



Effects of climate variability on vegetation phenology in spring: application to a wine growing area in Burgundy (France).

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A photo monitoring is carried out since 2011 on the wine growing area of Alise-Sainte-Reine in northern Burgundy (Côte-d'Or department, East-Central France). The vegetation cover and land use in the studied area consists of plots of land for vine cultivation, orchards, meadows and woods. The photographic shots are focused on the plots of vine. The photographic observations are carried out during key periods of plant phenology, e.g. budburst and leafing in spring. Photos taken in early May showed strong differences between on the one hand the years 2011 and 2018, and on the other hand the years 2016 and 2017. The vine and trees were clearly subjected to an earlier leafing in 2011 and 2018 than in 2016 and 2017. Spring vegetation in 2011 seemed to be subjected to the earliest leafing among the four selected years.

Daily data of minimum / maximum temperature and sunshine duration were downloaded from the database of the French national weather agency (Météo-France), for the months of January to April (each year for the 2011-2018 period, and for the normal period 1981-2010), at the nearest weather stations of Semur-en-Auxois (temperature) and Châtillon-sur-Seine (sunshine). The daily catalogue of the Hess-Brezowsky classification of circulation patterns over Europe (downloaded from the DWD / GWL database) was used to compute the frequency of weather patterns during the studied periods.

The analysis of synoptic-scale atmospheric circulation patterns and climatic conditions over the studied area, between January and April, allowed to explain the strong differences in phenological stages between the two years 2011-2018 and the two years 2016-2017. The frequency of Southerly circulations was higher in 2011 (25%) and 2018 (26.7%) than in 2016 (16.5%) and 2017 (15.8%), while the frequency of Norwesterly and Northerly circulations was lower in 2011 (20%) and 2018 (6.7%) than in 2016 (37.2%) and 2017 (30%). The frequency of circulation patterns with main high / low pressure area over central Europe was higher in 2011 (24.2%) than in 2018 (10%), especially associated with anticyclonic configurations favourable to sunny weather types. Therefore, a positive anomaly of monthly mean maximum temperature of 4.9°C was recorded at the station of Semur-en-Auxois in April 2011. The frequency of of circulation patterns with main high / low pressure area over central Europe was clearly higher in 2017 (26.7%) than in 2016 (8.3%), associated with a positive anomaly of sunshine duration in March and April 2017 (+3.5 and +36.6%), and a negative anomaly of sunshine duration in March and April 2016 (-8.8 and -22.8%). However, these favourable climatic features in 2017 are not visible on the vegetation. The highest occurrence of frost days in April 2017 (9 days) than in April 2016 (5 days) may have a strong impact on vine and (fruit) trees.