# BIOMASS, CoReH2O, Premier: ESA's Candidate 7th Earth Explorer Missions

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The European Space Agency released a call for the next Earth Explorer Core Mission Ideas in March 2005, with the aim to select a 7th Earth Explorer mission to be launched in the next decade. Twenty-four proposals were received and subject to detailed scientific and technical assessment. In 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 Earth Explorer 7 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 primary scientific objectives of the BIOMASS mission are: to determine the distribution of above-ground biomass in the world forests; and to measure annual changes in this stock over the period of the mission. To achieve these objectives, the BIOMASS space segment will consist of a P-band SAR in side-looking geometry with full polarimetric and interferometric capabilities.

The CoReH2O mission addresses major gaps in present snow and ice observations to advance the understanding of the role of the cryosphere in the climate system and to

improve the knowledge and prediction of water cycle variability and changes. Basic measurements of CoReH2O include extent, water equivalent and melting state of the seasonal snow cover, snow accumulation and diagenetic facies of glaciers, permafrost features, and sea ice types. The proposed sensor is a dual frequency SAR, operating at 17 GHz and 9.6 GHz, VV and VH polarizations. The dual frequency, dual polarization approach enables the decomposition of the scattering signal for retrieving physical properties of snow and ice. Two specific mission phases are proposed with emphasis on either temporal (phase 1, 3 day repeat orbit) or spatial coverage (phase 2, 12-15 day repeat orbit).

The PREMIER mission addresses the relationships between atmospheric composition and climate, atmospheric transport processes important to climate and air quality, and relationships between atmospheric dynamics and climate. The specific mission objectives are to investigate processes controlling global atmospheric composition in the mid/upper troposphere and lower stratosphere, a complex region of particular importance for climate; and to study links with surface emissions and pollution. The PREMIER payload consists of a millimetre-wave limb-sounder using a heterodyne multibeam receiver at high vertical sampling, and an imaging limb-sounding infrared Fourier-transform spectrometer with included limb cloud imaging function. The satellite will fly in polar sun-synchronous orbit in loose formation with MetOp, to provide added value to the nadir-viewing trace gas measurements of IASI and GOME-2.

This presentation will give an overview of the three missions focusing on their scientific background, the mission objectives, observation requirements, system concepts and mission elements. Detailed discussions of the scientific preparations and campaign activities will be described in dedicated presentations.

**Bibliography**

[1] European Space Agency (2008) Candidate Earth Explorer Core Missions – Reports for Assessment, ESA SP-1313(3), Mission Science Division, ESA-ESTEC, Noordwijk, The Netherlands, ISSN 0379-6566, 104pp, available at http://www.congrex.nl/09c01/

[2] European Space Agency (2006) The Changing Earth: New scientific challenges for ESA's Living Planet Programme. ESA SP1304, see also http://www.esa.int/esaLP