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CryoSat-2 polar mission launched

8 April 2010

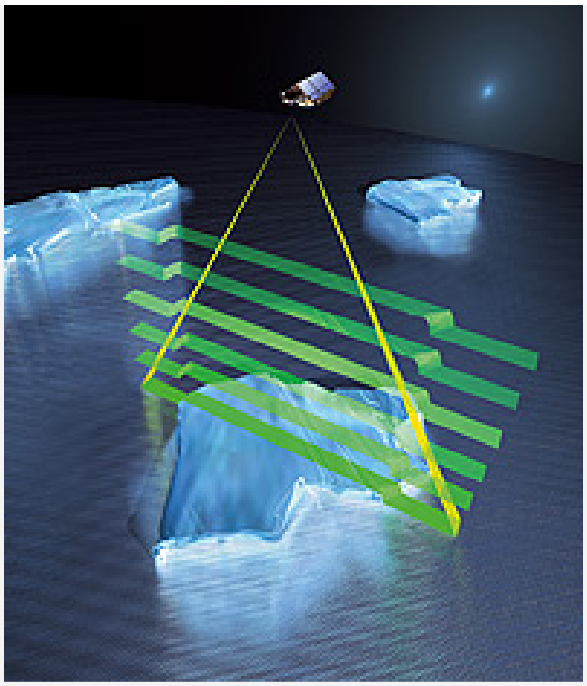
European satellite measures changing sea ice coverage

Cryosat-2 laumch

Europe's satellite mission to measure the Antarctic and Greenland ice sheets, the Earth observation satellite CryoSat-2, was launched at 15:57 CET on a Russian Dnepr launcher from Baikonur in Kazakhstan. The satellite is now in orbit 717 kilometres above Earth. The mission will survey the Antarctic and Greenland ice sheets and sea ice until 2013. Researchers expect to gain a new understanding of the relationships between global warming, the shrinking of the polar ice sheets and changes oceanic and atmospheric circulation from the mission. DLR is contributing towards the funding of the mission on behalf of the German Federal Government. Germany contributes 24 percent of the total funding for the European Space Agency's (ESA) Living Planet programme, of which the CryoSat-2 mission is a part. The total cost of the mission is around 140 million Euro.

The polar ice sheets are of fundamental importance for the global climate, ocean currents and sea levels. Due to the greenhouse effect, more ice is melting at the north and south poles than is being created. The salt concentration of seawater at low latitudes is decreasing. This inhibits the transport of cold, deep-sea water to the Equator as well as the corresponding counter-flow of warm, surface water to the poles. This also weakens the Gulf Stream, which warms the lower latitudes of Europe in comparison to similar latitudes on other continents. With CryoSat-2, scientists will, for the first time, be able to measure changes in the thickness and mass of the polar ice sheets from space, and accurately determine contribution to sea-level change due to the melting of large ice sheets. This will make it possible to create reliable climate forecasts and provide early detection of risks for low-lying areas.

Innovative SIRAL measurement technology used for the first time



The CryoSat-2 measurement system

Distinguishing between sea ice, which is largely underwater, and the water around it, is a challenge for conventional space-based altimeters. These systems direct radar signals vertically down to Earth, and receive the reflections from its surface. By knowing the exact position of the satellite at a particular time and the amount of time it takes the radar to be reflected back up from Earth's surface, the height of the illuminated area can be calculated. This technology has a measurement uncertainty of about 10 centimetres. However, at the sloped, often rough edges of the ice sheets, the error can grow to more than 100 metres.

This is why CryoSat-2 is equipped with a new measurement system, SIRAL (Synthetic Aperture Interferometric Radar Altimeter). It employs two antennas, arranged transversely, or across the satellite's flight direction, and connected by a carbon-fibre antenna frame. The system measures the phase difference – that is, the difference between the travel times from the satellite to Earth and back – of the signals received by the two antennas. From this, it is possible to precisely determine the location where the reflection occurred, even when the reflecting surface is sloped.

CryoSat-2 data	
Launch	8 April 2010
Lifter rocket	Dnepr (modified SS-18)
Launch site	Baikonur, Kazakhstan
Dimensions	4.6 x 2.4 x 2.2 metres
Weight	720 kilograms (including 37 kilograms of fuel)
Mission life	at least 3 years + 6 months commissioning phase + option for 2-year extension
Orbit	Mean altitude 717 kilometres, not Sun-synchronous, inclination 92 degrees
Repetition rate	369 days (including 30 day sub-cycle)
Data reception/ processing	Kiruna, Sweden
Operation centre	ESOC, Darmstadt, Germany
Control centre	ESRIN, Rome, Italy

Commitment to climate

The German Federal Government's continued commitment to the programme, following the loss of its predecessor CryoSat-1 at launch in 2005, underscores its commitment to climate science and protection. Germany is playing a leading role in the mission: the main contractor for the construction of

CryoSat-2 was EADS Astrium, Friedrichshafen. IABG Ottobrunn performed the tests that verified the satellite's operational readiness and the mission is being controlled and monitored by ESA's European Space Operations Centre in Darmstadt. In all, 18 scientific institutes will be processing and evaluating the data sent to Earth by CryoSat-2. DLR's German Remote Sensing Data Center (Deutsches Fernerkundungsdatenzentrum; DFD) in Oberpfaffenhofen will be involved in image processing, while the coordination of user applications and publications will be handled by DLR in collaboration with the Alfred Wegener Institute for Polar and Marine Research (Alfred-Wegener-Institut für Polar- und Meeresforschung; AWI, Bremerhaven), at their CryoSat Project Office.

After completion of the scheduled six-month commissioning phase, CryoSat-2 will produce its first science data around August this year. The mission is scheduled to last a total of three years. CryoSat-2 is the third 'Explorer' mission in ESA's 'Living Planet' Earth research programme, following the GOCE gravity mission and the SMOS water mission. Three more special satellites are currently being built. The Explorer satellites will replace the European environmental satellites ERS-1, ERS-2 and ENVISAT in the medium-term.

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