

CRYOSAT pre-launch CalVal study for sea ice thickness

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To validate the ice thickness algorithms to be used for the SIRAL radar altimeter onboard the CryoSat satellite, it is necessary to obtain representative airborne and ground-based ice and snow measurements during different times of the year. In March-April 2003 the Cryovex'03 experiment was conducted in connection with the research vessel Polarstern cruise in the ice north of Svalbard. The main objective of the field measurements was to determine parameters that are important for later use of the return pulses (Level 1b data) from SIRAL for calculating multiyear ice freeboard and thickness (level 2 and 3 data). Many measurements were made on a large multiyear ice floe, which was considered to be representative for the floes in this region of the Arctic. The basic method of measurement is to find the ice freeboard from the difference in height between pulses from major ice floes and pulses from thin ice/water in major leads, both heights being referred to a common surface. A range of different methods and scales/spatial resolutions were provided by aircraft D2P radar, scanning airborne laser, nadir video imagery, helicopter-borne EM with laser, ground-based measurements of snow and ice thickness, and other physical and chemical snow and ice properties. EM and laser profiles were compared for two flights, conducted on April 11 and April 15. Assessments of these flights have been made. The sensitivity of radar altimeter-derived ice thickness to various snow loads and to ice density variation, obtained from in situ measurements has been calculated. Based on the field studies we also conclude that it is necessary to determine statistical relations for the snow and ice parameters for other Arctic regions and seasons, to calculate the average sea ice thickness from radar-altimeter data.