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Measuring biomass from space - ESA'S BIOMASS Earth Explorer mission candidate

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The BIOMASS mission concept 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 alongside two other competing candidate missions. The mission is a direct response to the urgent need for greatly improved mapping of global forest biomass and the lack of any current space systems capable of addressing this need.
To measure forest biomass on a global scale the mission is designed as a fully polarimetric P-band SAR with interferometric observation capabilities. The system will operate at a centre frequency of 435 MHz 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. The satellite shall fly in a sun-synchronous dawn-dusk orbit to minimise ionospheric disturbances. 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 to enable a better understanding of forest structure characteristics on the measured signal.

This presentation will give an overview and status of the scientific activities of the BIOMASS mission and will report on the status and conclusions of ongoing and recently finished studies in support of assessment of feasibility. 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 impact of the ionosphere on the signal; (2) the formulation of a biomass retrieval algorithm that combines in an optimum way the radar intensity and interferometric information; and (3) the collection and analysis of campaign data over tropical forest. Further a study has been started that investigates how the data can be exploited in carbon modeling using data assimilation concepts and in the framework of UNFCCC and REDD+ activities.