



## **Temperature and precipitation in the Balearic Islands: Recent trends and future scenarios**

**1 R. Romero (1), V. Homar (1), S. Alonso (1,2) and C. Ramis (1)**

(1) Grup de Meteorologia, Departament de Física, Universitat de les Illes Balears, Palma de Mallorca, Spain, (2) IMEDEA (UIB-CSIC), Institut Mediterrani d'Estudis Avançats, Palma de Mallorca, Spain (Romu.Romero@uib.es)

Changes in climatic parameters are often presented in terms of global averages even though large regional variability is generally observed. In its fourth assessment report, the IPCC attributes to the Mediterranean area temperature trends during the period 1979-2005 which lay between 2.5 and 3.5 °C per century. Regarding regional precipitation, the same report indicates a decrease estimated at 5-20 % during the period 1901-2005, although changes less than 3 % are obtained for the period 1979-2005. Detection and future projections of sub-regional tendencies provide not only supplementary conclusions to more large-scale oriented results but are also of particular interest to local policy-makers and resource managers. This study presents some results for the Balearic Islands (Spain), located at the centre of the western Mediterranean basin. Temperature and especially precipitation trends are of great concern for a tourist pole as the Islands, where water resources are limited and dry season demands, mainly in summer, are very high.

Recent annual and seasonal tendencies for surface temperature have been derived using daily time series of maximum and minimum temperature for the period 1976-2006 from 3 thermometric stations, located away from urban areas. Minimum temperatures have increased at a rate of 5.1 °C per century during the 31 years and maximum temperatures also increased at a rate of 4.8 °C per century. Seasonally, these increases

are most accentuated in summer and spring. Analogous warming trends are observed when the analysis is restricted to the occurrence of extreme daily values. Tendencies for precipitation have been calculated using data from 18 rain gauges with complete daily time series during the period 1951-2006 and 2 additional sites where only monthly totals were available. It is found an appreciable negative tendency for annual precipitation (30% per century) mainly owing to the precipitation shortening experienced in winters and falls. Additionally, it is found that light and heavy to torrential daily precipitation amounts increase their contribution to the total annual precipitation, while the share from moderate-heavy precipitations is decreasing.

Regional future tendencies have been derived using two sources: (i) Monthly time series of temperature and precipitation over the Balearics extracted from the last generation of GCM global outputs, and (ii) Daily series at regional scale (10-50 km resolution) available from several dynamical and statistical downscaling techniques. In the first case, 21<sup>st</sup> century simulations forced with SRES B1, A1B and A2 emission scenarios have been considered; in the second case, available data refers to B2 and A2 scenarios and the dynamical method only covers the 2071-2100 subperiod. Future projections are complemented with a comparison of annual and seasonal tendencies for the 20<sup>th</sup> century from all techniques against the observations. It is found that both the GCMs and the downscaling techniques largely underestimate the recent trends of temperature and precipitation over the Islands. Future tendencies by the high emission A2 scenario, in the form of appreciable warming and substantial precipitation decrease, become comparable with the already observed values. An important seasonal variability is also detected in the results, although generally inconsistent with the observed seasonal pattern.