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Climate change and viticulture in Mediterranean climates: the complex response of socio-ecosystems. A comparative case study from France and Australia (1955-2040)

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The wine industry is very sensitive to extreme weather events, especially to temperatures above 35°C and drought. In a context of global climate change, Mediterranean climate regions are predicted to experience higher variability in rainfall and temperatures and an increased occurrence of extreme weather events. Some viticultural systems could be particularly at risk in those regions, considering their marginal position in the growth climatic range of Vitis vinifera, the long commercial lifespan of a vineyard, the high added-value of wine and the volatile nature of global markets. The wine industry, like other agricultural systems, is inserted in complex networks of climatic and non-climatic (other physical, economical, social and legislative) components, with constant feedbacks. We use a socio-ecosystem approach to analyse the adaptation of two Mediterranean viticultural systems to recent and future increase of extreme weather events.

The present analysis focuses on two wine regions with a hot-summer Mediterranean climate (CSb type in the Köppen classification): Côtes-du-Roussillon in southern France and McLaren Vale in southern Australia. Using climate data from two synoptic weather stations, Perpignan (France) and Adelaide (Australia), with time series running from 1955 to 2010, we highlight changes in rainfall patterns and an increase in the number of days with Tx >35°c since the last three decades in both regions. Climate models (DRIAS project data for France and CSIRO Mk3.5 for Australia) project similar trends in the future. To date, very few projects have focused on an international comparison of the adaptive capacity of viticultural systems to climate change with a holistic approach. Here, the analysis of climate data was complemented by twenty in-depth semi-structured interviews with key actors of the two regional wine industries, in order to analyse adaptation strategies put in place regarding recent climate evolution. This mixed-methods approach allows for a comprehensive assessment of adaptation capacity of the two viticultural systems to future climate change. The strategies of grape growers and wine producers focus on maintaining optimal yields and a constant wine style adapted to markets in a variable and uncertain climate. Their implementation and efficiency depend strongly on non-climatic factors. Thus, adaptation capacity to recent and future climate change depends strongly on adaptation to other non-climatic changes.