The Early-Middle Pleistocene transition: a central Mediterranean perspective

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The exceptionally thick and fossil-rich successions of recently uplifted, open marine sediments that are exposed along the shoreline of Southern Italy have been investigated since the early days of stratigraphy. Since the 19th century, these successions have been utilized for establishing marine stages that, in many instances, are still employed worldwide (Cita et al., 2006; Rio et al., 2003). It is generally agreed that the base of the "Ionian" Stage (Middle Pleistocene subseries) should be placed close to the the Matuyama–Brunhes magnetic reversal (ca. 780 ka), which provides the main criterion for defining the Early–Middle Pleistocene (E-MP) boundary (Head et al., 2008; Pillans and Gibbard, 2012). The latter occurs in the midst of a long-lived episode in the recent Earth history, known as the "mid-Pleistocene revolution" or "Early-Middle Pleistocene transition" (ca. 1.2–0.5 Ma), when the low-amplitude and high-frequency (41-ka) climatic periodicity was progressively replaced by high-amplitude, low-frequency (100-ka) cycles. This scenario points to a slow build-up of major ice caps during glacial periods and their rapid melting in the wake of a transition towards milder climates, thus implying the existence of a marked asymmetry and non-linear behavior of the climatic system.

Even in the central Mediterranean on-land record, where documentation of this critical interval is excellent and marine sections straddling the Early–Middle Pleistocene transition are not rare, defining the GSSP for the "Ionian" Stage and providing a dependable reconstruction of the associated changes in the climate systems represents a challenging task: indeed, the Matuyama–Brunhes magnetic reversal is often poorly documented, possibly in response to unfavorable mineralogy and weathering of the component rocks (e.g., Sagnotti et al., 2010). With these limitations in mind, a fundamental benefit of the Crotone sedimentary basin (Calabria, Southern Italy) is its unique and consistent record of the E-MP transition in richly fossiliferous, hemipelagic facies, which proved already suitable to a conventional chronostratigraphic and paleoenvironmental approach (e.g., Capraro et al., 2017).

The research project proposed hereby will focus on documenting the changes in regional and global climates that took place over this critical interval by means of a micropaleontological and geochemical approach, namely the reconstruction of stable oxygen and carbon isotope records for selected foraminifer species and the anlysis of terrestrial pollen. This task is to be accomplished by collecting and integrating new data from a number of section in the Crotone area, which have been already selected during previous investigations. These records, once fixed within a tight chronostratigraphic framework based on paleomagnetic and biotic evidences, will permit reconstructing the dynamics of natural systems across the E-MP transition in the key central Mediterranean region and improving its global correlation potential.

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