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Seasonal water storage and delayed evapotranspiration across continents: Patterns and drivers

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Storage and delayed evapotranspiration (ET) of precipitation (P) inputs by land ecosystems is critical regulating the timing and stability of plant production and the multiple ecological and economic processes that it supports. The extent to which actual ET (AET) can decouple from P inputs depends on the ecohydrologic system capacity to store water. This decoupling and its associated storage requirement can be particularly relevant at the seasonal scale in regions where, for instance, rainfalls are highly seasonal and/or P and potential ET (PET) are seasonally out of phase. Focusing on the 2003-2010 period, we explore, first, where on Earth this decoupling is likely to occur from a climate perspective by assessing the magnitude and duration of the expected seasonal land water transfers. These climate-based predictions are then compared with independent evidence derived from satellite observations of vegetation activity (MODIS) and water storage (GRACE), together with datasets of terrain attributes. We assess how land surface processes alter the "potential" seasonal hydrologic buffer provided by the local climatic conditions, in terms of volume and residence time. This analysis helps outlining the expected seasonal response of the land water cycle in the frame of likely climate and land use changes.