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Comparison of airborne laser scanning and D2P radar altimetry

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The CRYOVEX (CRYOsat Validation EXperiment) campaign was conducted in spring 2003, the first airborne and in-situ campaign to prepare for CryoSat. One of the main objectives of the campaign was to collect simultaneous and collocated airborne laser and radar altimetry for understanding of the CryoSat measurements. The focus area was the Greenland Sea between northeast Greenland and Svalbard, but the Austfonna icecap in Svalbard and the EGIG profile across the Greenland ice sheet was also surveyed. The survey aircraft was equipped with an INS, three GPS receivers, a Riegl laser scanner and the 13.9 GHz APL D2P (delay/Doppler phase-monopulse) radar. The D2P radar has the same overall characteristics as the SIRAL (SAR/Inteferometric Radar Altimeter) which will fly on CryoSat.

Comparison of the laser and D2P data has been conducted over areas with open water, sea ice and icecaps of Greenland and Svalbard. The open water and airport runway areas allow determination of offsets between the laser scanner and the D2P radar. When applying these offsets it is possible to study the penetration of radar signals into sea ice and inland icecaps. The comparisons are also used for testing and validating various radar retracking methods. Over sea ice the comparison results show a good agreement with expected snow depths, while results over the ice sheets shows significant radar penetration into the snow compared to the laser heights, with radar reflectors likely corresponding to annual layers.