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

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In the framework of its Earth Observation Programmes the European Space Agency (ESA) carries out a number of ground-based and airborne campaigns to support geophysical algorithm development, calibration/validation, simulation of future spaceborne earth observation missions, and applications development related to land, oceans and atmosphere.
The Agency does not normally conduct a campaign in isolation but seeks collaboration with national research organizations in the ESA member states as well as with other international organizations.
In 2005, ESA released a call for the next Earth Explorer Core Mission Ideas with the aim to select a 7th Earth Explorer (EE7) mission to be launched in the next decade. Twenty-four proposals were received and subject to detailed scientific and technical assessment. During the so-called Phase 0, six concepts were selected and further investigated. A down-selection was made after the User Consultation Meeting held in Lisbon, Portugal in January 2009. Three candidate mission concepts were selected for further feasibility phase (phase A) investigation. Each of the candidate missions are being elaborated through two parallel industrial studies at phase A level for further down-selection in 2011/12, with a projected launch of EE7 in the 2016/17 timeframe.

The Candidate missions under consideration are:
-BIOMASS - Global measurements of forest biomass and extent,
-CoReH2O - (Cold Regions Hydrology High-resolution Observatory) – Detailed observations of key snow, ice and water cycle characteristics,
-PREMIER - (PRocess Exploration through Measurements of Infrared and millimetre- wave Emitted Radiation) –Understanding the processes that link trace gases, radiation, chemistry and climate in the atmosphere.
The BIOMASS mission objectives are to improve estimates of carbon stocks and fluxes over land through global measurements of forest biomass and changes in this biomass with time. The mission concept is based on novel spaceborne P-band synthetic aperture polarimetric radar operating at 435 MHz and with 6 MHz bandwidth. The mission will also provide the first opportunity to study the earth's surface at P-Band.
The BIOMASS mission concept relies on the sensitivity of the cross-polar (HV) and co-polar horizontal (HH) channels to forest biomass and on forest height measurements derived from Polarimetric-Inteferometric radar image pairs. Additional forest structure information is provided through tomographic techniques.
This paper focuses on describing the general setup for campaign execution in the context of BIOMASS.
The objective of INDREX-II in 2004 was to build up a data base for the investigation and validation of bio-/geophysical parameters obtained from L- and P-band polarimetric SAR interferometry acquired over tropical forests and to secure with this data set that feedback to ESA regarding the optimal SAR sensor configuration and algorithms for biomass retrieval and monitoring in tropical areas can be provided.
The TropiSAR 2009 campaign took place in French Guiana in August 2009. Airborne SAR data at P- and L-band over selected test sites have been collected and analysed together with relevant co-located ancillary data (e.g. lidar height measurements, in-situ forest data).
The BioSAR 2010 (BioSAR-3) campaign leverages the data and results from the BioSAR 2007 and BioSAR 2008 campaigns to address additional requirements linked to the BIOMASS mission. In particular, the campaign addresses the ability of the mission to detect and map temporal and spatial changes in forest biomass and disturbances. These represent an intrinsic element of the mission concept and exploitation but for which suitable datasets are lacking.
The ongoing activities for TROPISCAT in French Guiana are designed to answer scientific question related to statistics of temporal coherence at P-Band, the temporal variation of polarimetric intensity and imaging the vertical structure of a forest.
Data from all campaigns will be archived and users can access campaign data through the EOPI web portal [http://eopi.esa.int].