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# Ultra-high resolution elemental profiling of Mediterranean sediments reveals sub-decadal climate cyclicity over the last two millennia

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Records of rapid climate change in Mediterranean sediments are rare; high resolution palaeoclimate signals are usually erased by bioturbation in oxic bottom waters. However, the basin is known to both *experience* and *record* changes in climate on orbital timescales. Could shorter timescale climate changes be recorded in the same way if the conditions were right to preserve the signals?

The discovery of anoxic basins in the Eastern Mediterranean has opened the way to this unprecedented study. The hostile environment of the hypersaline basins prevents bioturbation, and the resulting laminated sediments permit ultra-high resolution climate reconstructions with implications for the modern-day climate debate. Here we present the first ever sub-millimetre elemental profiles of sediments from the Atalante basin, containing uninterrupted laminations over the last 2000 years.

Using Micro-XRF scanning of embedded sediment blocks, we created downcore elemental profiles at 25$\mu$m resolution. This exceptional level of detail reveals persistent sub-decadal climate variability in the region over the last two millennia. Ca/Fe count ratios show reproducible sub-decadal oscillations, suggesting interannual changes in relative marine and terrestrial sediment fluxes. Similar behaviour in Ti/Al count ratios indicates a change in the source of terrestrial material on these timescales. The observed variability in the input of dust, fluvial sediment and marine carbonates on a

decadal timescale could either indicate a North Atlantic Oscillation effect, via rainfall in (and thus fluvial sediment supply from) southern Europe, or ENSO-related changes in Saharan aridity and the strength of the African monsoon. Statistical analysis of the high resolution data set is used to unravel the roles of these two drivers of short term climate change in the Mediterranean.