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Relative impact of irrigation techniques and climate change on hydroclimatic regimes in the Mediterranean region

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Irrigated agriculture is the major water consumer in the Mediterranean region. Improved irrigation techniques have been widely promoted to reduce water withdrawals and increase resilience to climate change impacts. In this study, we assess the impact of the ongoing transition from flood to drip irrigation on future hydroclimatic regimes in the agricultural areas of Valencia (Spain). The impact assessment is conducted for a control period (1971-2000), a near-term future (2020-2049) and a mid-term future (2045-2074) using a chain of models that includes five GCM-RCM combinations, two emission scenarios (RCP 4.5 and RCP 8.5), two irrigation scenarios (flood and drip irrigation), and twelve parameterizations of the hydrological model Tetis. Results of this modelling chain suggest considerable uncertainties regarding the magnitude and sign of future hydroclimatic changes. Yet, climate change could lead to a statistically significant decrease in future groundwater recharge of up -6.6% in flood irrigation and -9.3% in drip irrigation. Projected changes in actual evapotranspiration are as well statistically significant, but in the order of +1% in flood irrigation and -2.1% in drip irrigation under the assumption of business as usual irrigation schedules. The projected changes and the related uncertainties will pose a challenging context for future water management. However, our findings further indicate that the effect of the choice of irrigation technique may have a greater impact on hydroclimate than climate change alone. Explicitly considering irrigation techniques in climate change impact assessment might therefore be a way towards better informed decision-making.

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