Geophysical Research Abstracts,
Vol. 11, EGU2009-4265-1, 2009
EGU General Assembly 2009

Trends of temperature and precipitation extremes in areas with semiarid climate in the North Eastern Spain

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The analysis of extreme events has attracted the attention of different researchers during the last decade. Some research points out that they are part of the decadal fluctuation while the possibility of being an indicative of longer trends related to the anthropogenic induced climate change also exist.
This study tries to contribute to the analysis of climate trends and climate extremes related to temperature and precipitation in areas with Mediterranean semiarid climate with maritime and continental trends, areas with rainfed agriculture being vineyards one of the main land use. Data series from 1952 to 2006 of daily temperature and precipitation recorded at three observatories were analysed: Lleida (latitude: 41.23º N, longitude 0.22º E), Vilafranca del Penedès (41.22º N, 1.41º E) and Cabacès (latitude 41.25º longitude: 0.73º E). For temperature, daily temperature extremes (days with temperatures higher than the corresponding to the 90% percentile and temperatures below the 10% percentile) as well as number of days that exceed various temperature thresholds were analysed for each season of the year. For precipitation, seasonal precipitation and in particular that recorded during the main rainfall periods and their trends as well as the number of wet days with precipitation higher that the corresponding the 95th percentile) and very wet days (days with precipitation higher that the corresponding the percentiles and 99% are analysed. Trends for the whole period and for each season were analysed.
The analysis showed an increase of the mean annual maximum temperatures in the three observatories, with a significant increase of the number with extreme temperatures (T> T95% percentile). Maximum temperature increased at a rate ranging between 0.039 and 0.078 ºC/year, with for the last 45 years implies a mean increase higher than 2ºC, being higher in the observatory with higher continental influence. However, minimum temperatures only increased significantly in all seasons of the year in Vilafranca del Penedès (observatory with maritime influence) (0.03 ºC/year), while in Cabacés increased only in spring and summer (0.039 ºC/year) and in Lleida the trends were not significant. The number of days with high extreme temperatures increased significantly in the three observatories, being higher in the most arid area. The number of days with T>30ºC, critical temperature for vineyard optimal development, presents an increasing trend. The number of low extreme temperatures decreased in the observatories with maritime influence but increased in the most arid area. For precipitation, there were not significant changes in annual precipitation, but in Vilafranca and Lleida observatories, significant trends were observed for spring (decreasing) and autumn (increasing). The total number of wet days per year increased significantly in Vilafranca, but not in other two observatories, although they were irregularly distributed over the year, with an increase of extreme events and the fraction of total rainfall that these events represent in autumn and winter, and with an increase of the strength of the events in autumn. Most of water recorded during extreme events is lost by runoff and water available for plants is reduced. Effective rainfall does not cover evapotranspiration water needs during the grapevine growing period in most years and with a decreasing trend.