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A Quantitative Global Assessment of Inland Water Measurement Capability using Multi-Mission Satellite Radar Altimetry

P.A.M. Berry (1), L. Attwood (1), J. L. Wheeler (1), J. Benveniste (2), and R. G. Smith (1)

(1) De Montfort University, EAPRS Lab, Faculty of Technology, Leicester, United Kingdom (pamb@dmu.ac.uk, 0044 116 2078159), (2) European Space Agency, Earth Observation Applications Department, Via Galileo Galilei, I-00044, Frascati (RM), Italy

Multi-mission satellite radar altimetry makes a unique contribution to the monitoring of global inland surface water. Existing datasets already allow derivation of decadal timeseries over many targets worldwide, and these data are utilised both for climate change research and to inform water resource management. As the number of gauged catchments continues to fall, the importance of a global remote sensing measurement capability becomes ever more critical. The key to unlocking this potential is to retrack the complex waveforms returned from inland water targets, to identify and discard echo components returned from targets not directly beneath the satellite, and to discriminate successfully between wet land and inundated surface.

This paper presents a global assessment of current capabilities, utilising an automated methodology to grade more than 50,000 multi-mission altimeter derived time series of river and lake heights worldwide. From this, quantitative estimates are made of the extent to which current and past altimeter missions (including ERS2, TOPEX, EnviSat, Jason-1) can measure and monitor the earth's inland water surfaces. The best performance is found to be from the EnviSat RA-2, where 8337 targets (33% of the targets acquired by the instrument) return useable timeseries of heights when correctly retracked.

Predicted improvements to this unique measurement capability, resulting from the enhanced instrumentation in proposed future missions (including CryoSat2 and Sentinel-3) are discussed, and the key contribution to global climate change monitoring is demonstrated.