



## **Seasonal trends in precipitation and surface air temperature extremes in mainland Portugal, 1941-2007**

M.I.P. de Lima (1,2), F.E. Santo (3), and A.M. Ramos (4)

(1) IMAR - Institute of Marine Research, Marine and Environmental Research Centre, Coimbra, Portugal, (2) ESAC/Polytechnic Institute of Coimbra, Coimbra, Portugal, (3) Institute of Meteorology, Lisbon, Portugal, (4) Environmental Physics Laboratory, Universidad de Vigo, Spain

Several climate models predict, on a global scale, modifications in climate variables that are expected to have impact on society and the environment. The concern is on changes in the variability of processes, the mean and extreme events (maximum and minimum). To explore recent changes in precipitation and near surface air temperature extremes in mainland Portugal, we have inspected trends in time series of specific indices defined for daily data. These indices were recommended by the Commission for Climatology/Climate Variability and Predictability (CCI/CLIVAR) Working Group on Climate Change Detection, and include threshold indices, probability indices, duration indices and other indices.

The precipitation and air temperature data used in this study are from, respectively, 57 and 23 measuring stations scattered across mainland Portugal, and cover the periods 1941-2007, for precipitation, and 1941-2006, for temperature. The study focuses on changes at the seasonal scale. Strong seasonality is one of the main features of climate in mainland Portugal. Intensification of the seasonality signal across the territory, particularly in the more sensitive regions, might contribute to endanger already fragile soil and water resources and ecosystems, and the local environmental and economic sustainability. Thus, the understanding of variations in the intensity, frequency and duration of extreme precipitation and air temperature events at the intra-annual scale is particularly important in this geographical area.

Trend analyses were conducted over the full period of the records and for sub-periods, exploring patterns of change. Results show, on the one hand, regional differences in the tendency observed in the time series analysed; and, on the other hand, that although trends in annual indices are in general not statistically significant, there are sometimes significant changes over time in the data at the seasonal scale that point out to an increase in the already existing asymmetries in the climate in mainland Portugal, including changes in the extremes of precipitation and surface air temperature.