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The added value of remote sensing products in constraining hydrological models

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The calibration of a hydrological model still depends on the availability of streamflow data, even though more additional sources of information (i.e. remote sensed data products) have become more widely available. In this research, the model parameters of four different conceptual hydrological models (HYPE, HYMOD, TUW, FLEX) were constrained with remotely sensed products. The models were applied over 27 catchments across Europe to cover a wide range of climates, vegetation and landscapes. The fluxes and states of the models were correlated with the relevant products (e.g. MOD10A snow with modelled snow states), after which new a-posteriori parameter distributions were determined based on a weighting procedure using conditional probabilities. Briefly, each parameter was weighted with the coefficient of determination of the relevant regression between modelled states/fluxes and products. In this way, final feasible parameter sets were derived without the use of discharge time series.

Initial results show that improvements in model performance, with regard to streamflow simulations, are obtained when the models are constrained with a set of remotely sensed products simultaneously. In addition, we present a more extensive analysis to assess a model's ability to reproduce a set of hydrological signatures, such as rising limb density or peak distribution. Eventually, this research will enhance our understanding and recommendations in the use of remotely sensed products for constraining conceptual hydrological modelling and improving predictive capability, especially for data sparse regions.