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Precipitation dynamics in mainland Portugal: trends and future changes

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This study identifies spatial-temporal historical trends and future changes in precipitation and its extremes over mainland Portugal. For this purpose, eight precipitation indices were chosen from the 27 ETCCDI: total precipitation (PRCPTOT), maximum 1-day precipitation (R×1day), maximum 5-day precipitation (R×5day), simple daily intensity index (SDII), number of heavy precipitation days (R20 mm), consecutive wet days (CWD), consecutive dry days (CDD) and contribution from very wet days to total precipitation (R95PTOT). Additionally, an extreme precipitation susceptibility index (EPSI), based on the most relevant and complementary extreme indices (R×1day, R×5day, SDII, R20, CWD and R95PTOT), is considered. The evaluation of trends in the precipitation indices was performed using the nonparametric Mann–Kendall test for the period 1950–2003. Considering the same indices, this study also assesses possible changes under future climatic conditions for the period 2046–2065. Our findings indicate predominantly drying annual trends, mainly in central Portugal. In spring, statistically significant drying trends are found, mostly in northern and central Portugal, while weak wetting trends are detected in autumn, but not significant at 5% level. The EPSI show a decrease of extreme precipitation in spring over central Portugal and a slight increase in autumn over northern Portugal and nearby Lisbon. The projections for 2046–2065 show a decrease in PRCPTOT, mostly over northwestern Portugal. The contribution of extreme precipitation to total precipitation (R95PTOT) is expected to increase throughout Portugal, as well as the number of consecutive dry days (CDD). EPSI is projected to increase in 29% of the Portuguese municipalities, including in almost all municipalities in the Lisbon metropolitan area. CDD is also projected to increase, especially in the south of the country. Overall, municipalities in the northern region are more susceptible to extreme precipitation events, while those in the south are more susceptible to long drought events. Acknowledgements: This study was funded by the R&D project INNOVINE&WINE – Vineyard and Wine Innovation Platform, NORTE-01-0145-FEDER-000038, co-funded by FEDER (Fundo Europeu de Desenvolvimento Regional) through the programme NORTE 2020 (Programa Operacional Regional do Norte 2014/2020).