



The Mediterranean droughts during the last 650 years: reconstruction from tree-rings and climate model simulation

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We present a winter Palmer Drought Severity Index Reconstruction (PDSI) in the Mediterranean region (from 10°W to 50°E and from 30°N to 50°N) on a grid spaced by 2.5° longitude /latitude. This reconstruction, based on tree-ring data, proceeds in two equally important steps. First the tree-ring series are standardized using a method derived from the regional curve calculated on the biological age of the trees. It is adapted to be very flexible. So we preserve the long-term variations of the tree-growth. The method is applied to 161 ring width and density series from 138 sites. The PDSI series are calculated from temperature and precipitation monthly series of the Climatic Research Unit for 176 grid points and extend on 1901-2000. Second, for calibration, we use a combination of an analogue technique, which is able to deal with missing data, and an artificial neural network technique for an optimal non-linear calibration of the proxy series on the temperature variables; then a bootstrap technique is used for calculating error bars of the reconstruction. Between 36 and 76% of the variance is calibrated depending on the grid point. A cross-validation procedure is used to validate the reconstructions. Maps of drought anomalies are obtained for various extreme periods. In parallel, we have calculated the PDSI from the simulated climate by two European climate models (ECHO-G and HadCM3) and downscaled them to the same grid as the data. An original method of statistical comparison taking into account the error bars of the data reconstruction and the variability of the model simulations have enable one to test the ability of the two models to simulate the climate variations forced by natural and anthropogenic factors in the very sensible Mediterranean region. This is a contribution to EU project SOAP EVK2-CT2002-00160.