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## Analysis of frost in vineyards in Spain in the context of climate change

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Frosts have a significant impact on agriculture in Spain, as in many other temperate countries. Their changing behaviour in the context of climate change is of great interest to public institutions, agricultural unions, and the agricultural insurance sector. For this reason, this study is focused on the evolution of days with temperatures below specific ranges in different projections (specifically RCP4.5 and RCP8.5) of climate change.

The wine grape crop was selected for this study, which is of great importance in the agriculture of our country and for which we have series (2005-2019) of frost event dates linked to crop damages. The values of local temperatures on those dates were not available, so this data were obtained from the observational EObs gridded dataset. A range of relevant temperature was extracted for these data, and then the analysis of the temperatures within this range in the immediate future (2020-2050) with respect to 1990-2019 was performed.

The study of the present climate confirms that spring frosts appear in the three areas studied, with intrazonal differences being observed. In none of these zones do the most extreme winter frosts occur below -15°C, but in all of them frosts below -10°C do occur.

For a future with moderate warming (RCP4.5), the day of the last frost is expected to be up to 4 days earlier in most of the studied areas. The absolute minimum temperature in March, April and May is also expected to increase between 0.4 and 0.8 °C with smaller increases as spring progresses (minor increase in May than in March).

For a future with severe warming (RCP8.5), the date of the last frost is expected to be up to 8-11 days earlier. Other changes under this scenario are increasing in the absolute minimum temperature in March, April and May between 0.6 and 1.5°C, with smaller increases in April.

Consequences for the wine grape management and varietal selection pursuing adaptation to reduce crop damages are discussed.

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