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## The role of decadal prediction in the detection of heat waves in the Iberian Peninsula

Juan José Rosa-Cánovas<sup>1,2</sup>, Matilde García-Valdecasas Ojeda<sup>3,4</sup>, Emilio Romero-Jiménez<sup>1</sup>, Patricio Yeste<sup>1,2</sup>, Feliciano Solano-Farías<sup>1</sup>, Sonia Raquel Gámiz-Fortis<sup>1,2</sup>, Yolanda Castro-Díez<sup>1,2</sup>, and María Jesús Esteban-Parra<sup>1,2</sup>

<sup>1</sup>Department of Applied Physics, University of Granada, Granada, Spain (jjrc@ugr.es)

<sup>2</sup>Andalusian Institute for Earth System Research (IISTA-CEAMA), Granada, Spain

<sup>3</sup>Istituto Nazionale di Oceanografia e di Geosica Sperimentale (OGS), Sgonico, Italy

<sup>4</sup>Earth System Physics Section, International Centre for Theoretical Physics (ICTP), Trieste, Italy

Heat waves are among the natural hazards with the greatest social, environmental and economic impact in Mediterranean Europe. In this scenario of changing climate towards warmer conditions, heat waves are expected to increase their length and intensity during the next decades. Thus, reliable near-term forecasting for heat waves plays a fundamental role in the development of effective mitigation and adaptation strategies in these regions.

This study evaluates the prediction skill of heat waves in the Iberian Peninsula (IP) with a collection of global decadal experiments dynamically downscaled by using the Weather Research and Forecasting (WRF) model. The Decadal Prediction Large Ensemble (DPLE) has been used to set the initial and boundary conditions in the downscaling simulations. The DPLE encompasses a set of decadal experiments initialised every year from 1954 to 2015 carried out for an ensemble of 40 members with the Community Earth System Model (CESM) at NCAR. In this assessment, the decadal experiments starting in the years from 1987 to 1999 have been regionalised for 3 members of the ensemble. The downscaling simulations have been conducted in one-way mode and considering two nested domains: the EUROCORDEX domain, with resolution around 50 km, and another covering the IP at 10 km resolution, approximately.

Two indices have been used to quantify the intensity and duration of the heat waves: the Heat Wave Magnitude Index daily (HWMId) and the Warm Spell Duration Index (WSDI). The maximum daily temperature is used to compute both indices. While HWMId is described as the maximum magnitude of the heat waves in a year, WSDI represents the extension of warm spells in a general sense. The results obtained from the regionalised experiments have been evaluated against observational data.

**Keywords:** decadal prediction, Weather Research and Forecasting Model, heat waves, Iberian Peninsula, dynamical downscaling, Decadal Prediction Large Ensemble

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