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Using aerial images for establishing a workflow for the quantification of water management measures

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Quantified landscape characteristics, such as morphology, land use or hydrological conditions, play an important role for hydrological investigations as landscape parameters directly control the overall water balance. A powerful assimilation and geospatial analysis of remote sensing datasets in combination with hydrological modeling allows to quantify landscape parameters and water balances efficiently.

This study focuses on the development of a workflow to extract hydrologically relevant data from aerial image datasets and derived products in order to allow an effective parametrization of a hydrological model. Consistent and self-contained data source are indispensable for achieving reasonable modeling results. In order to minimize uncertainties and inconsistencies, input parameters for modeling should be extracted from one remote-sensing dataset mainly if possbile. Here, aerial images have been chosen because of their high spatial and spectral resolution that permits the extraction of various model relevant parameters, like morphology, land-use or artificial drainage-systems.

The methodological repertoire to extract environmental parameters range from analyses of digital terrain models, multispectral classification and segmentation of land use distribution maps and mapping of artificial drainage-systems based on spectral and visual inspection. The workflow has been tested for a mesoscale catchment area which forms a characteristic hydrological system of a young moraine landscape located in the state of Brandenburg, Germany.

These dataset were used as input-dataset for multi-temporal hydrological modelling of water balances to detect and quantify anthropogenic and meteorological impacts. ArcSWAT, as a GIS-implemented extension and graphical user input interface for the Soil Water Assessment Tool (SWAT) was chosen. The results of this modeling approach provide the basis for anticipating future development of the hydrological system, and regarding system changes for the adaption of water resource management decisions.