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Meteorological considerations of grapevine damage due to temperature variations: the 2019 late spring frost and summer heat wave events in Burgundy

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During 2019, the occurrence of two contrasting weather events, a cold snap and a heat wave, caused extensive damage to the vineyards of Northern Burgundy. The late spring cold snap, that occurred from May 5th to 7th, generated frost like conditions across the northern and north-western areas of the Côte-d'Or department. The weather stations of the Northern Auxois area, where the three observation and study sites are located, recorded minimum temperatures ranging between -1 and -2°C. On the 24th and the 25th of July vineyards were exposed, yet again, to an extreme temperature variation. A brief but unusually intense heat wave increased daily maximum temperatures up to 42°C in the department's far north. Landforms such as plateaus were less exposed to the increase in temperatures due the limiting effect of higher elevations. This led to temperatures not exceeding 40°C above 300 m, elevation at which the vineyard sites of this study are located.

Weather conditions that caused the early May frost event were related to a northern circulation present over Western Europe that persisted from the 28th of April to the 6th of May. The strong anticyclonic ridge stretching from Greenland to the Iberian Peninsula directed an air mass of arctic origin towards France. On July 24th and 25th, the presence of a surface high pressure system above Scandinavia, associated with a low-pressure center located near the Atlantic Ocean, generated an influx of a very hot air mass from the northern part of the African continent through France and neighbouring countries.

The local impact of these two weather events was modulated by the topographical features specific to the study area: a limestone plateau strongly dissected by parallel valleys of S.E. / N.W. orientations. The three observation sites have similar soil characteristics and are located on south facing slopes. However, damage to vegetation was uneven across sites as well as within each site.

These observations rise up the question of the influence of very fine-scale environmental conditions and the impact they might have on the different vegetative growth stages. Lastly, the variation in physiological response among grapevines and its effect on their sensitivity to the occurrence of different weather hazards is also to be considered.