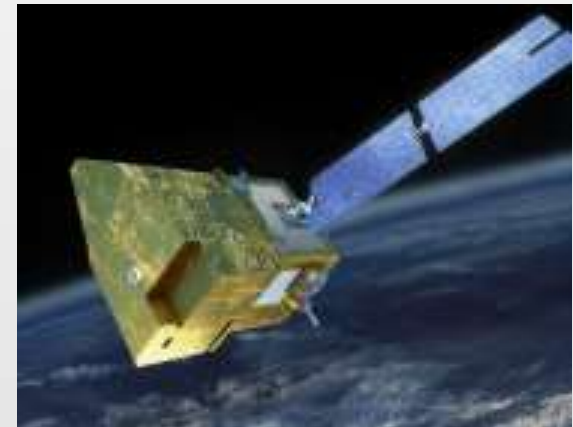






## MICROCARB – MEASURING CO<sub>2</sub> FROM A MICROSATELLITE

- Mission goal  
Mapping of sources and sinks of carbon dioxide (CO<sub>2</sub>) on a global scale
- Instrument Concept  
Infrared passive spectrometer operating in 4 bands with high spectral and radiometric performance  
Measure the total column concentration of CO<sub>2</sub> with a precision of 1 ppm and a pixel size of 5 km x 6 km.
- Partnership to be established
- Launch: planned for 2020
- Phase B in progress (decided end 2015)





## SWOT – SURFACE WATER AND OCEAN TOPOGRAPHY MISSION

- Mission goal
  - Complete coverage of the world's oceans and freshwater bodies with repeated high-resolution elevation measurements
  - Oceanography: mesoscale and sub-mesoscale circulation patterns
  - Hydrology: surface water monitoring - lakes, reservoirs and wetlands larger than 250 m<sup>2</sup>
- Instruments
  - Wide-swath Ka-band radar interferometer
  - Nadir radar altimeter
  - Microwave radiometer
- US/French partnership
  - NASA-CNES + CSA & UKSA
- Launch: end of 2021





## CFOSAT – CHINA-FRANCE OCEANOGRAPHY SATELLITE

- Mission goal  
Study of the characteristics of ocean surface winds and waves
- Two Radar instruments
  - SWIM ‘Surface Waves Investigation and Monitoring’, a wave scatterometer (6 rotating beams enable to measure wave properties: direction, wavelength, etc.)
  - SCAT, a wind-field scatterometer (wind intensity and direction measures)
- Chinese/French partnership
  - CNSA: SCAT instrument
  - CNES: SWIM instrument
- Launch: mid 2018





## VEN $\mu$ S– VEGETATION AND ENVIRONMENT MONITORING ON A NEW $\mu$ SATELLITE

- Mission goal  
High revisit (2 days) and high resolution (5-10 m) for vegetation monitoring
- Instrument
  - Camera with 12 narrow spectral bands in the VNIR
- Israel/France partnership
  - ISA: microsatellite with Hall Effect Thruster
  - CNES: high resolution camera
- Launch: summer 2017
- 110 sites (160?) selected among 400 issued from an international Call for Proposal







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## REFOCUSING OF CNES CALIBRATION ACTIVITIES

- Forthcoming priorities for CNES: sounding and altimetry missions
- Gap period for CNES Imagery Missions
  - Is there any need to continue the effort in radiometric calibration database and methods development ?
  - How to use existing experience and tools for other CNES missions (Microcarb or IASI-NG for instance) ?
  - How to take benefit of CNES experience for other agencies missions ?
    - . CNES involvement in Sentinel 2 calibration and performance characterization
    - . CNES support to ESA for Sentinel 3 in-flight calibration monitoring
    - . CNES support to Eumetsat for 3MI calibration activities
  - Time to transfer data and transmit experience to other calibration teams ?





## CNES DECIDED INVOLVEMENT IN CEOS/WGCV ACTIVITIES

- CEOS activity managed as a 'project' in CNES
  - Clear budget line established
  - Human resource identified (more or less!)
- Internal Review Board recommendations
  - Strong involvement in RadCalnet and support to ESA for establishing the new Namibia calibration site
  - Leadership of the PICSAR Task Group and associated studies
  - Participation to the 'Radiometry Harmonisation' Task Group (if any!)
  - Participation to GSICS/GRWG for IASI intercalibration, lunar calibration (make Pleiades data available) and 'geo-deserts' database populating
  - Analyse the opportunity for a ACWG participation to promote IASI, MERLIN and MicroCarb Missions
  - Development of new generation tools for SADE/MUSCLE!  
More operational and open to external users