Campaigns in Support of ESA'S Earth Candidate Mission Concept BIOMASS

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ESA's Earth Observation Missions

Earth Explorer

Research driven

Core Missions

GOCE
March 17th 2009

ADM-Aeolus

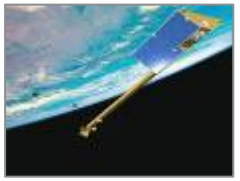
EarthCARE

Biomass/ CoReH2O/ PREMIER

Opportunity Missions

CryoSat-2
April 8th 2010

SMOS
Nov. 2nd 2009



Swarm

CarbonSat FLEX

Continuity of Missions

ERS-2 since 2000

Envisat since 2007

Missions in EOEP

Earth Watch

Operational Service driven

Operational Meteorology

- Meteosat
- MSG
- EPS (MetOp)
- MTG
- Post EPS

GMES

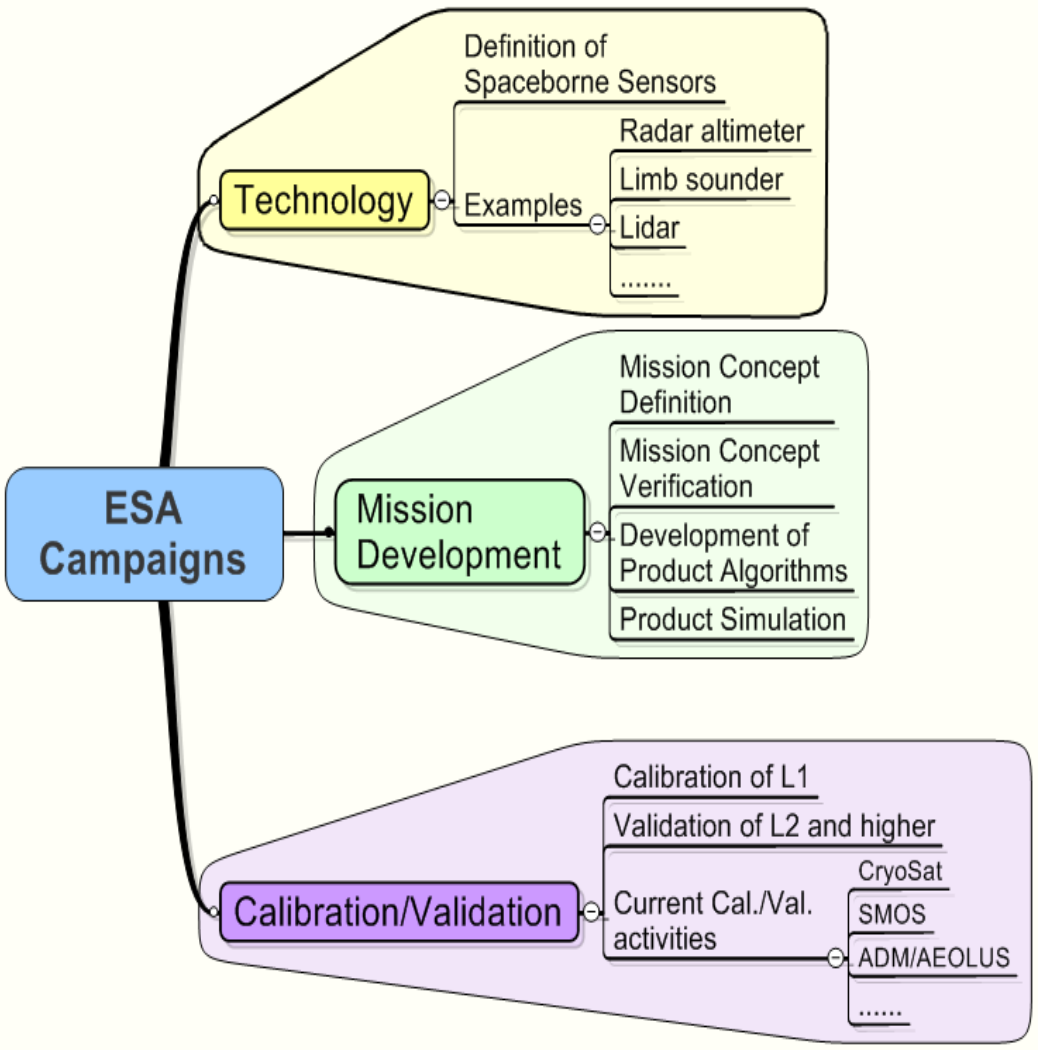
- Sentinel 1
- Sentinel 2
- Sentinel 3
- Sentinel 4 (MTG)
- Sentinel 5 precursor
- Sentinel 5 (Post-EPS)

Why are ESA Earth Observation campaigns required ?

- Explore EO possibilities
- Prove EO concepts
- Develop interpretation
- Develop calibration
- Develop validation
- Simulate data products
- Check (validate) results
- Develop applications

Programmatic Background

- Programme started in 1981
  - 85 campaigns as of Sept 2010
  - 4-5 campaigns/year
- Strategic objectives:
  1) Support to EO programs
  2) Improved access to airborne instrumentation and data in Europe
  3) Partnerships with national and international organisation ESA Campaigns Programme addresses all phases of ESA missions
- Campaign activities address three main areas: technology, mission development and calibration/validation

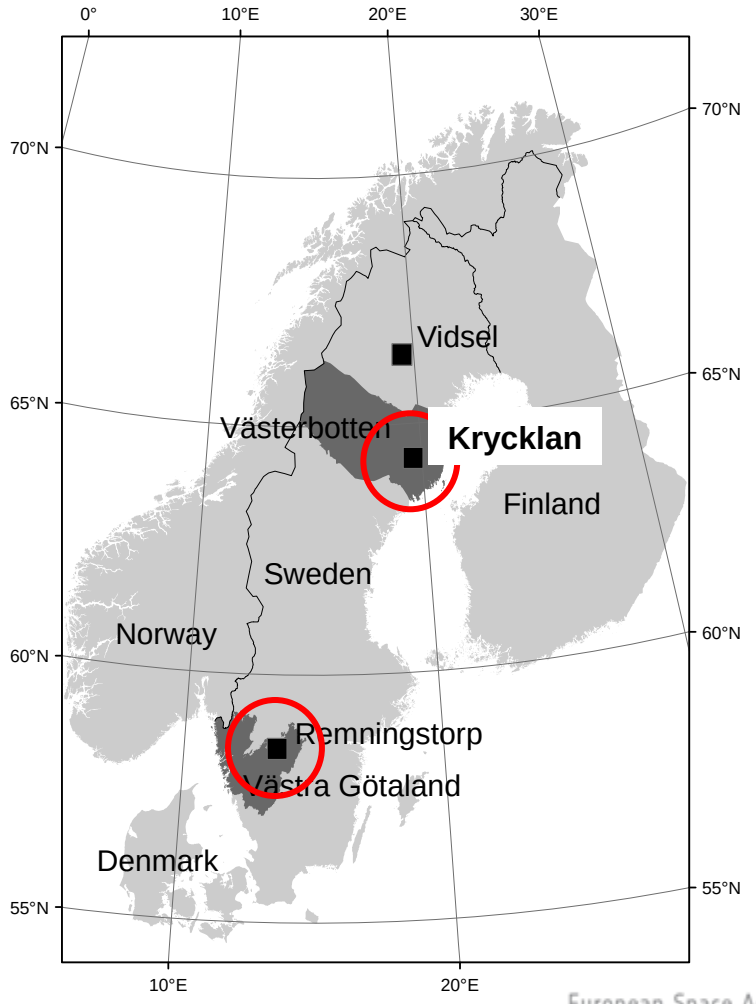


Recent campaign activities

- Continued support of future mission concepts
  - Respond to recommendations from ESAC report, Lisbon User Consultation Meeting in January, 2009
  - New campaigns initiated to support Phase-A of Earth Explorer 7 candidate missions **BIOMASS** (BioSAR2007, 2008 and 2010, IceSAR 2007, TropiSAR2009, TropiScat 2011), **CORE-H2O** (NoSRex2009 and 2010, Ku-band miniSAR2011), **PREMIER** (PremierEX2010)
- Validation
  - **SMOS** (Domex, AACES, Spring 2010 SMOS Cal/Val), **CryoSat** (CryoVex2006, 2008, 2010 and 2011)
- GMES Space Component
  - **Sentinel-1** (AgriSAR2006 and 2009, IceSAR 2007), **Sentinel-2** (SEN2FLEX 2006, CEFLES2 2007, SEN2EXP2011?) and **Sentinel-3** (SEN3EXP2009)
- Application development
  - **DUE Urban Heat Island** and **FuegoSat Reorientation** (DESIREX2008, Thermopolis2009)

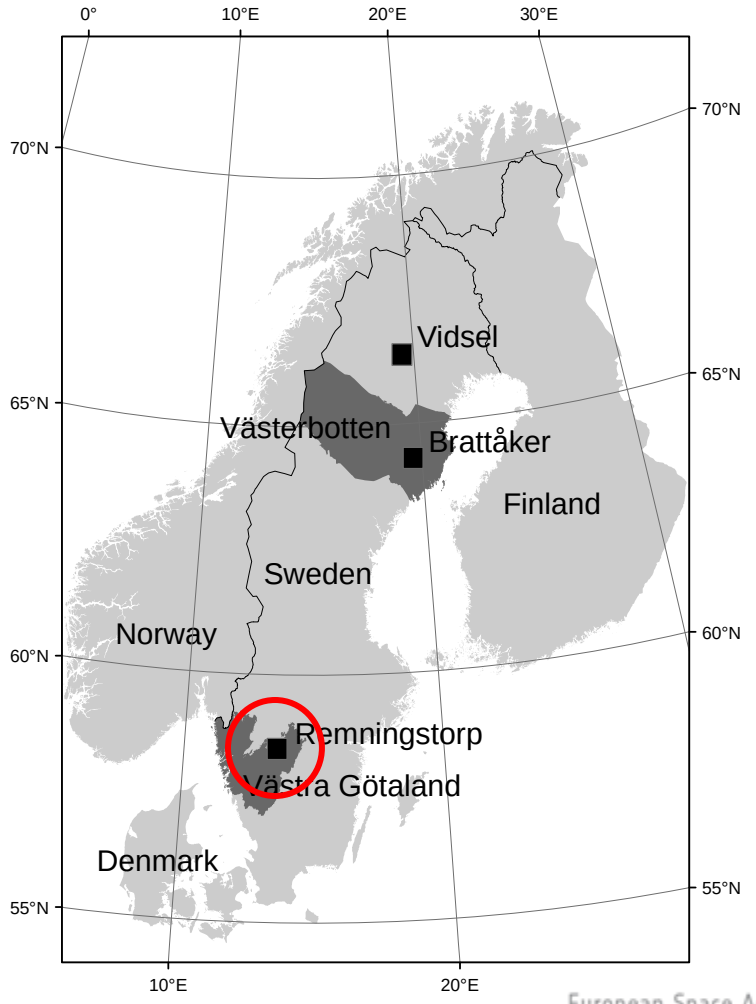
BioSAR

- **BioSAR-1 (2007), Remningstorp**, E-SAR
  - **Temporal correlation, P/L-band, Tomo**
  - 3 dates (mar, apr, maj), 2 headings
- **BioSAR-2 (2008), Krycklan**, E-SAR
  - **Topographic effects, P/L-band, Tomo**
  - 1 date (oct), 4 headings
- **BioSAR-3 (2010), Remningstorp**, SETHI
  - **Change detection, Cross-calibration ESAR**
  - 1 date (sep), 3 headings
  - *Work is ramping up*



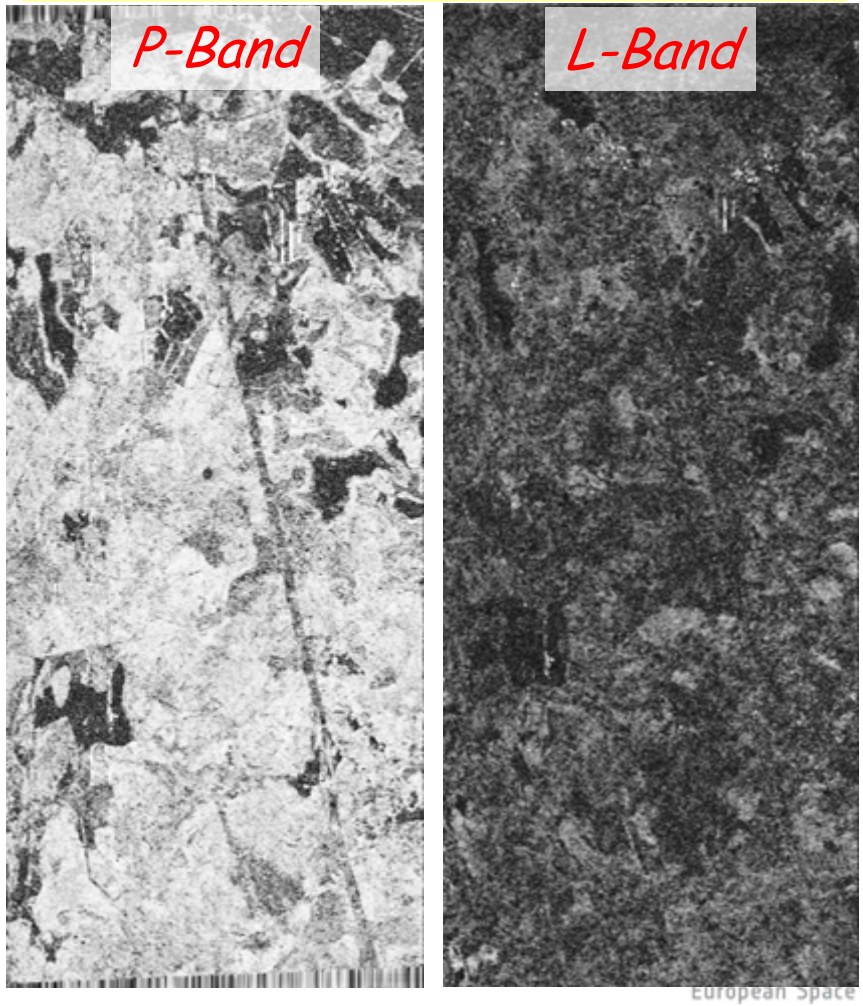
BioSAR 2007

- Aims
  - Measure temporal coherence over time intervals compatible with spaceborne mission concept
  - Validate BIOMASS mission level-2 retrieval algorithms (forest biomass, forest height) over Boreal forests
- Experiment details
  - Airborne acquisitions: DLR E-SAR
  - In-situ measurements: FOI, Chalmers University
  - Test site: Remningstorp, Sweden
  - Three acquisition dates from March 6 to May 2, 2007 exploiting transit flights to Svalbard for IceSAR campaign



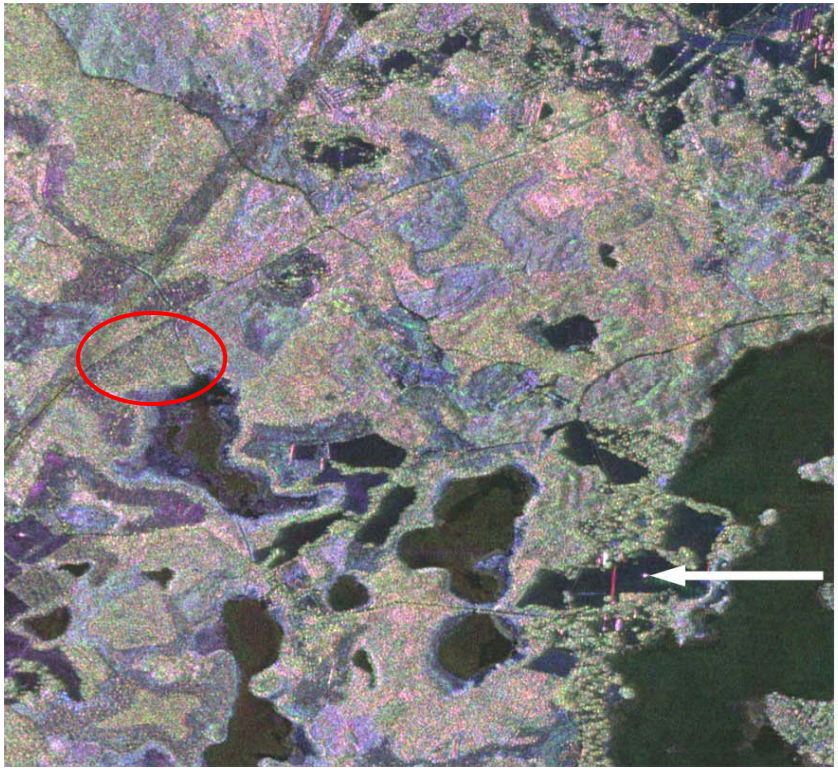
- Main results:
  - Temporal coherence for Boreal forest characterised at L- and P-Band *for time intervals compatible with spaceborne concepts*
    - Measured coherence levels depend strongly on wavelength for equal time intervals
  - Candidate Explorer BIOMASS mission retrieval algorithms validated and performance assessed

56 day interval coherence maps

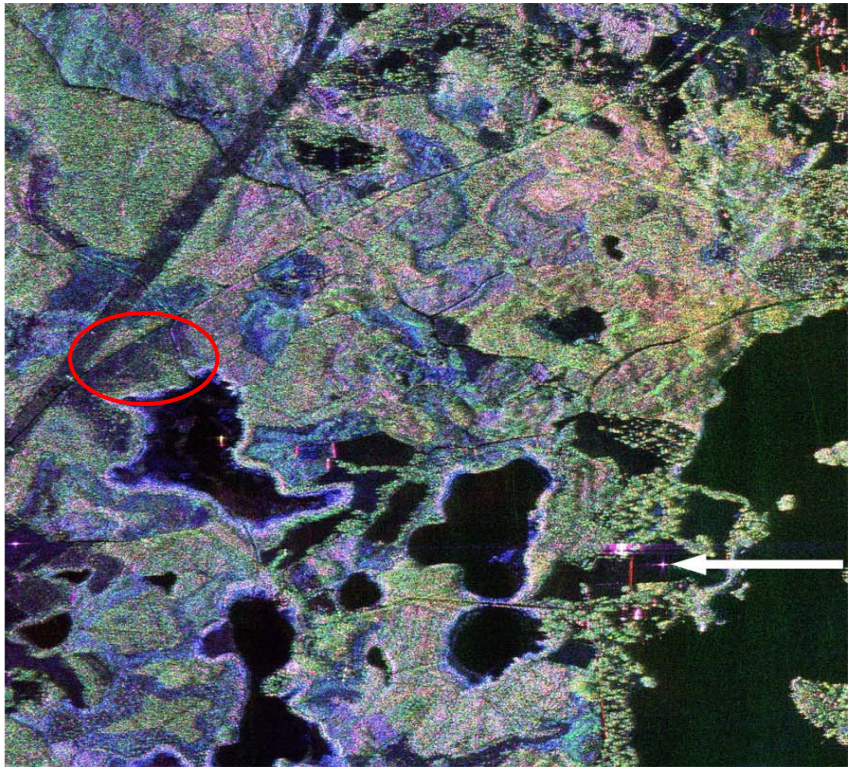


Remningstorp: Quick-looks 2007 vs 2010

ESAR 2007, BioSAR-1



SETHI 2010, BioSAR-3

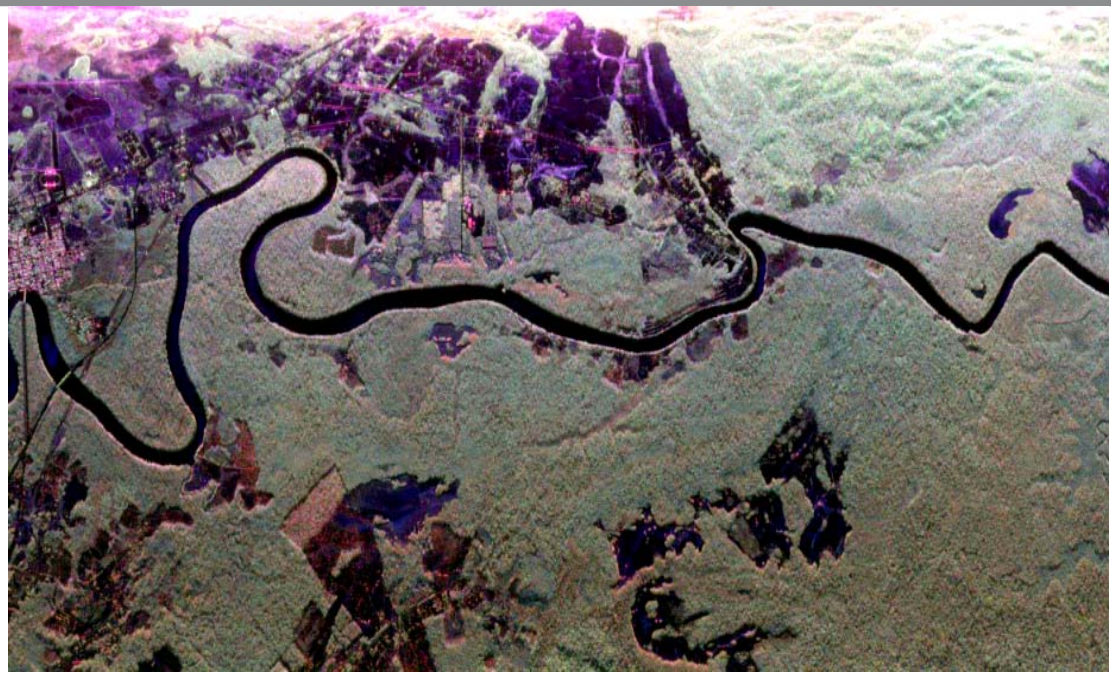


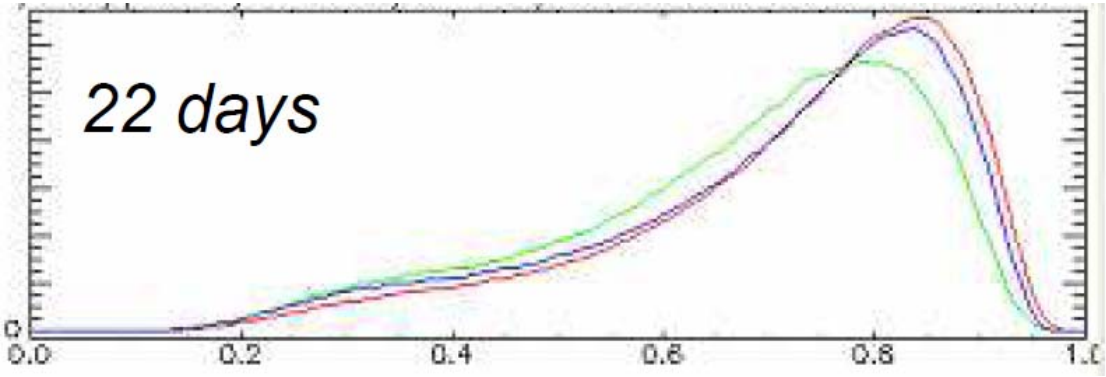
TropiSAR 2009

- Aims
  - Support BIOMASS Phase-A (Tropical Forests)
  - Quantify temporal decorrelation over tropical forests
  - Support development of L2 forest biomass retrieval algorithms
  - Assess L2 product validation methodology
- Experiment details
  - Airborne acquisitions using SETHI and Falcon-20 (ONERA)
  - Leverage existing French national programmes in French Guyana (CNES, GUYAFOR)
  - Co-located ground and laser altimeter measurements

TropiSAR 2009

- Experiment Status
  - Airborne data processing chain implemented and tested
  - High data quality verified
  - First results indicate only moderate temporal decorrelation at P-band over tropical forests
  - Continued data analysis by campaign team and BIOMASS Level-2 retrieval studies (height and forest biomass retrieval to be tested)

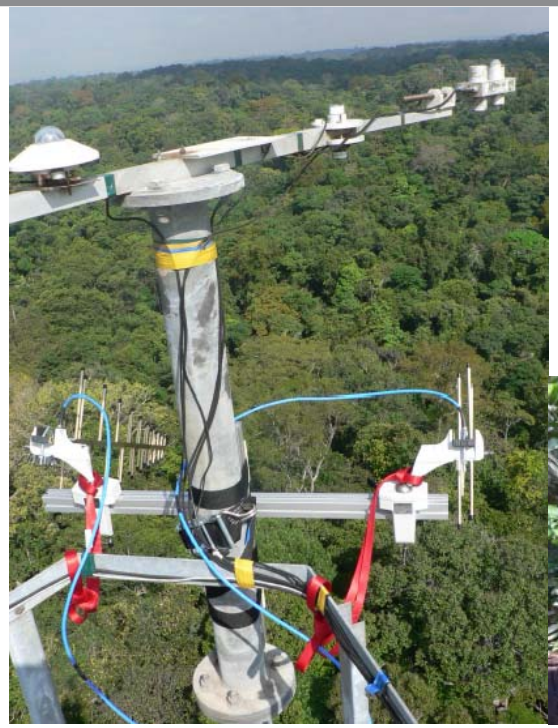


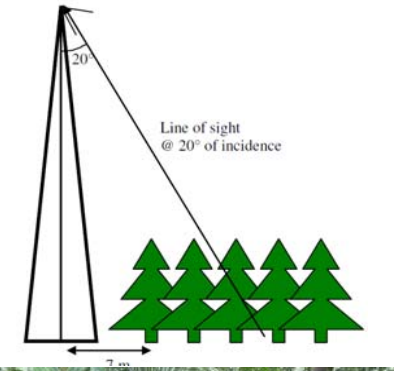


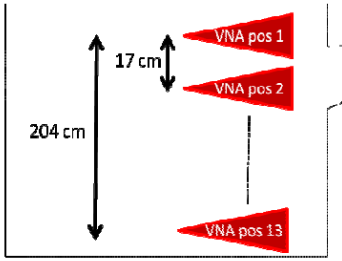
Coherence

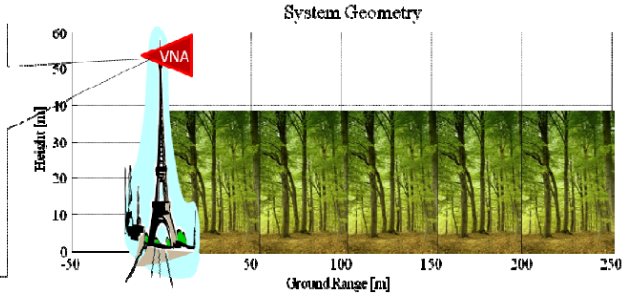
TropiScat 2011

- Aims
  - Long-term statistical characterisation of integrated temporal coherence at P-band over tropical forests (diurnal, weekly, monthly, yearly)
  - Identification and characterisation of the main sources of temporal decorrelation (environmental, instrument, geometrical)
  - Characterisation of 3-dimensional distribution of radar scatterers and their backscattering
  - Validition of simplified physical and statistical scattering models (intensity, polarimetry, pol-insar) for geophysical information retrieval
- Experiment details
  - Test site: French Guyana (TBC)
  - Tower acquisitions: CESBIO (F), ONERA (F), PoliMi (I)
  - Currently in planning phase



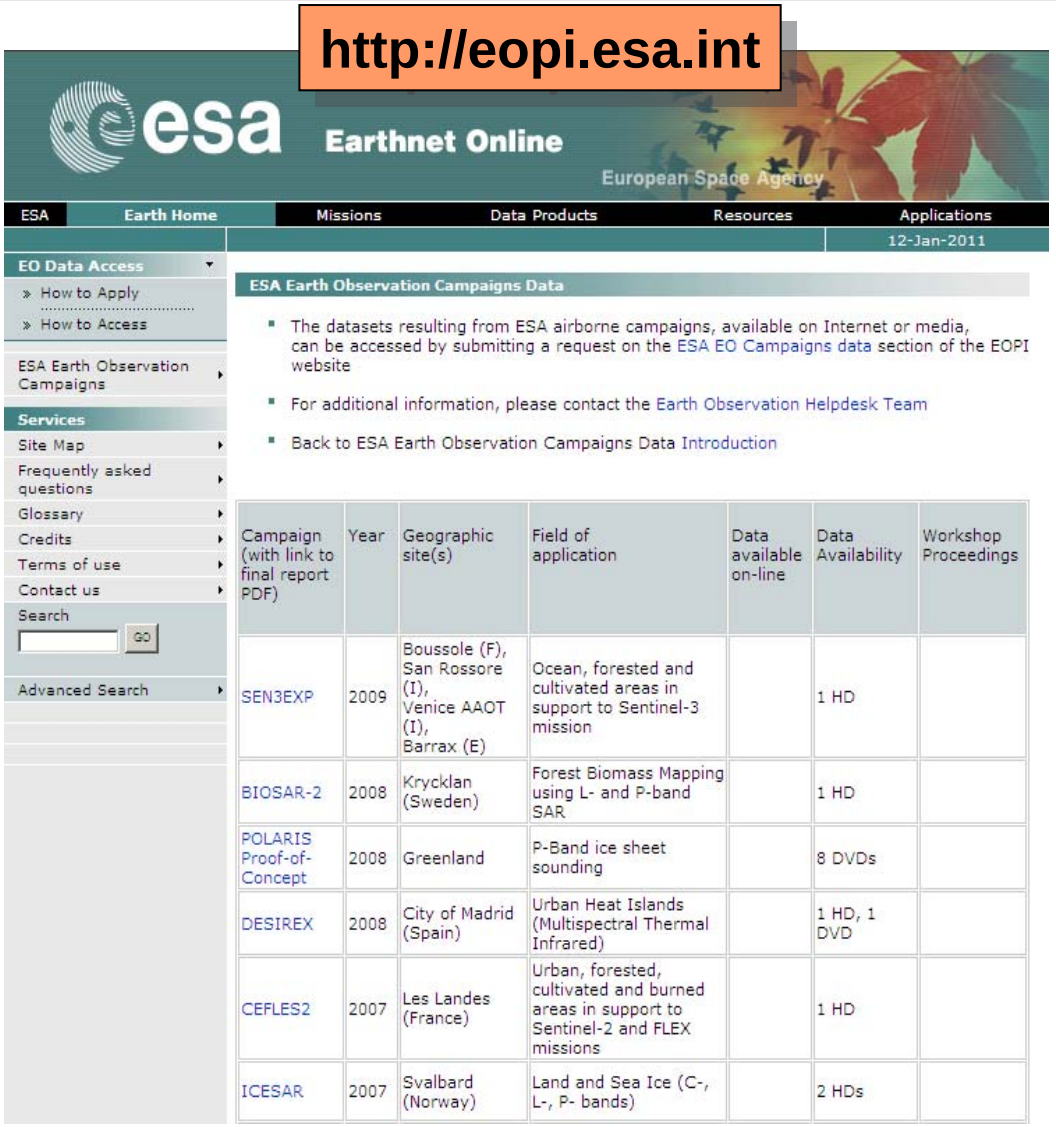






Access to ESA Campaign Data

- ESA campaign data available to interested PIs
  - Formatted and documented datasets
  - Data Inventory
  - Final report with full description of campaign activity and analyses
- Final report accessible directly through web
- Access to datasets provided through Category 1 mechanism (short proposal incl. identification of desired datasets)



Campaign (with link to final report PDF)	Year	Geographic site(s)	Field of application	Data available on-line	Data Availability	Workshop Proceedings
SEN3EXP	2009	Boussole (F), San Rossore (I), Venice AAOT (I), Barrax (E)	Ocean, forested and cultivated areas in support to Sentinel-3 mission		1 HD	
BIOSAR-2	2008	Krycklan (Sweden)	Forest Biomass Mapping using L- and P-band SAR		1 HD	
POLARIS Proof-of-Concept	2008	Greenland	P-Band ice sheet sounding		8 DVDs	
DESIREX	2008	City of Madrid (Spain)	Urban Heat Islands (Multispectral Thermal Infrared)		1 HD, 1 DVD	
CEFLES2	2007	Les Landes (France)	Urban, forested, cultivated and burned areas in support to Sentinel-2 and FLEX missions		1 HD	
ICESAR	2007	Svalbard (Norway)	Land and Sea Ice (C-, L-, P- bands)		2 HDs	