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Human modification of the atmospheric water cycle through land use change

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Human society have radically transformed the land surface of the Earth and through that altered the hydrological cycle in various way. In this research, we quantify and analyse the global changes to terrestrial moisture recycling from anthropogenic driven modifications in land cover and land use. We simulate evaporation and moisture recycling in potential, historical, and current land cover and land use scenarios by coupling a global hydrological model (STEAM) with a moisture tracking scheme (WAM-2layers). Moreover, we investigate where and when rainfall change occurs, assuming that change in moisture recycling translates into change in rainfall. Although changes in the hydrological flows are limited at the global and annual average, the spatial and temporal differences are significant. Propagation of land use change into rainfall change appears non-uniformly distributed. In particular, disappearance of vegetation appears to reduce the dry season length and affect the dry season rainfall more than the average. Thus, land use change in certain regions potentially affects agricultural development in downwind regions by altering the total rainfall as well as the dry season length. This study shows how land resources and water availability are tightly connected also over large distances, and points to the need to study land use change and climate change in conjunction.