Geophysical Research Abstracts
Vol. 19, EGU2017-16703, 2017
EGU General Assembly 2017

Marine ostracod turnover tracks orbitally forced palaeoenvironmental changes at the Lower-Middle Pleistocene transition: the case study of the Valle di Manche section (Calabria, southern Italy)

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Ostracods, small crustaceans living in almost every aquatic depositional setting, are widely used in palaeoenvironmental reconstructions due to their well-known ecological sensitivity. A close connection between the composition of ostracod fauna and the Milankovitch climate-eustatic variability has been documented in several Plio-Pleistocene marine sections of the Central Mediterranean area.
The Valle di Manche section (VdM; Calabria, southern Italy), one of the suitable candidates to host the Global Stratotype Section and Point (GSSP) of the Ionian Stage-Middle Pleistocene, represents an ideal venue where to investigate ostracod turnover in relation to orbitally forced palaeoenvironmental changes, being firmly constrained in time and well documented by a number of independent climatic proxy. A high-resolution, quantitative analysis of the ostracod fauna has been undertaken on the middle part of the VdM, ca. 30 m-thick and showing two T-R cycles developed at the Lower-Middle Pleistocene transition (late MIS 21 to early MIS 18). Within each cycle, a relatively thin, fining-upward transgressive muddy unit is overlain by gradually coarsening upward and more expanded regressive silty to sand packages.
A total of 40 samples have been selected to characterise the whole spectrum of lithofacies and detect high-frequency palaeoenvironmental variations especially within homogeneous clayey stratigraphic intervals.
Taxa typical of circalittoral (>70/100 m) depths (e.g., Bosquetina dentata, Cytherella vulgatella, Cytheropteron monoceros, Pterygocythereis ceratoptera and Krithe species), commonly accompanied by the lower circalittoral-bathyal species Henryhowella sarsii, occur within the fine-grained units developed during the full interglacials of MIS 21 and MIS 19. Furthermore, ostracod assemblages document that the oxygen availability at the sea floor changed during MIS 19.
In contrast, a less-diversified ostracod fauna dominated by Aurila convexa, a species preferring vegetated sandy substrates in the upper circalittoral zone, characterises coarser glacial deposits. Atop the sandy successions A. convexa is partially replaced by Semicytherura ruggierii, suggesting a further decrease in palaeobathymetry and, possibly, an increase in riverine influence.
Within each T-R cycle vertical changes in ostracod fauna track both an overall deepening-shallowing upward trend and high-frequency variations in stratal stacking patterns, allowing the precise identification of key sequence stratigraphic surfaces: Transgressive Surface (TS) and Maximum Flooding Surface (MFS). The former, which is marked by a sharp increase in Krithe, Cytherella and Cytheropteron species, develops during the late d18O glacial termination. The MFS, invariably highlighted by concomitant highest and lowest percentages of H. sarsii and A. convexa respectively, matches the lightest d18O values recorded by foraminifers and corresponding to full interglacial conditions. Within the MIS 19 muddy unit, the MFS is identified few decimeters above the Pitagora ash layer, a prominent bed close to the Matuyama-Brunhes geomagnetic reversal.