500-year temperature reconstruction in the Mediterranean Basin by means of documentary data and instrumental observations

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Abstract The paper reports the main results of the EU project Millennium in the Mediterranean area over the last 500 years. It analyses a long series of temperature from Portugal, Spain, France, Italy and Greece. The series are obtained by combining indices from documentary sources from AD 1500 to the onset of regular instrumental observations. There is an ongoing discussion regarding the proper way of combining documentary and instrumental data and how to translate accurately the conventional indices from −3 to +3 into modern units, i.e. degree Celsius. This paper produces for the first time a number of early instrumental observations, in some cases (i.e. Italy and France) covering 350 years, including thereby the earliest regular observations.
after the invention of the thermometer. These Mediterranean data show that anomalous temperatures usually had only a locally limited effect, while only few extreme events had a widespread impact over the whole region, such as the summer of 2003. During the period from 1850 to the present day, the Mediterranean temperature anomaly was close to the Northern Hemisphere in spring and summer, while it was warmer in autumn and winter. Compared with the long-term instrumental records (i.e. 1655 onwards), the recent warming has not exceeded the natural past variability characterized by heating–cooling cycles with no significant long-term trends.

1 Introduction

This work presents the research activities performed by a large research group in the context of the Sixth EU Framework programme MILLENNIUM. The aim is to understand better the past climate of the Mediterranean through the gathering of new information from both documentary proxy (DP) and instrumental observations (IO). The sites under examination (Fig. 1) are located in an area within 35° to 50° N and 10° W to 25° E; most of them are situated in the three large European peninsulas (the Iberian, Italian Peninsula and Balkan). A system of fold mountains, including Pyrenees, Alps and Balkans, separate the Mediterranean from the continental regions of Western and Central Europe. The Mediterranean climate is characterized by the polar-ward (summer) and equator-ward (winter) shift of the Azores subtropical high-pressure cell. As a consequence, during summer the Western Mediterranean is invariably dominated by an anticyclonic circulation, with dry sinking air capping a surface marine layer of varying humidity leading to no rain in Central Mediterranean but thunderstorms in the North. On the other hand, in winter the polar jet stream and