Geophysical Research Abstracts
Vol. 12, EGU2010-2669, 2010
EGU General Assembly 2010

Measuring Forest Biomass and Height from Space - Results from the assessment of ESA's BIOMASS satellite concept

Klaus Scipal and the BIOMASS Team
European Space Agency, Mission Science Division, Noordwijk, Netherlands (klaus.scipal@esa.int, +31 71 565 5675)

Knowledge about forest above-ground biomass is of fundamental importance in quantifying the terrestrial carbon cycle, but is also crucial in assessing forest resources and the ecosystem services provided by forests, and is an essential element in assessing carbon fluxes under the United Nations Framework Convention on Climate Change. For most parts of the world, in particular the tropical forests, information on biomass is currently very limited, at very coarse scales, and subject to large and unquantified errors. In response to the urgent need for greatly improved mapping of global biomass and the lack of any current space systems capable of addressing this need, the BIOMASS mission was proposed to the European Space Agency for the third cycle of Earth Explorer Core missions and was selected for Feasibility Study (Phase A) in March 2009. Over the five-year mission lifetime, it shall map the full range of the world's above-ground biomass with accuracy and spatial resolution compatible with the needs of national scale inventory and carbon flux calculations, and will map changes in forest biomass. The mission will carry a polarimetric P-Band SAR, capable of providing both direct measurements of biomass derived from inverting intensity data, and measurements of forest height derived from polarimetric interferometry.

The BIOMASS payload consists of a fully polarimetric system operated at a centre frequency of 435 MHz (P-band) with a bandwidth of 6 MHz. To enable measurements at a scale comparable to that of deforestation and forest disturbance (i.e. around 1 ha), it is envisaged that BIOMASS will provide level-1 products with around 50 m x 50 m resolution at 4 looks, so around 16 looks at a scale of 1 ha. The satellite shall fly in a sun-synchronous dawn-dusk orbit to minimise ionospheric disturbances with a controlled drift to meet the revisit requirement for forest height recovery using Pol-InSAR techniques. The revisit time will be between 25-45 days to maintain high temporal coherence. In this setup the mission will achieve coverage of the earth's forests regions at least twice per year. The mission duration is planned for 5 years in order to obtain repeated measurements of the world's forests. This will lead to reduced uncertainties in measurements of the biomass of undisturbed forests and will allow measurement of forest dynamics by detecting changes in biomass and forest cover. At the beginning of the mission a short tomographic phase (1 month) is foreseen during which measurements with 10-12 spatial baselines and a revisit time of 1-4 days will be collected over selected forest regions.

This presentation will provide an overview on the status of scientific activities and will report on the conclusions of recently finished studies which assessed the capability of the BIOMASS mission to measure forest biomass and height. These studies have been initiated in order to advance methods for the retrieval of biomass from P-band PolInSAR data. Specifically they address (1) the formulation of a biomass retrieval algorithm that combines in an optimum way the radar intensity and interferometric information; (2) the collection and analysis of campaign data over tropical forest; and (3) the integration of the derived data in global carbon models.