

On evaluating the potential of Envisat Individual echoes to retrieve water in small inland water bodies

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Water bodies narrow in width and shallow in depth are usually challenging targets for satellite remote sensing. In particular, there is a growing interest today in monitoring water heights. Satellite radar altimetry, although designed with oceans in mind, can provide historical and homogenous timeseries of water heights (within satellite track constraints) with a global coverage. Also, radar altimetry is an alternative to the irregular sampling offered by sparse single measurements made with water gauges, and provides access to remote or difficult to reach locations. Generally, the water heights derived from satellite radar altimetry are calculated from an incoherent average of the waveforms received from a large number of echoes reflected back from the surface. However, if the footprint includes non-water targets (e.g. because it touches the shoreline), the reflected echo may be contaminated with some effect on the averaged results. Here we propose the use of individual echoes (IEs) to monitor small inland water bodies (lakes ~200 m diameter, rivers ~200 m or less wide). A large number of IE data packets (each formed by a 1984 x 128 complex data array) have been collected by Envisat during its ten years of service. The inland water body waveforms are seen to vary from specular to moderate Brown, according to the peculiarities of the target, i.e., size, nature of the surrounding land, water surface, etc. Examples generated by extracting all the IE tracks in the vicinity of selected water bodies will be shown and discussed in terms of their echo characteristics, potential accuracy of the measured water height and implications for future inland water altimetry.