Environmental changes across the onset of the Messinian salinity crisis: insights from the Piedmont Basin (NW Italy).

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Since the discovery of the late Miocene (Messinian) Mediterranean Salt Giant more than 50 years ago, the environmental conditions that caused its formation have been debated. Such reconstruction suffers from the absence of modern analogues, the lack or scarcity of fossils (calcareous plankton and benthos, but also pollens), and the inaccessibility of the evaporites buried beneath the present-day Mediterranean seafloor. We investigate the palaeoenvironmental changes, which drove the formation of the Mediterranean Salt Giant at the onset of the Messinian salinity crisis (MSC) through high resolution sedimentological, petrographical, and geochemical (lipid biomarkers, major and trace elements) analyses of sedimentary successions of the Piedmont Basin (NW Italy). Shale/marl couplets deposited in intermediate to deep-water settings (200 – 1000 m) are targeted, representing the lateral equivalent of primary sulphate evaporites from shallow-water settings that accumulated between 5.97 and 5.60 Ma. We suggest that climate and hydrological changes affected the northern Mediterranean in the earliest stage of the MSC event, leading to an intensification of water column stratification. An upper water layer of marine water influenced by freshwater input was separated through a pycnocline from more evaporated, denser and oxygen-depleted bottom waters. The water column structure and pycnocline oscillation exerted pivotal control over the sedimentary products pertaining to the first stage of the MSC.