

## THE CLIMATIC CHANGES BETWEEN 5 AND 3 KYR CAL BP IN CENTRAL MEDITERRANEAN: NEW DATA

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ABSTRACT: Zanchetta *et al.*, *The climatic changes between 5 and 3 kyr cal bp in central Mediterranean: new data.* (IT ISSN 0394-3356, 2011)

Middle Holocene to Late Holocene transition is particularly relevant because marks the passage at two distinct climatic modes. The collation of new and the revision of old data indicates that in central Mediterranean this period is characterised by a series of dry/wet climatic phases with pronounced climatic deterioration centred at ca. 4 and 3.5-3.3 ka cal BP.

RIASSUNTO: Zanchetta *et al.*, I cambiamenti climatici tra 5 e 3 ka cal bp nel Mediterraneo centrale alla luce dei nuovi dati. (IT ISSN 0394-3356, 2011)

Il periodo di transizione tra l'Olocene medio e l'Olocene superiore è particolarmente interessante in quanto rappresenta il passaggio tra due modi di funzionamento climatico. La revisione dei dati disponibili in letteratura associati a nuovi dati recentemente ottenuti nel Mediterraneo centrale permette di osservare che questo periodo è caratterizzato da una complessa successione di fasi più aride e più umide con almeno due momenti di pronunciata fase di deterioramento climatico a ca. 4 e 3,5-3,3 ka cal BP.

Keywords: Central mediterranean, climatic changes, Holocene

Parole chiave: Mediterraneo centrale, cambiamenti climatici, Olocene

The predictions on future climate suggest that changes in rainfall and water resources will have important socio-economic and political impacts over the Mediterranean region (e.g. LIONELLO *et al.*, 2006). Therefore, understanding the past climatic and hydrological variability in this area is an essential prerequisite for establishing future climate scenarios and the possible impact on human society. Of particular relevance is the study of the last ca 5000-6000 years because the boundary conditions of the climate system did not change dramatically (in comparison to larger glacial-interglacial changes or at the beginning of Holocene), and represent the period of general establishment of an environment and climate which can be compared directly to modern condition (e.g. WANNER *et al.*, 2008). Climatic change between ca 5 and 3 ka is of particular interest with a succession of dry/wet oscillations, which may have had profound effect on civilizations (e.g. STAUBWASSER & WEISS, 2006). The complexity of this period over Central Mediterranean has been recently pointed out by MAGNY *et al.*, (2009). Data from Balkans lakes (Shkodra, Prespa, Ohrid, LENG *et al.*, 2010; ZANCHETTA *et al.*, submitted), speleothems from Apuan Alps (DRYSDALE *et al.*, 2007; ZANCHETTA *et al.*, 2007) which indicate that prominent event of climatic deteriorations (including the renewal

growth of the Calderone Glacier, marking the onset of the Apennine "Neoglacial" GIRAUDI *et al.*, 2011) occurred at ca 4 ka, 3.5-3.3 ka. In may record possessing poor chronological resolutions potentially these events may appear progressively diachronic or can be easily confounded, but the detailed tephrostratigraphy available for this period (ZANCHETTA *et al.*, 2011) can help in solving some the dilemma.

### REFERENCES

- DRYSDALE R.N., ZANCHETTA G., HELLSTROM J.C., MAAS R., FALICK A.E., PICKETT M., CARTWRIGHT I. & PICCINI L. (2006) - *Late Holocene drought responsible for the collapse of Old World civilizations is recorded in an Italian cave flowstone.* *Geology* **34**, 101-104.
- LIONELLO P., MALANOTTE-RIZZOLI P. & BOSCOLO, R. (2006) - *Mediterranean Climate Variability.* **4**, Elsevier, The Netherlands.
- GIRAUDI C., MAGNY M., ZANCHETTA G. & DRYSDALE R.N. (2011) - *The Holocene climatic evolution of Mediterranean Italy: A review of the continental geological data.* The Holocene, DOI: 10.1177/0959683610377529.
- LENG M.J., BANESCHI I., ZANCHETTA G., JEX C., WAGNER H. & VOGEL H. (2010) - *Late Quaternary palaeoenvironmental reconstruction from Lakes Ohrid and Prespa (Macedonia/Albania border) using stable isotopes.* *Biogeosciences* in press.
- MAGNY M., VANNIERE B., ZANCHETTA G., FOUACHE E.,

- TOUCHIAS G., PETRIKA L., COUSSOT C., WALTER-SIMONNET A.-V. & ARNOUD F. (2009) - *Possible complexity of the climatic event around 4300-3800 cal. BP in the central and western Mediterranean*. *The Holocene*, **19**, 1-11.
- STAUBWASSER M. & WEISS H. (2006) - *Holocene climate and cultural evolution in late prehistoric-early historic West Asia*. *Quaternary Research*, **66**, 372-387.
- WANNER H., BEER J., BÜTIKOFER J., CROWLEY, T.J., CUBASCH, U., FLÜCKIGE J., GOOSSE H., GROSJEAN H., JOOS F., KAPLAN J.O., KÜTTEL M., MÜLLER S., PRENTICE C., SOLOMINA O., STOCKER T.F., TARASOV P., WAGNER M. & WIDMANN M. (2008) - *Mid- to Late Holocene climate change: an overview*. *Quaternary Science Reviews*, **27**, 1791-1828.
- ZANCHETTA G., DRYSDALE R.N., HELLSTROM J.C., FALICK A.E., ISOLA I., GAGAN M. & PARESCHI M.T. (2007) - *Enhanced rainfall in the western Mediterranean during deposition of Sapropel S1: stalagmite evidence from Corchia Cave (Central Italy)*. *Quaternary Science Review*, **26**, 279-286.
- ZANCHETTA G., SULPIZIO R., ROBERTS N., CIONI R., EASTWOOD W.J., SIANI G., CARON B., PATERNE M. & SANTACROCE R. (2011) - *Tephrostratigraphy, chronology and climatic events of the Mediterranean basin during the Holocene: an overview*. *The Holocene*, DOI: 10.1177/0959683610377531.