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Global River and Lake Height Measurement using Satellite Radar Altimetry

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Data from the current generation of satellite radar altimeters are now utilized by researchers to derive height changes over many of the earth's large lakes and a few of the largest rivers. The primary limitation to global river monitoring is the requirement to 'retrack' the altimeter echoes to derive an accurate range to the water surface, rather than utilizing the pre-processed data from the Space Agencies.

This paper presents results derived from ERS2, EnviSat, TOPEX, Jason1 and Jason2 by retracking the individual waveforms, and adding a precise global mask of river locations derived from ACE2 to facilitate correct selection of river echoes. The analysis shows that this approach now offers the ability to monitor thousands of lake and river crossings worldwide. Using these new results, the current capability of the ESA Near-Real-Time River and Lake system and its potential enhancements are quantified.

Using the unique database of EnviSat Individual Echoes, obtained for a small sampling of targets at a sampling frequency of 1800Hz rather than the 18Hz standard sampling rate, the potential for the next generation of satellite radar altimeters is illustrated, with recovery of heights from data covering an area as small as a few tens of metres in spatial extent.

These results demonstrate the huge untapped potential of satellite radar altimetry to monitor the earth's inland surface water resources, and give a glimpse into the enhanced capability offered by the next generation of instruments on CryoSat2 and Sentinel 3.