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Climate change scenarios and present climate spatial variability at local scale: implication for crop adaptation

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The adaptation of agricultural species needs to be evaluated against model-generated climate scenarios. Adaptation strategies, contrary to mitigation, are strongly related to the spatial variability of environmental conditions, being dependent on local and different vulnerability conditions of the territory. In this context we have evaluated the statistical variability in an ensemble climate scenario against spatial and temporal variability observed under current climate in an area in Southern Italy. The results provide a reference to evaluate the challenges of adaptation vs. coping with climate spatial and temporal variability.
The aim of the present study was the analysis of spatial and temporal variability of meteorological variables in two regions located in Southern Italy: the Beneventano and the Destra Sele areas. The former site is an inner area with a complex orography and characterized by rainfed crops (mainly olive, grapevine and wheat); the latter is a plan adjacent to the coastline and mostly cultivated with irrigated crops (maize and tomato).
The climate change scenarios have been generated within the Italian project "AGROSCENARI" by means of a statistical downscaling technique (Tomozeiu et al., 2007) using a combination of climate scenarios generated within the European project ENSEMBLES (Van der Linden and Mitchell, 2009) and time series of meteorological observations at different locations. The climate scenario included 50 realizations of daily observations of minimum, maximum temperature and precipitation on a regular grid with a spatial resolution of 35 km, for 2021-2050 period.
Available meteorological ground station data at four locations have been analysed in order to quantify actual spatial variability at the local scale. The spatial pattern was compared with mean and variability of climate scenarios. Focusing on the most representative crops of the areas and their varieties, climate change influence on period and length of the growing season as well as on phenological stages has been investigated. Such study has been performed taking into account temperature and thermal sums variations.
Analysis of meteorological data showed a marked increase in temperature values comparing the present and the simulated future climate scenario. Concerning precipitation the pattern of changes is more complex. In the present climate, differences in maximum temperatures between Destra Sele (coastal area) and Beneventano (inland) are comparable to those given by the climate scenario we considered. Possible impacts of climate evolution on cropping patterns are discussed.