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Monitoring of small reservoirs storage volume with ENVISAT ASAR, and suitability of small reservoirs as runoff gauges.

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In many semi-arid regions of the developing world, hundreds of small reservoirs dot the landscapes in support of rural water supply. Previous research has shown that the storage volumes of small reservoirs can be determined as a function of reservoir surface areas classified with Landsat ETM images. However, the often-obstructing atmospheric conditions make monthly monitoring with optical satellites almost impossible.

Although weather independent radar remote sensing is a promising alternative under often-cloudy conditions, the extraction of small water bodies from individual scenes is affected by other factors, such as wind-induced waves and ripples causing Bragg scattering.

To assess the suitability of ENVISAT ASAR as a tool to extract small reservoir surface areas, which can be related to storage volumes, the surface extents of three reservoirs were determined from monthly ENVISAT ASAR images from June 2005 until August 2006. The quality of the radar based water body extraction can be determined in two ways: by comparison with GPS based outlines; and by comparison with reservoir extents derived from bathymetrical models and water level measurements, both recorded on the day of image acquisition.

While the radar based reservoir sizes compare well to the areas determined from the bathymetrical models, the GPS based outlines commonly over-estimate the true extent of small water bodies. This is explained due to the sometimes large wetland areas in the tail part of small reservoirs, which are included in the GPS based reservoir outlines,

but not in the bathymetric models.

Finally, the suitability of ENVISAT ASAR for small reservoir storage estimates will be presented by comparing reservoir storage volume estimates with in-situ measurements. This research is seen as a suitable study for basin-wide estimates of small reservoir storage volumes, and points to further applications, such as the use of small reservoirs as minimum runoff gauges that can be observed from space.

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