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# Using local moisture recycling to assess the impact of regreening on the local water cycle in five Mediterranean regions

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Mediterranean regions worldwide are expected to face an increase in water scarcity due to land degradation and climate change. Regreening enhances infiltration and preserves evapotranspiration, which may enhance rainfall locally and thus potentially reduce water scarcity. However, the exact impact of such land cover changes on the hydrological cycle remains unclear. To assess the impact of regreening on the local water cycle, we aimed to identify drivers of the local moisture recycling ratio (LMR) for five Mediterranean regions: southwestern Australia, California, central Chile, the Mediterranean Basin, and the Cape region of South Africa. We defined LMR as the fraction of evaporated moisture that rains out within approximately 50 km from its source and we calculated it using the output of a Lagrangian atmospheric moisture tracking model. For this, we studied the correlation between LMR and ecohydrological variables (dependent on the hydrological cycle or vegetation, i.e., precipitation, evaporation, aridity and vegetation cover) and non-ecohydrological variables (i.e., wind, orography and distance to the nearest coast) using Spearman rank correlation and principal component analyses. We find first, on average, LMR is small (1-2%) but varies among and within the five regions. Second, precipitation corresponds strongest to LMR in all five regions. Third, regreening could enhance LMR and strengthen the local water cycle for all five Mediterranean regions, although to different extents. The results suggest that an increase in evaporation due to regreening positively affects LMR and thus strengthens the local water cycle. The enhanced local water cycle reduces aridity, which induces LMR, and thus a positive feedback might be established. Finally, the correlation between LMR and ecohydrological and non-ecohydrological variables varies among the five regions. Therefore, the variables influencing LMR most are different for each region. Our results suggest that the potential impact of regreening varies among the Mediterranean regions due to the difference in correlations between LMR and the non-ecohydrological variables. Our study helps understand where regreening might benefit the local water cycle in regions with a Mediterranean climate.