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Effects of land use change on water-related ecosystem services in the Amazon Basin

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Land use changes can affect many dimensions of the hydrological cycle which in turn affect the provisioning of water and its related ecosystem services to society. Modification at different spatial and temporal extents due to seasonal changes in water supply and land use intensities may compound and challenge our ability to predict the cascade of processes that lead to the supply of ecosystem services, i.e., ecosystem service cascade (ecosystem property, supply and service). In the Amazon basin, land use changes may affect water supply through modification of moisture recycling periodicity, and a quantification of its effects on other water-related ecosystem services, namely crop production and biodiversity, is scarce. We investigated this process using a moisture-tracking model, to show that upstream land use changes will affect the persistence of cropland in the Amazon arch of deforestation. We also show that biodiversity trait distributions affect the provision of water that maintains the cascades of moisture recycling, and different trait combinations enable regulation of atmospheric water regulation and land surface temperature. As trait combinations are a result of land use changes, the future of moisture recycling in the Amazon and its dependence downstream may require a better land use planning that incorporates these processes more explicitly.