A proposal for a meteorological index of climate change impact

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Abstract: In the last decades worldwide marked signals of climatic anomalies, observed at both global and local scale, have been recognized by several scientific studies. In such a framework, the weather events, as well as the intrinsic variability of the atmospheric phenomena, seem to converge towards medium and long-term trends that differ from the average climatic reference. The aim of this paper was to analyze at Italian level the trend of selected meteorological variables (temperature and precipitation) in order to provide a composite index of climate change. In particular, we focused our study on Tmin, Tmax and total amount of rainfall data. Through statistical methods based on the elaboration of long-term climatic series, we derived a short-term scenario and computed the deviation of each abovementioned variable from the climatic reference period (1961-1990). By means of a Standardized Climate Change Index (SSCI), we quantifies the variability related to temperature and precipitation both singularly and jointly. Results are discussed in the light of improvement in land management and mitigation actions to face the effects of the actual climate variability.

Keywords: Climate change, Trend, Standardized index, Climatic variability, Italy

INTRODUCTION

Scientific evidences confirm atypical climate signals at global and local scale during the past few decades. In such framework, the meteorological events and the weather variability converge on long-term trends prefiguring future scenarios very different from the current reference climatic parameters. The phenomenon is mainly characterized by a significant increase in temperature (global warming) often associated with a decrease of precipitation and/or serious alteration of the rainfall regimes. The average surface temperature has increased by 0.74°C over the last 100 years, mainly due to the contribution of the years between 1995 and 2007 which proved to be the warmest since 1850 to present. In consideration of further temperature rises, that according to IPCC should be equal to 0.2°C for each of the next two decades, it is possible to assume that temperature will increase, between 1.8°C and 4.0°C, up to 6.4°C, at the end of the century (IPCC, 2007).

Over the past 2000 years the climate has experienced alternating phases of “cold” and “hot”, with deep effects on ecosystems and society equilibrium (Naurzbaev and Vaganov, 2000). According to other studies, the temperature trend over the last 2000 years was characterized by an uninterrupted downward trend until the middle of the twentieth century when there was a reversal remarked in the four decades between 1950 and 2000, the warmest of the whole period (Kaufman et al., 2009).

Signals of climate change have been highlighted in the early years of last century in North America (Huntington Vishera and Sargent, 1922), while the first research on the historical changes of the Italian climate is dated back decades ago and regarded the study of the scope of the main rivers (Melicchia, 1939) subsequently followed by other several studies (e.g., Piervitali et al. 1997; Schönwiese and Rapp, 1997; Ambrosetti and Barbanti, 1999; Brunetti et al., 2000; Brunetti et al., 2001; Simolo et al., 2010).

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