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A high-resolution Holocene palaeomagnetic record from the western Mediterranean

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The 7.1-metre C5 core was recovered in 2013 from a site in the Tyrrhenian Sea, 15 km off the Italian coast (40°58′25″N, 13°47′03″E), as part of the NEXTDATA climate data project. We have carried out a detailed rock magnetic and palaeomagnetic analysis of the core, in conjunction with sedimentological, palaeontological, and palynological investigations. A published age model based on tephro- and biostratigraphic tie-points forms the starting point for our refined magnetostratigraphic chronology, which we have constructed from a combination of palaeosecular variation (PSV) and relative palaeointensity (RPI) data. An existing, well-dated palaeomagnetic record from a regional site at Augusta Bay furnishes the main reference curves for our palaeomagnetic tuning procedure. Automated tuning to the Augusta Bay record, within the constraints imposed by the existing tie-points for the C5 core, has allowed us to produce an optimized, high-resolution, 4500-year age model for the core. We discuss the computer-aided tuning protocol, the trade-offs between curve-matching optimization and biostratigraphic constraints, and the influence of tuning parameters on the age model.

We present our reconstructed PSV, RPI, and sedimentation rate curves for the site, and compare our palaeomagnetic results with other published records from the Tyrrhenian Sea and further afield, and with field reconstructions from geomagnetic models such as SHA.DIF.14k and CALS10k.2. We discuss the variability among Holocene magnetic records in the region and the possible rock magnetic influences on the fidelity of magnetic recording, and explore the potential for a more extensive, stacked age model constructed using additional sedimentary cores sampled during the NEXTDATA project. In addition, we describe new extensions to the PuffinPlot palaeomagnetic analysis application which we have developed for the analysis of the C5 core, including an algorithm for automated optimization of RPI estimates.