

## **A two-stage strategy for efficient and effective calibration of distributed hydrological models**

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**Abstract** Calibration of distributed environmental models requires a high amount of either computing power or time, which can be a significant issue. As the computational effort for distributed models mainly depends on the number of spatial modelling entities, a promising approach for their optimization is to decrease these entities while sustaining the major characteristics of the model. In this article, a two-stage approach is presented to reduce the computational effort. In the first stage the number of spatial units is decreased, thus simplifying the original representation of the catchment. Spatial units are eliminated or merged with other units according to different merging rules (e.g. merging of similar units). The simplified model is used to carry out an initial calibration. In the second stage the process of simplification is reversed, i.e. the spatial representation of the catchment is restored stepwise. The obtained parameter sets are recalibrated. This is reiterated until the original distribution is recovered. To test and analyse this strategy, the distributed model J2000 is applied on the two meso-scale catchments of the Wilde Gera and Ilm, both located in central Germany. Furthermore, variations of the approach to simplify the spatial representation are analysed.

**Key words** calibration; hydrology; spatial representation