

Automated global water mapping based on wide-swath orbital synthetic-aperture radar

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Abstract

This paper presents an automated technique which ingests orbital synthetic-aperture radar (SAR) imagery and outputs surface water maps in near real time and on a global scale. The service anticipates future open data dissemination of water extent information using the European Space Agency's Sentinel-1 data. The classification methods used are innovative and practical and automatically calibrated to local conditions per 1×1 tile. For each tile, a probability distribution function in the range between being covered with water or being dry is established based on a long-term SAR training dataset. These probability distributions are conditional on the backscatter and the incidence angle. In classification mode, the probability of water coverage per pixel of 1 km×1 km is calculated with the input of the current backscatter – incidence angle combination. The overlap between the probability distributions of a pixel being wet or dry is used as a proxy for the quality of our classification. The service has multiple uses, e.g. for water body dynamics in times of drought or for urgent inundation extent determination during floods. The service generates data systematically: it is not an on-demand service activated only for emergency response, but instead is always up-to-date and available. We validate its use in flood situations using Envisat ASAR information during the 2011 Thailand floods and the Pakistan 2010 floods and perform a first merge with a NASA near real time water product based on MODIS optical satellite imagery. This merge shows good agreement between these independent satellite-based water products.

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The full article can be requested at the publisher or at HKV [CONSULTANTS](#) (c.meijer@hkv.nl).