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The current and future sociohydrological role of traditional irrigation systems in high mountain areas in Southern Spain

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In Mediterranean mountain regions, traditional irrigation systems persist in areas where the standard modernization approaches do not succeed in being operational. In many cases, these actions have been changing the hydrological natural regime, soil uses, vegetation distribution for centuries, and they are part of the social structure and cultural heritage of such regions. In Sierra Nevada mountains in Southern Spain the old irrigation/recharge channels dating from the Arabs (Xth Century) are still operational in some areas; they contribute to maintaining local agricultural systems and population in basins dominated by snow conditions, and constitute a traditional regulation of water resources in the area. This work shows the spatial distribution and current state of the channel systems and water uses, and their sociohydrological and ecological role, in this area. The study includes a pilot study on a selected 4-km channel from an altitude of 1573 m.a.s.l. over an average slope of 0.0023, and quantifies its annual hydrological budget and assesses its vulnerability to soil use policies and climate trends. The results along the channel under natural regime (no water uptake from the channel) show a lapse time between 4-14 days from the beginning of the snowmelt season for the water to reach the bottom end, depending on the wet/dry regime of the year, and an operational period (the whole channel has surface water flow) between 4-2 months, respectively. Recession periods of 35 and 61 days were found too, respectively, with a mean daily average infiltration rate of 0.03 m^3/s over the whole channel during each annual operational period. The past mean 40-yr annual trends of -1.4 and -2.0 mm/yr of precipitation and snowfall, respectively, 0.03 C/yr of temperature, -0.0012m3/s/yr of contributing flow to the channel,and -1.7 days/yr of operational days point to a medium to high vulnerability of these systems and their sociohydrological role against global warming.