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Water levels of lakes and Rivers observed from space

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Satellite radar altimetry has been used for more than 20 years to monitor the water level of the Earths continental water resources. The launch of CryoSat-2 in 2010 has marked a new era in satellite radar altimetry. CryoSat-2 is the first satellite that carries a synthetic aperture radar (SAR) altimeter on-board. The SAR technology provides an along-track resolution of approximately 300 m. The higher resolution makes it possible to accurately monitor much smaller water bodies than previously. Here we demonstrate the potential of SAR altimetry to derive water levels of continental water bodies. We consider lakes at various sizes and evaluate the CryoSat-2 derived lake levels in terms of along-track precision and agreement with in-situ data. As a reference we compare our CryoSat based results with conventional altimetry such as Envisat. We find that the precision of the along-track mean water level is a few cm, even for lakes with a surface area of just 9 km^2. The high precision makes it possible to detect water level variation below the decimeter level. Some of the results is now available in a new open service AltWater (altwater.dtu.space/), where along-track water levels and water level time series can be obtained for a subset of globally distributed lakes.

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