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ESA's CryoSat Mission: addressing rates of change in the thickness of ice sheets and marine ice

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CryoSat, selected as ESA's first Earth Explorer Opportunity mission, is designed to reduce key uncertainties in our understanding of the impact of climate change on polar ice, by determining rates of change in the thickness and mass of Earth's marine and continental ice fields. In October 2005, the CryoSat-1 mission came to an abrupt end due to a failure in the launch sequence. Its replacement, CryoSat-2 was approved in February 2006 and the platform has completed flight acceptance review. The satellite is currently being shipped to the Baikonur, Kazakhstan for launch in February 2010.

The main payload of CryoSat is the SIRAL (Synthetic Interferometric Radar Altimeter), a pulsed, phase coherent full de-ramp radar altimeter which has evolved from the heritage of both pulse-limited (ERS/EnviSat & Jason-1) and phase coherent (Soviet Venera 15/16 and Magellan) altimeter payloads. Unique to spaceborne altimetry is its use of along-track azimuth processing of phase coherent echoes to improve sampling over sea-ice floes for reducing omission errors. Another system feature unique to SIRAL is the addition of a second receive antenna aligned in the across-track direction to improve, via interferometric and azimuth phase processing, localisation of retrieved echoes over the steeply-sloping ice-sheet margins. By contrast to its forerunner SIRAL on CryoSat-1, the new instrument version also has full redundancy to maximise the duration of the mission.

The mission objectives of CryoSat will be described and justified using existing results using ERS-1/-2 and Envisat RA-2 data, and the unique features of its design and pre-launch and on-ground data processing algorithm performances explained. This will be accompanied by illustrated examples of testing of methods of validation using an airborne proxy instrument, during a number of recent airborne and in-situ campaign activities in the Arctic.

For further details about the CryoSat mission and launch see: http://www.esa.int/cryosat