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CRUCIAL: Cryosat-2 Success over Inland Water and Land

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CRUCIAL is an ESA/STSE funded project investigating innovative land and inland water applications from Cryosat-2 with a forward-look component to the future Sentinel-3 mission. The fact that the Earth's land surface is, in general, a relatively poor reflector of Ku band energy, with the exceptions of inland water, salar and ice surfaces has enabled Earth-orbiting satellite radar altimeters to be used for land surface applications including mapping and measurement of river and lake systems. Research with EnviSat Burst Echoes has shown that substantial high frequency information content is present at short spatial scales with a small bright reflecting patch at nadir, such as over inland water, able to dominate the returned echo. Onboard echo averaging of the previous generation of satellite radar altimeters therefore causes loss of significant amounts of information. The high along-track sampling of Cryosat-2 altimeter in SAR mode (18 KHz) offers the opportunity to recover high frequency signals over much of the Earth's land surface, enhancing the inland water height retrieval capability. Constraining this application is the limited availability of SAR Full Bit Rate (FBR) data from Cryosat-2 over these land surfaces; however, for Sentinel-3 the SAR mode will be deployed widely over land. The Cryosat-2 CRUCIAL project will not only provide valuable data, but, as precursor of the Sentinel-3 SAR mode data, gives a valuable first look at this new measurement capability. This paper will summarise the CRUCIAL aims and objectives and showcase first results from retracking Cryosat-2 SAR and LRM waveforms over multiple inland water targets.