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The Absolute Dating Potential of Proximal-Distal Tephra Correlations in an Aegean Marine Stratigraphy (Core LC21).

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Quaternary marine stratigraphies frequently suffer from poor absolute age control. Radiocarbon dating is intuitively the most appropriate technique for most marine stratigraphies, but its application is limited to the last 50ka or so by the decay rate of carbon. There are also uncertainties related to reservoir effects and the calibration of radiocarbon time to real time. However, precise dating and correlation of marine cores is essential to understand the timing and spatial relationships of the valuable environmental records they preserve.

Here we demonstrate the potential of both visible and "invisible" micro-tephra layers to precisely date an important marine environmental record (Core LC21 from the Southern Aegean Sea). This is done by geochemically correlating the distal marine tephra layers to proximal volcanic deposits from Italy, Greece and Turkey. We use both Major Element (EPMA- Oxford Archaeology) and Trace Element (LA-ICP-MS, Royal Holloway Earth Sciences) analyses on individual tephra shards to determine the source of the tephra, and to make the correlations to explosive eruptive events. The most precise date (14C, 39Ar:40Ar or U-Th) from the event's proximal deposit is then imported into the equivalent distal tephra found in the marine core. Many of these distal "micro-tephras" were previously undetected by standard core logging techniques such as visual stratigraphy or scanning XRF. The extent and potential application of these tephras is now being realised.

This study will provide the first direct (same core) and independent, absolute chronological markers for sapropels S3, S4 and S5, three major anoxic events found in the Eastern Mediterranean. In addition, the major and trace element geochemistry will be used to robustly correlate three marine cores spanning the Mediterranean.

This work forms the Marine Tephrostratigraphy component (Work Package 5) of the UK Natural Environment Research Council (NERC) consortium project "RESET" (Response of Humans to Abrupt Environmental Transitions). In collaboration with a number of European research teams, the programme aims to construct a secure chronological framework for assessing the timing and effects of rapid environmental changes during the late Quaternary. See http://c14.arch.ox.ac.uk/reset/embed.php?File=index.html