

Embedding complex hydrology in the climate system – towards fully coupled climate–hydrology models

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Abstract Motivated by the need to develop better tools to understand the impact of future management and climate change on water resources, we present a set of studies with the overall aim of developing a fully dynamic coupling between a comprehensive hydrological model, MIKE SHE, and a regional climate model, HIRHAM. The physics of the coupling is formulated using an energy-based SVAT (land surface) model while the numerical coupling exploits the OpenMI modelling interface. First, some investigations of the applicability of the SVAT model are presented, including our ability to characterise distributed parameters using satellite remote sensing. Secondly, field data are used to investigate the effects of model resolution and parameter scales for use in a coupled model. Finally, the development of the fully coupled climate–hydrology model is described and some of the challenges associated with coupling models for hydrological processes on sub-grid scales of the regional climate model are presented.

Key words climate change; SVAT; hydrological modelling; land surface modelling; coupling; atmospheric feedbacks; remote sensing; MIKE SHE; HIRHAM