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- ▣ Title and Author Search

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- ▣ [Contents of Issue 2](#)
- ▣ [Special Issue](#)

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Two millennia of climate variability in the Central Mediterranean

C. Taricco¹, M. Ghil^{2,3}, S. Alessio¹, and G. Vivaldo¹

¹Dipartimento di Fisica Generale dell'Università, and Istituto di Fisica dello Spazio Interplanetario-INAf, Torino, Italy

²Geosciences Department & Laboratoire de Météorologie Dynamique (CNRS and IPSL), Ecole Normale Supérieure, Paris, France

³Department of Atmospheric and Oceanic Sciences & Institute of Geophysics and Planetary Physics, University of California, Los Angeles, CA, USA

Abstract. This experimental work addresses the need for high-resolution, long and homogeneous climatic time series that facilitate the study of climate variability over time scales of decades to millennia. We present a high-resolution record of foraminiferal $\delta^{18}\text{O}$ from a Central-Mediterranean sediment core that covers the last two millennia. The record was analyzed using advanced spectral methods and shows highly significant oscillatory components with periods of roughly 600, 350, 200, 125 and 11 years. Over the last millennium, our data show several features related to known climatic periods, such as the Medieval Optimum, the Little Ice Age and a recent steep variation since the beginning of the Industrial Era. During the preceding millennium, the $\delta^{18}\text{O}$ series also reveals a surprising maximum at about 0 AD, suggesting low temperatures at that time. This feature contradicts widely held ideas about the Roman Classical Period; it is, therefore, discussed at some length, by reviewing the somewhat contradictory evidence about this period.

We compare the $\delta^{18}\text{O}$ record with an alkenone-derived sea surface temperature time series, obtained from cores extracted in the same Central-Mediterranean area (Gallipoli Terrace, Ionian Sea), as well as with Italian and other European temperature reconstructions over the last centuries. Based on this comparison, we show that the long-term trend and the 200-y oscillation in the records are temperature driven and have a dominant role in describing temperature variations over the last two millennia.

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