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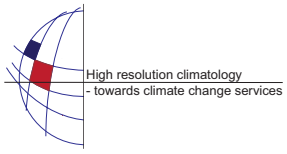

Impact of climate change estimated through statistical downscaling on crop productivity and soil water balance in Southern Italy

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The climatic change induced by the global warming is expected to modify the agricultural activity and consequently the other social and economical sectors. In this context, an efficient management of the water resources is considered very important for Italy and in particular for Southern areas characterized by a typical Mediterranean climate in order to improve the economical and environmental sustainability of the agricultural activity. Climate warming could have a substantial impact on some agronomical practices as the choice of the crops to be included in the rotations, the sowing time and the irrigation scheduling. For a particular zone, the impact of climatic change on agricultural activity will depend also on the continuum "soil-plant-climate" and this continuum has to be included in the analysis for forecasting purposes. The Project CLIMESCO is structured in four workpackages (WP): (1) Identification of homogeneous areas, (2) Climatic change, (3) Optimization of water resources and (4) Scenarios analysis.
In this study we applied a statistical downscaling method, Canonical Correlation Analysis after Principal Component Analysis filtering, to two sub-regions of agricultural interest in Sicily and Apulia (respectively, Delia basin and Capitanata). We adopt, as large scale predictors, the sea level pressure from the the EMULATE project dataset and the 1000 hPa temperature obtained from the NCEP reanalyses, while the predictands are monthly time series of maximum and minimum temperature and precipitation. As the crop growth models need daily datasets, a stochastic weather generator (the LARS-WG model) has been applied for this purpose. LARS-WG needs a preliminary calibration with daily time series of meteorological fields, that are available in the framework of CLIMESCO project. Then, the statistical relationships have been applied to two climate change scenarios (SRES A2 and B2), provided by three different GCM's: the Hadley Centre Coupled Model version 3 (HadCM3), the Max Planck Institute's ECHAM 5 and the NCAR's Community Climate System Model version 3 (CCSM3).
The objective of this paper is to evaluate the impact of climate change on productivity of durum wheat and tomato cultivated in the Northern part of Puglia region (Southern Italy) in a sensitivity evaluation in order to appreciate the differences due to three GCM under two scenarios of IPCC. The growth processes and soil water balance were simulated using DSSAT model. The development processes (rate of emergence, leaf appearance, and progress toward flowering and maturity) and growth processes (photosynthesis, leaf expansion, fruit and seed growth, N mobilization, etc.) depend on the base and optimum temperatures. The model calculates biomass accumulation as the product of radiation use efficiency and photosynthetically active intercepted radiation. The soil water model is calculated operates on the basis of a "tipping bucket" approach and includes rainfall, infiltration and runoff, drainage, soil evaporation, plant transpiration and root absorption.