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Analysis of the observed and modelled budburst dates of grapevine in Croatia

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Since changes in temperatures and precipitation significantly affect the biosphere, viticulture as an important economic branch in the moderate latitudes (e.g., mainly between 35°N and 55°N) is strongly influenced by climate change. The most commonly analysed/modelled phenological phases of grapevines are budburst (beginning of grapevine seasonal growth), flowering (crucial for the reproductive cycle) and veraison (initiation of the ripening). Recent studies indicate that budburst is greatly regulated by temperature. Due to climate change and temperature increase, budburst dates show trends in earlier occurrences at several available stations throughout Croatia which increases the vulnerability of the grapevine to the spring frost.

The aim of this study is to determine trends and changes in budburst date, their statistical characteristics at available stations in period 1961-2020 in Croatia. We focus on four grapevine varieties, two white (Graševina and Chardonnay) and two red (Merlot and Plavac Mali) and performance of statistical models (GDD, Riou's model and BRIN model) that predict budburst dates in the present climate. For this purpose an effect of the dormancy period and base temperature on the simulated budburst date have been explored. The study is further extended to future climatic conditions using statistical and numerical climate models. Therefore, a daily output from three CORDEX Regional Climate Models' (RCMs) simulations (CLMcom-CCLM4-8-17, SMHI-RCA4, CNRM-ALADIN5.3) for Croatian domain are used. All RCMs are forced by Global Climate Models (GCMs) with a moderate (RCP4.5) and a high-end (RCP8.5) green-house gas (GHG) scenario(s) and all the simulations have horizontal grid spacing of 0.11°. Results indicate further earlier appearance of budburst regardless of varieties.