

Was the Mediterranean Sea during the Calabrian (Early Pleistocene) a low seasonality environment?

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Understanding past seasonal temperature variability in the ocean is essential to evaluate the effects of future climate change on marine ecosystems. Here, we estimate seasonal amplitudes and average water temperature from stable oxygen isotope ($\delta^{18}\text{O}_{shell}$) values assuming $\delta^{18}\text{O}_{water}$ values of $0.9 \pm 0.1\text{‰}$ (V-SMOV). Fossil valves of the bivalve *Arctica islandica* were collected from three Pleistocene successions (middle-late Calabrian) in Italy. Biostratigraphic analyses from Tacconi Quarry deposits (Rome) indicate an age between 1.6 and 1.2 Ma, while Augusta and Cutrofiano (Lecce) successions are slightly more recent (1.1 and 0.62 Ma, respectively). Prior to carbonate geochemical analysis, we checked the shells for potential diagenetic alterations (e.g., from aragonite to calcite). Stable oxygen isotope ($\delta^{18}\text{O}_{shell}$) profiles of eleven fossil *A. islandica* valves all depict a relatively low seasonality scenario. $\delta^{18}\text{O}_{shell}$ amplitudes vary between 0.4‰ and 1.1‰ implying a reconstructed seasonal water temperature amplitude of 1.7°C to 4.8°C . The reconstructed average water temperature for the Sicilian population (i.e., 9 valves) is $9.5 \pm 0.47^\circ\text{C}$ for $\delta^{18}\text{O}_{water}$ $0.9 \pm 0.1\text{‰}$ and coincides well with temperature requirements for modern *A. islandica*. The low seasonality scenario (ca. 3°C) represented by the shells and the low reconstructed water temperatures, colder than modern water temperatures let to the conclusion that the shells lived during a maximum glacial phase when relatively constant water temperatures prevailed throughout the year.