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# *Archaeal lipids as indicators for paleoenvironmental change in an evaporitic basin (Vena del Gesso, Italy)*

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Archaeal lipids are increasingly used to reconstruct paleoenvironmental conditions but have been rarely applied to the often extreme conditions of evaporitic basins. Here, we investigate the distribution of archaeal lipids in two evaporitic beds (IV and XI) of the Vena del Gesso outcrop (Italy)[1]. This is a prominent example of an ancient evaporitic basin, which experienced a change from normal marine to hypersaline conditions during the onset of Messinian salinity crisis ~6 Ma ago[2]. Repeated inundations of restricted marine water started depositional cycles where each major gypsum bed is followed by a marl layer, with evaporitic bed IV being most developed[2]. Varying amounts of archaeol, a general biomarker for Archaea[3], and $C_{20-25}$ extended archaeol, a biomarker for halophilic Euryarchaeota[3] (Fig. 1a), suggests adaptation of the archaeal community to possibly more saline conditions in bed XI compared to bed IV. Another striking shift in archaeal lipids is the decrease of the relative abundance of crenarchaeol[4] from 17 – 46% in bed IV to 3 – 10% in bed XI, which implies more favorable conditions for Thaumarchaeota in bed IV (Fig. 1b). This decrease in crenarchaeol coincides with a decrease in isorenieratene (biomarker for photic zone euxinia[5]) and the presumably more saline conditions. The higher abundance of H-GDGT-0 (produced by strict anaerobes[6]) and presence of the novel S-GDGT-1[7] in bed XI, combined with the lack of isorenieratene[1] indicates that in this evaporitic cycle the water column was anoxic rather than euxinic. Our data shows that the archaeal community shifted dramatically both in and between evaporitic cycles, signifying major changes in the paleoenvironment.

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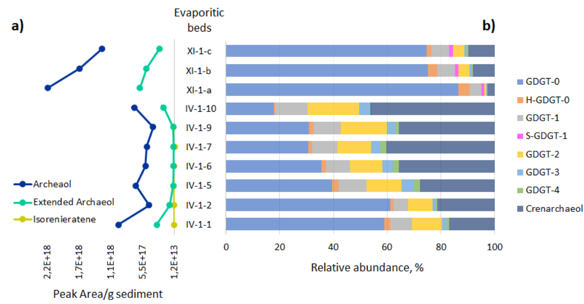


**Fig. 1**