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High resolution climatology
- towards climate change services

Experimental and modeling analysis of micro-meteorological factors involved in the development of Piedmontese vineyards

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The vine (Vitis vinifera L.) constitutes one of the most important Italian products. Despite many other studies aimed to develop tools for managing the vineyards and improving the features and the quality of the wine, this study involves for the first time interdisciplinary fields with strong links and interconnections, stressing the collaboration of several specialists from different areas (pathologists, physiologists, entomologists, chemists and physicists) and of some wine companies. The research aims finding the main relations between the grapevines and the environment in which they grow, and it is carried out in the frame of a three-year project named "Adoption of a multisciplinary approach to study the grapevine agroecosystem: analysis of biotic and abiotic factors Able to Influence yield and quality - MASGRAPE", funded by the Piedmont region. The goal of the research is to delineate a detailed picture of the ecosystem of the vine and of the factors that improve the final product: the wine. The contribution of the physical-meteorological unit is twofold and includes an experimental activity, carried out through field measurements, and several experiments of model simulations. The former requires the joint use of micrometeorological and physiological data in order to assess the hydrological and energy budgets. The latter uses the land surface scheme UTOPIA (formerly known as LSPM) with the aim to assess and quantify the hydrological and radiative processes in the soil-plant-atmosphere system. The following experimental data have been collected in three vineyards located in Piedmont and belonging to the cultivars Nebbiolo and Barbera during 2008 and 2009: standard meteorological measurements, solar global radiation, PAR, soil temperature and humidity, fast response wind speed, temperature and moisture measurements, and some parameters directly related to the growth of the plants (number of leaves, LAI, leaf size, height and width of the plants). Fast response data have been analyzed using the methodology of the eddy covariance and corrected by the method of planar fit, the instruments being placed on hillsides. The data collected have been used to validate the model UTOPIA.
In this talk we are presenting the preliminary results of the analysis of the experimental data, as well as the results of the first numerical simulations using the UTOPIA. The availability of a long period of data has allowed also to compare the characteristics of the different seasons. In particular, as the first semester of 2008 has been quite wet and rainy, while the corresponding one of the 2009 has been drier, some comparisons among the different years have been done.
The preliminary results of the comparisons between UTOPIA and the measurements show that the model reproduces the trend of the transpiration and of the heat fluxes, but the accuracy of those predictions depends strongly by the accuracy of some input data relative to the vegetation, as for instance the LAI: underestimations of the LAI concur to produce an underestimation of the transpiration processes.