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Propagation of precipitation uncertainties in water balance estimations

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The spatial variability of rainfall is often termed as the major source of uncertainty in investigations of rainfall-runoff processes and water balance estimations. Therefore, the propagation of uncertainties, resulting from the calculation of areal precipitation from point measurements, in water balance estimations is of crucial importance for the prediction variation of hydrological behaviour. Different spatial interpolation methods (Thiessen polygon, inverse distance weighting, ordinary, and external drift kriging) for areal precipitation are applied, and their impact on water balance estimates is analysed. Furthermore, geostatistical simulations using the turning method for areal precipitation are performed in order to investigate the propagation of consequential uncertainties in water balance estimations. These results provide ranges of the temporal and spatial distribution of water balance variables as consequence of uncertainties from the calculation of areal precipitation interpolation and simulation from station data.

Within the framework of the GLOWA-Volta project this study is performed for the White Volta basin (100 000 km^2), a hydrometeorological data sparse region in the semi-arid environment in West Africa. The impact of the selected spatial interpolation method for areal precipitation on the temporal and spatial distribution of water balance variables is minor for spatially aggregated variables and the corresponding time series. However, the selected interpolation method affects the spatial distribution of water balance variables. The results of the turning band simulations for precipitation show that the range of possible realizations of routed discharge varies considerable depending on the location of the subcatchment and the uncertainties of

the upstream subcatchments.