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Climate variability in north-western Italy during the second half of the 20° century

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The prolonged drought spells and the heat waves that occurred in north-western Italy in recent years, together with climate model predictions on increased probability of droughts in the Mediterranean area, call for a careful study of historical rainfall and temperature climatologies in this region. Motivated by this need, we analyzed a large set of daily temperature and precipitation time series measured by a dense observational network in north-western Italy, in the period from 1952 to 2002. Inhomogeneities in the spatial and temporal distribution of the measurement stations have been carefully taken into account, adopting statistical quality-control methodologies and applying Monte Carlo methods to estimate sampling errors and to assess the significance of the results. We find that average temperatures display a significant increase of about 1° C during the period of observation. This increase is more pronounced for maximum daily temperatures during winter and summer seasons. By contrast, precipitation time series display no significant trend in the last fifty years. We also determine the statistical properties of interannual fluctuations in temperature and precipitation, and quantify their correlation with large-scale atmospheric patterns and global indices such as the North Atlantic Oscillation (NAO), the Scandinavian pattern (SCAN) and European Blocking (EB). The positive phase of the Scandinavian pattern and the presence of frequent blocking episodes are found to be significantly correlated with increased summer and fall precipitation and cold temperatures in the study area.