

## A Holocene enviromagnetic record from the eastern Tyrrhenian Sea Pontus Lurcock and Fabio Florindo, INGV Roma, Italy GP53A-1110

## Introduction

Low-resolution dating was available from three dated tephra layers and one In January 2013, under the aegis of the Nextdata project (http://www.nextdataproject.it/), 50 metres of Holocene sediment were piston biostratigraphic datum, the oldest being 14.9 ka at 602 cm. Using these ages cored from Tyrrhenian Sea sites near the mouth of the Volturno River in as tie points, we produced a high-resolution age model by measuring pasouthern Italy. We present palaeomagnetic results from core C5 (lat. laeomagnetic directions (palaeosecular variation, PSV) and relative pa-40°58'24'', long. 13°47'02''), length 7.1 m, retrieved on 30 January 2013 at a laeointensity (RPI) on the core. We correlated our palaeosecular inclination water depth of 93 m. Work to date has mainly focused on developing an age and RPI curves against reference curves from well-dated cores from the model. Four age/depth tie points have been established by tephra- and nearby Gulf of Salerno (Iorio et al., 2013). biostratigraphy; we present a magnetostratigraphy based on inclination of We performed the correlation using the program Match (Lisiecki and palaeosecular variation (PSV) and relative palaeointensity (RPI), along with Lisiecki, 2002), which allowed us to produce an age model simultaneously rock magnetic results which support the validity of the palaeomagnetic anaoptimizing the fit of the two available lysis, as well as having the potential to provide insight into the palaeoenvirparameters. onment in which the sediments were deposited.

The sediments record varying influences from regional climate and local terrigenous inputs. Our high-resolution palaeomagnetic chronology, along with ongoing environmental magnetic analyses of the cores using hysteresis loops, remanent coercivity spectra, first-order reversal curves, and thermomagnetic experiments, provides a high-resolution record of environmental change from this sector of the Mediterranean, and demonstrates the ability of magnetic techniques to reconstruct records of competing controls in rapidly deposited coastal sediments.



## Challenges

- Large variations in sedimentation rate, both with location and with time.
- Variations in lithology, especially tephra layers, can complicate palaeomagnetic behaviour.
- On sub-millenial time scales, geomagnetic field intensity is not globally coherent, limiting the usefulness of global RPI stacks like GLOPIS-75.
- Current geomagnetic models (e.g. CALS10k) have insufficient resolution and temporal range to provide useful reference curves.

## Dating the sediments



Zijderveld plots show that natural remanent magnetizations are strong and stable, with a single component trending towards the origin. Throughout most of the core, MAD-3 values are below 2.

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## Rock magnetism

We have completed a preliminary set of rock magnetic studies – 10 hysteresis loops and isothermal remanent magnetization curves from samples throughout the core, and one first-order reversal curve (FORC) (Pike et al., 1999) – to establish the reliability of the palaeomagnetic results and serve as a pilot for a higher-resolution enviromagnetic investigation.

Measured remanent coercivities are in the 25–35 mT range, consistent with mag-

netite, and the FORC plot indicates single-domain (SD) or pseudosingle-domain (PSD) mineralogy, with moderate interaction between magnetic grains.

A Day plot (Day et al., 1977) of the measured hysteresis parameters suggests fairly uniform mineralogy with a consistent PSD magnetic grain size. In combination with the AF demagnetization behaviour, the rock magnetic results indicate that the sediments are suitable for palaeomagnetic analysis.







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## Implications

While the long-term behaviour of the RPI and inclination signals are similar to the reference curves, there are some deviations. Most noticeably, our inclination record contains several strong excursions in the 11–14 ka age range which are not present in the reference curve. It is possible that some of the discrepancies are simply due to the higher resolution of our record compared to that of Iorio et al. (2013).

The age model indicates a high (1-2 m/kyr) sedimentation rate for the past 3 ka, with two pulses separated by a slower (though still high in absolute terms) interval. The sedimentation rate is around an order of magnitude lower throughout the older part of the record, with the most noticeable variation being an increase to ~50cm/kyr for 2kyr around the start of the Holo-

### Next steps

- Further verification of RPI curves.
- Correlation of RPI and PSV records against other cores collected during the expedition, using PSV, RPI, and bulk magnetic susceptibility.
- Comparison of RPI and PSV records with global and regional stacks, and with regional master curves.
- Comparison of the younger part of the core with higher-resolution records from the region.
- Rock magnetic analyses at closer intervals through core C5, providing a more complete picture of environmental variations through time at this site.
- Measurement of temperature dependence of magnetic susceptibility for further investigation of magnetic mineralogies.

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#### References