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A continuous paleosecular variation record of the last 4 millennia from the Augusta Bay (Sicily, Italy)

Leonardo Sagnotti (1), Alessandra Smedile (1), Paolo Marco De Martini (1), Daniela Pantosti (1), Fabio Speranza (1), Aldo Winkler (1), Paola Del Carlo (2), and Luca Giorgio Bellucci (3)

(1) Istituto Nazionale di Geofisica e Vulcanologia, Roma, Italy (leonardo.sagnotti@ingv.it), (2) Istituto Nazionale di Geofisica e Vulcanologia, Pisa, Italy, (3) Istituto di Scienze Marine, CNR, sede di Bologna, Italy

We present a high resolution paleomagnetic and rock magnetic study of two cores, MS06 and MS06-SW (6.7 and 1.1 m long, respectively) collected in the Augusta Bay shelf (Eastern Sicily, Ionian Sea, Italy) about 2.3 km from the coastline at 72 m depth. Geophysical surveying carried out in the sampling area highlighted the presence of a transparent homogeneous sedimentary sequence, likely deposited after the Last Glacial Maximum, not affected by anthropogenic disturbances, despite the intense industrial activities along the adjacent shore. The MS-06 cores penetrated a monotonous mud sedimentary sequence, interrupted at $\sim$3 m below the top by a 3-4 cm thick volcanic sandy layer that, according to petrochemical analyses, was correlated with the tephra fallout deposit produced by the 122 BC plinian eruption of Mt. Etna. This tephra along with radiocarbon dating of 9 marine shells and with radioactive tracers for the uppermost 0.3 m (210Pb and 137Cs) provided the chronological constraints for the stratigraphic sequence that resulted younger than 4500 yr B.P.

The two cores have been subsampled with u-channels. Paleomagnetic and rock magnetic measurements were taken at 1 cm spacing on a pass-through cryogenic magnetometer with 4.2 cm access diameter, equipped in-line AF demagnetization coils, anhysteretic remanent magnetization (ARM) acquisition solenoid and a susceptibility meter with a loop sensor. We measured the low-field magnetic susceptibility and the natural remanent magnetization (NRM) for both cores. The NRM has been stepwise AF demagnetized up to a maximum field of 100 mT. An ARM was then produced on the u-channel samples (in 100 mT AF and 0.05 mT DC fields) and subjected to the same demagnetization treatment applied to the NRM.

The data show that the sample sequence is magnetically homogeneous, with magnetic susceptibility values oscillating between 60 and 280 (x 10E-06 SI) and ARM values mostly comprised between 50 and 200 (x 10E-03 A/m). A single interval of high magnetic mineral concentration is observed, which corresponds to the volcanic sandy layer. Paleomagnetic data allowed the identification of a well defined characteristic remanent magnetization which provides a high-resolution record of paleosecular variation (PSV) at the sampling site. The reconstructed PSV curve is in good agreement with the available reference PSV curves for the Mediterranean region and with the prediction from recent PSV modelling for Europe. The paleomagnetic data obtained in this study on the one hand support and refine the age model for the cores, derived from other independent constraints, and on the other hand provide an original high-resolution PSV curve which can serve as a reference for the central Mediterranean over the last 4 kyr.