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Moisture recycling in five different regions with Mediterranean climates around the world

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Weather extremes are predicted to be more intense and recurrent in the future because of climate change. Previous studies show that Mediterranean regions around the world are especially vulnerable to extreme events that depend on the hydrological cycle, such as droughts and floods. Land use and land cover changes may enhance these events, as they influence the exchange of moisture and energy between the land surface and atmosphere. To better understand the role of extremes in a future climate, we need to improve our understanding of the impact of climate change on the terrestrial hydrological cycle. Atmospheric transport of moisture is an important element of this cycle as it determines the allocation of evaporated moisture. We are especially interested in the sink-source relations. So, how land contributes to the moisture recycling over land further away, and the origin of the precipitation over, the so-called precipitation-shed. Tuinenburg et al. (2020) recently published a dataset with high-resolution global atmospheric moisture connections from evaporation to precipitation, allowing novel detailed insight. We used this dataset to study temporal variability in atmospheric moisture connections for five different regions with Mediterranean climates. We investigated the dependency of different Mediterranean regions on local and remote moisture sources, and how this dependency varies throughout the year. Large differences in the spatial pattern of moisture recycling over land showed to exist between the Mediterranean regions on the Northern and Southern Hemisphere. Additionally, of all regions, the Mediterranean Basin shows the largest temporal variability. This information is essential to study how local changes in land use and land cover have and will further affect the hydrological cycle in local and remote regions. This helps us to understand how climate extremes could change in the future as a result of land use and land cover changes.

Tuinenburg, O. A., Theeuwen, J. J. E., and Staal, A. Global evaporation to precipitation flows obtained with Lagrangian atmospheric moisture tracking, PANGAEA, https://doi.org/10.1594/PANGAEA.912710, 2020.