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STORAGE CAPACITY ESTIMATION OF SMALL RESERVOIRS IN DRYLANDS BASED ON INTERFEROMETRIC SYNTHETIC APERTURE RADAR (INSAR) AND TANDEM-X DATA

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ABSTRACT:

In the semi-arid northeast of Brazil, numerous reservoirs of various sizes have been constructed to ensure water supply in the dry season. Among them, more than 30,000 are small reservoirs with average storage capacityof 0.5 hm^3. To support local water management at the catchment to regional scale, an accurate estimation of the water storage capacities of reservoirs is required. However, current bathymetric surveys in the study area and elsewhere are manually conducted either with echo sounders or with depth meters at different times, which involves enormous efforts and point-wise measurements with varying accuracies. SAR interferometry based on TanDEM-X data acquired in the bistatic mode has been proven to be very effective to generate Digital Elevation Model (DEM) of fine resolution. However, water bodies including the reservoirs in the test area of this study have been masked out in the global TanDEM-X DEM mission.

This study, therefore, aims at deriving high resolution DEMs of the reservoir areas with TanDEM-X data acquired in the dry season, i.e. when the water level is lowest and most reservoirs fall nearly or completely empty. Subsequently height-area-volume curves are generated with respect to each reservoir of interest based on their topography extracted from InSAR DEM. These curves assist the subsequent estimation of available water volume from water surface changes derived from satellite time series data for each reservoir, and hence contribute to calculate the available water storage in the catchment or region.Field data from DGPS measurements and existing bathymetric surveys are employed for validation purpose.