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Trends of temperature and precipitation and their impact on grapewine phenology and production of in a Mediterranean vineyard region of Northeastern Spain

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The present analysis tries to contribute to the knowledge and impacts of climate change on agriculture, in particular in dryland areas of the Mediterranean NE Spain. The analysis was carried out in the Penedès region, located in Northeastern Spain (Barcelona province). In this area, vineyards have cultivated for centuries and at present represent about 80% of the cultivated area, most of them as rainfed agriculture, without irrigation. In order to analyse climate change impacts on grape development and production, the trends of daily rainfall and temperature were analyzed for the whole year and for the growing season, as well as some bioclimatic indexes (Hugling and Winkler index) using a long data set belonging to Vilafranca del Penedès for the period 1952-2006, and shorter series belonging to the observatories of Sant Sadurní d'Anoia, Sant Martí Sarroca, Els Hostalest de Pierola for the last 12 years (1996-2007). Phenology dates and production for the last 12 years for the main varieties cultivated in the area (Macabeo, Xarello, Parellada and Chardonnay) were analysed in relation to all the climatic analysed parameters. The study revealed warming trends with higher increases in the maximum temperatures (0.04ºC/year) than in the minimum temperatures (0.03ºC/year), and a significant increase in the number of days with temperatures higher than 30ºC (0.43 days/year). Changes were also reproduced during the grape growing season. The increase of temperature has its influence on higher evapotranspiration ratios, which implies less effective water for crop development. Annual rainfall showed high variability from year to year and did not change significantly with time not at annual level either during the growing season. However, the precipitation of the main rainfall periods (spring and autumn) shows opposite trends, decreasing precipitation in spring and increasing in autumn. According to the vine phenological stages a significant decrease of precipitation during the bloom to véraison was observed (-0.33 mm/year), which presented a significant influence on grape production. The observed trends influence negatively grape development during the growing season, shortening the different phenological stages (véraison is advanced about 4 days/ºC increase of Tmin) and decreasing yield for most of the main varieties cultivated in this area for white wine and cava production (Macabeo, Xarello, Parellada).