

ESA'S CANDIDATE CORE EXPLORER MISSION COREH2O: A SATELLITE MISSION DEDICATED TO SNOW AND ICE RESEARCH

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Abstract

The European Space Agency has released the call for the next Earth Explorer Core Mission Ideas in March 2005 with the aim to select the 7th Earth Explorer mission to be launched in the next decade. This is the science and research element of the Living Planet Programme, providing an important contribution to the global endeavour of understanding Earth's System in light of global climate change. Twenty-four proposals were received and subject to detailed scientific and technical assessment. In the so-called Phase 0, six concepts have been 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 are now being further investigated in the feasibility and consolidation phase (Phase A), after which the 7th Earth Explorer will be selected. 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.

This paper focuses on describing the CoReH2O candidate. The main objectives of this proposed mission are to observe snow water equivalent, to improve the modeling of snow and ice processes, and to advance the prediction of stream flow in regions where snow and glacier melt are important components of the water balance.

Snow cover and glaciers are not only key components of the water balance in high latitudes, but are also vital resources of fresh water for many densely populated areas at mid and low latitudes. In many regions the availability of this resource is seriously threatened by climate change, but details on the expected magnitude and patterns of changes in snow-water storage are largely unknown, and so CoReH2O addresses these deficiencies. The primary parameters of interest are spatially detailed observations on the extent, water equivalent and melting state of the seasonal snow cover and the snow accumulation on glaciers, see [2]. A dual frequency SAR, operating at X-band (9.6 GHz) and Ku-band (17.2 GHz), VV and VH polarizations, with a swath width of about 100 km, has been selected for this mission. For the first two years a three-day repeat cycle with limited spatial coverage is proposed, in order to match the time scale of meteorological forcing, particularly addressing the parameterization of snow and ice processes in hydrological models and in regional atmospheric circulation models. During this phase the intent is to perform intensive campaigns and studies in test basins of different snow regimes around the world. The second mission phase shall provide near complete observations of the global cryosphere at a repeat cycle of about 12-15 days.

Experimental and theoretical studies have been initiated in order to advance methods for the retrieval of snow physical properties from SAR data and to develop concepts for the utilization of satellite products in snow and ice process models and hydrological models, see e.g. [1]. CoReH2O will help to advance our knowledge on

the role of snow and ice in the global and regional water cycles, thus complementing existing and upcoming satellite missions dedicated to observing water on land surfaces and in the atmosphere in its liquid and vaporous state.

This presentation will give an overview and status of the candidate mission CoReH2O (see [2]), being one of the three candidates currently being elaborated for the 7th Earth Explorer. The presentation will focus on the ongoing scientific preparatory activities and campaigns in the framework of the mission and report on the outcome of a dedicated workshop planned for April 2010 in Innsbruck, Austria (Workshop on Cold Regions Hydrology, see <http://www.congrex.nl/10c06/>).

Bibliography

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