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Coupling of a new land surface evaporation model (Eva) to the Water Accounting Model (WAM) for the analysis of land-use change impacts on continental moisture recycling

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In some regions of the world, moisture recycling is to a considerable extent sustained by terrestrial evaporation – a moisture flow that can be partly altered by humans through land-use change. With increasingly stressed fresh water resources as well as growing pressure on land, there is a need to advance our understanding of the entire impact chain of continental moisture recycling: from land-use to downwind precipitation.

For the purpose of analyzing land-use change impacts on continental moisture recycling, we have developed a globally distributed land surface evaporation model (Eva) and coupled it to the moisture tracking scheme WAM. The Eva model estimates evaporative fluxes (incl. partitioning of interception and transpiration) based on predefined and satellite derived land use and soil properties. Land-use classes may easily be substituted for investigation of land-use change impacts. As our objective is specifically tuned to assess the effect of land-use change on evaporation and downwind precipitation, we have deliberately simplified the hydrological scheme of Eva (disregarding groundwater interaction and lateral flow). This is a balance act between the model's ability to represent all hydrological processes and its usability for isolated explorations of the land-moisture-precipitation nexus at the macro scale.

The WAM-Eva coupling is a simple tool to apply in future studies on how different land-use scenarios may affect moisture recycling at a continental and global scale, and contributes to our understanding of how land management in one region may affect fresh water availability in another.