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How does future groundwater recharge depend on climate, land cover and subsurface heterogeneities in the European and Mediterranean region?

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The presence of subsurface heterogeneities can have a large impact on the hydrological fluxes. In karst areas the presence of subsurface dissolution enlarged conduits or fissures, which act as preferential vertical flow pathways, enhances groundwater recharge and makes surface runoff almost negligible. As a result, recharge in karst systems may be particularly sensitive to environmental changes compared to other less permeable systems. However, the impact of future changes in climate and land cover on recharge has been little studied over karst areas, even if karst aquifers are an important source of drinking water in many regions of the world. A better understanding of future karst groundwater resources is needed for guiding sustainable water management.

The objective of this study is to gain a better understanding of the sensitivity of karst groundwater recharge to changes in climate and land cover at the regional scale. In a previous study, we developed a large-scale integrated vegetation-recharge model, called V2Karst, to assess the impact of climate and land cover parameters on karst groundwater recharge at specific sites. In this study, we apply the V2Karst model over European and Mediterranean carbonate rock areas using climate projections from GCMs and land cover projections from the Land-Use Harmonisation database, while accounting for uncertainties in projections and parameter values. We introduce a sensitivity index to determine, under which conditions recharge is highly responsive to changes in climate and land cover.