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Application of Remote Sensing Data to Improve the Water and Soil Resource Management of Rwanda

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The Rwandan agriculture strongly relies in the dry seasons on the water stored in artificial reservoirs of various sizes for irrigation purposes. Furthermore, the success of irrigation depends on a wide range of soil properties which directly affect the moisture regime of the growing medium. By integrating remote sensing and auxiliary data the objectives of our study are to monitor the water level fluctuation in the reservoirs, estimate the volume of water available for irrigation and to combine this information with soil property maps to support the decision making for sustainable irrigation water management in a study area in Southern Rwanda. For water level and volume estimation a series of Sentinel-1 (product type: GRD, acquisition mode: IW, polarizations HH and VH) data were obtained covering the study area and spanning over a period of two years. To map the extent of water bodies the Radar-Based Water Body Mapping module of the Water Observation and Information System (WOIS) was used. High-resolution optical data (Sentinel-2) were used for validation in cloud-free periods. To estimate the volume changes in the reservoirs, we combined the information derived from the water body mapping procedure and digital elevation models. For sustainable irrigation water management, digital soil property maps were developed by the application of wide range of environmental covariates related to soil forming factors. To develop covariates which represent the land use a time series analysis of the 2 years of Sentinel-1 data was performed. As auxiliary soil data, the ISRIC-WISE harmonized soil profile database was used. The developed digital soil mapping approach is integrated into a new WOIS workflow.