



Mediterranean climate patterns and wine quality in North and Central Italy

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Results of the analysis of correlations between climate variability and quality of wines in Italy show that the large scale variability has a stronger impact on the wine quality than the local scale climate variability. The main large scale mode in the Euro-Atlantic region is the North Atlantic Oscillation (NAO index). When this index is in a negative (positive) phase, the Atlantic influence on the Mediterranean climate is strong (weak). In the cold season, this influence is mainly exerted through a control of the Atlantic weather perturbations. In the warm season, Mediterranean region is partially influenced by the West African monsoon and by the Indian monsoon, while the Atlantic influence weakens. The seasonal analysis of the NAO index shows that excellent wines are produced when a weakly negative NAO phase in spring and summer is roughly compensated by a pronounced positive NAO phase in fall; i.e. the Atlantic influence is beneficial when it is well balanced through the active phase of the grapevines, which is when springs are mild, summers are not hot, and falls are dry. The worst wines are produced in cold and wet years.

However, since there are important latitudinal and longitudinal differences of the seasonal temperature and rainfall distribution within the Mediterranean region, the direct NAO-wine correlation is relatively poor. The dynamical patterns, which control the seasonal variability in the northern part of Central Mediterranean Europe, need to be analyzed for finding good correlations with the wine quality in North and Central Italy. Specifically, the analysis of the composite patterns show that the best wines are produced, when a spring positive geopotential anomaly over West Mediterranean Europe favors sunny days with cool nights, and when the jet stream over the Atlantic diverts the perturbations towards North Europe, but it still provides a sufficient amount of rainwater to the north of Central Mediterranean Europe. In addition, the best wines are produced when the summer cooling induced by the westerly winds is balanced by the warming induced by the southerly winds; and when a vast positive geopotential anomaly over West Mediterranean Europe closes the door to the fall storms, keeping Central Mediterranean Europe warm and dry in the period before harvest. Poor quality wines are produced when a jet stream is strong and in a southern position, opening the door of Central Mediterranean Europe to the Atlantic weather perturbations.

The persistency of these seasonal climate patterns analyzed in this paper can become a useful predictor for wine quality forecasting.