



A case study of climate change over a south-eastern Mediterranean region

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In the framework of the international CIRCE project, it is been conducted a study on the climate trends at regional scale, over the Apulia region, located in the south-eastern part of Italy.

Considering the peculiarities of the region, devoted mainly to agriculture and tourism, the understanding of water resources variability and decline in the context of human society and ecosystem adaptation is of paramount importance, while temperature changes could affect the growth of plants, tourism and energy consumption.

Three key climate indicators have been considered for the period 1951-2005, measured in a selected number of meteorological stations: mean monthly daily maximum temperature (Tmax), mean monthly daily minimum temperature (Tmin) and total monthly rainfall (RR). A further analysis has been based on two gridded daily temperature datasets: E-OBS (Haylock et al., 2008) and ERA-40 (Uppala et al., 2005). The indicators computed using these two datasets are: frequency of very cold nights (TN5n), frequency of very hot days (TX95n), Cold Wave Duration Index (CWDI); Heat Wave Duration Index (HWDI).

Time series analysis shows moderate trends towards warmer and drier conditions during the second half of the 20th century; this however does not apply to the daily maximum temperature (Tmax). Rates of temperature change have become noticeably more intense during the last 30 years of the century. In particular, the following rates of change have been identified for Tmax, Tmin and RR for the period 1951-2005:

Mean annual Tmax has no significant change if the whole period 1951-2005 is considered, but during the last 30 years of the 20th century has been warming at a rate of $+0.47^{\circ}\text{C}/\text{decade}$, with a faster rate of increase during the summer ($+1.0^{\circ}\text{C}/\text{decade}$)

Tmin has been warming at $0.18^{\circ}\text{C}/\text{decade}$ in mean annual Tmin. Its increase is particularly large during the warm season and peaks in May and August when trend values are higher than $0.3^{\circ}\text{C}/\text{decade}$. During the last 30 years of the 20th century mean annual Tmin has been increasing at a very high rate ($0.45^{\circ}\text{C}/\text{decade}$)

Total annual RR has declined significantly at about $-14.9 \text{ mm}/\text{decade}$. The reduction is larger in the period October-January.

The analysis of extreme temperature indicators in two European gridded datasets shows positive significant trends in the period 1976-2005 in summer for the frequency of hot days (5 days/decade) and the duration of heat waves (1.3 days/decade), which confirm progressively warmer conditions during the last part of the 20th century.

If the temperature trends computed for the 1976-2005 period are representative of future tendencies, a very substantial change in crops and in the organization of the whole agricultural sector at a regional scale would be needed and present crop areas would be very different in the future. The combination of increased water demand due to higher air temperatures with a significant decrease in rainfall would moreover increase the need for importing water from nearby regions. The necessity of understanding the evolution of future scenarios of climate in the region is of crucial importance in order to support and drive the strategies of policy makers and stakeholders.