

A Continuous High Resolution Directional Secular Variation Record from Italian Speleothems: Rio Martino Cave, Western Alps, Italy

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Abstract: The Rio Martino cave, situated at Western Alps (Italy) represents an exceptional site for the reconstruction of the Secular Variation (SV) of the Earth's magnetic field in the past through speleothems analyses. The metaophiolite environment of the area provides an important magnetic detrital input thanks to iron particles transported into the cave through water penetration and flooding events. A flowstone core of around 60 cm long was directly drilled and oriented in situ with a compass and an inclinometer. Available U/Th dating indicates that the flowstone's deposition started at the beginning of the Holocene while an estimation of its growth rate is around 1 mm per 15 years. Samples were prepared by cutting a quarter of the core in slices of 3 mm-high, that represent a time interval of 45 years. Rock magnetic analyses on representative samples suggest the presence of magnetite as the main remanence carrier. All specimens were stepwise alternating field demagnetized up to 100 mT while thermal demagnetization was performed on selected twin specimens in order to control the record reliability. The Characteristic Remanent Magnetization (ChRM) was easily isolated and it is generally well defined, with Maximum Angular Deviation (MAD) lower than 10°. The obtained results offer a continuous and high resolution record that can be used to reconstruct the directional SV path in the area during the Holocene. Comparison of the new data with archaeomagnetic data from Italian artifacts and with the predictions of the CALS10k.1b, SCHA.DIF.14k and pfm9k.1a global geomagnetic field models, shows that the Rio Martino flowstone represents an excellent recorder of the Earth's magnetic field in the past and

demonstrates the potential of speleothems on palaeosecular variation studies and on the investigation of short term variations of the geomagnetic field.

Keywords: Speleothem; Secular Variation; Rio Martino Cave; Italy