


## RESEARCH ARTICLE

# Downscaling climate change of mean climatology and extremes of precipitation and temperature: Application to a Mediterranean climate basin

Rong Zhang<sup>1,2,3,4</sup>  | João Corte-Real<sup>1,2,5</sup> | Madalena Moreira<sup>1</sup> | Chris Kilsby<sup>6</sup> | Aidan Burton<sup>6</sup> | Hayley J. Fowler<sup>6</sup> | Stephen Blenkinsop<sup>6</sup> | Stephen Birkinshaw<sup>6</sup> | Nathan Forsythe<sup>6</sup> | João P. Nunes<sup>5,7</sup> | Elsa Sampaio<sup>1,2,8</sup>

<sup>1</sup>Institute of Mediterranean Agricultural and Environmental Sciences, University of Évora, Évora, Portugal

<sup>2</sup>DREAMS – Centre for Interdisciplinary Development and Research on Environment, Applied Management and Space, University Lusófona of Humanities and Technologies, Lisbon, Portugal

<sup>3</sup>Department of Hydrology, CEMADEN – National Center for Monitoring and Early Warning of Natural Disasters, São Paulo, Brazil

<sup>4</sup>Department of Hydrology and Water Resources, Nanjing Hydraulic Research Institute, Nanjing, China

<sup>5</sup>CESAM-Centre for Environmental and Marine Research, Department of Environment and Planning, University of Aveiro, Aveiro, Portugal

<sup>6</sup>Water Resource Systems Research Laboratory, School of Engineering, Newcastle University, Newcastle upon Tyne, UK

<sup>7</sup>CE3C – Centre for Ecology, Evolution and Environmental Changes, Faculdade de Ciências, Universidade de Lisboa, Lisbon, Portugal

<sup>8</sup>Department of Geosciences, Science and Technology School, University of Évora, Évora, Portugal

## Correspondence

Rong Zhang, Institute of Mediterranean Agricultural and Environmental Sciences, University of Évora, Núcleo da Mitra, Apartado 94, 7002-774 Évora, Portugal.  
Email: rzhang@uevora.pt; zhangrong.research@outlook.pt

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## Abstract

Downscaling is usually necessary for robust hydrological impact assessments. This may be undertaken using a wide range of methods, including a combination of dynamical and statistical-stochastic downscaling. This study uses the Spatial–Temporal Neyman–Scott Rectangular Pulses model—RainSimV3, the precipitation-conditioned daily weather generator—ICAAM-WG, and the change factor approach for downscaling synthetic climate scenarios for robust hydrological impact assessment at middle-sized basins. The ICAAM-WG was developed based on the concept of the Climate Research Unit daily weather generator (CRU-WG), motivated by the need for improved representation of heat waves by downscaling methods given the positive feedback between low soil moisture and high air temperature. We demonstrated the validity of the proposed methodology in the 705-km<sup>2</sup> Mediterranean climate basin in southern Portugal. The results show that, for the control period 1980–2010, both RainSimV3 and ICAAM-WG reproduced not only the mean climatology, but also extreme wet and low precipitation events, as well as the extremes of temperature and heat waves. We found that downscaling with ICAAM-WG (SIM6), which uses second-order autoregressive processes for the simulation of temperature during consecutive dry and wet days, outperformed

This paper is dedicated to the memory of our best friend and co-author Professor João Corte-Real, who was a brilliant supervisor, teacher and scientist.