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Representation of micrometeorological and physiological parameters with numerical models influencing the vineyard ecosystem: the case of Piemonte (Italy).

Valentina Andreoli (1), Claudio Cassardo (1), Silvia Cavalletto (2), Silvia Ferrarese (1), Silvia Guidoni (2), Elena Mania (2), and Federico Spanna (3)

(1) Department of Physics,University of Torino "Alma Universitas Taurinorum", Torino,Italy (vale.andreoli@libero.it), (2) Department of Agricultural, Forest and Food Sciences,University of Torino "Alma Universitas Taurinorum", Torino,Italy, (3) Phytosanitary sector, Regione Piemonte, Torino, Italy

Grapevine represents worldwide key economic activities, with Europe representing the largest vineyard area in the world (38%). This is also true both for Italy and for its Piemonte region, in which famous and renowned wines (such as Barolo and Barbaresco) are produced. Grapevine productivity depends on several factors including soil fertility, management practices, climate and meteorology. In particular, concerning the latter, there is a need for a reliable assessment of the effects of a changing climate on its yield and quality. However, in this respect, it is essential to understand how and how much climate and meteorology affect grape productivity and quality, since only few studies related to few regions in the world have been produced. In this context, crop models are essential tools for investigating the effects of climate change on crop development and growth via the integration of existing knowledge of crop physiology relating to changing environmental conditions. Nevertheless, crop models were developed and applied mainly for studying the responses to climate change of annual crops (e.g. cereals); whilst appropriate crop models and application of these are still limited for tree crops such as grapevine.
The rationale of the study, included in the MACSUR2 JPI FACCE project, is to use the third generation land surface model UTOPIA (University of TOrino model of land Process Interaction with Atmosphere) [1], in order to evaluate all components of hydrological and energy budget, as well as soil and canopy parameters, on a specific subset of land use, the vineyards. A preliminary step of this work has been to compare the datasets resulted from the calculations made by the UTOPIA and some experimental datasets acquired within vineyards by our team in the past experiments. The reason for such control is to ensure that UTOPIA outputs could be considered as sufficiently representative of the climatology of vineyards. Thus, some Piedmontese vineyards were selected, each one characterized by same climatic but different microclimatic conditions, in which measurements of a wide number of variables were performed in the vegetative seasons (such as in the experiment MASGRAPE). Subsequently, in this study, the results of additional simulations performed using the freely available global database GLDAS (Global Land Data Assimilation System) were compared with those of the simulations driven by observations, in order to check if the model was still able to reproduce the microclimatic characteristics of the vineyards.
This preliminary part of the study gave satisfactory results; thus, we could pass to the phase two of the project. In this phase, using GLDAS database, long term simulations will be carried out with the UTOPIA in order to have output data available on a period of climatic interest (30 years or more). This database could be used in order to perform climatic statistics and assess possible trends in some parameters, eventually to be correlated with grape production. In the talk, the preliminary aspects of this work will be illustrated.