

Messinian paleoenvironmental changes in the easternmost Mediterranean: a case study in the Adana Basin (southern Turkey)

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For the Palaeo-Mediterranean Basin, the Messinian stage was a crucial event characterised by palaeoenvironmental changes linked to important palaeoceanographic modifications. In this paper we present the palaeoenvironmental reconstruction of the Adana Basin, south Anatolia (one of the easternmost Neogene sedimentary basin developed in the Palaeo-Mediterranean) during Messinian, through the paleontological

analyses of the sediments referable to the Kuzgun and the Handere formations. In particular mollusc, ostracod, planktonic and benthonic foraminifer, and calcareous nannofossil assemblages have been analysed from three stratigraphic sections at about 6 km NW of the city of Adana, in the vicinity of the Kabasakal village.

From the uppermost part of the Kuzgun Formation, two sedimentary successions were analysed: a) the 13 m thick section named Adana-1, that consists mainly of fine-grained silty deposits with the intercalation of two main massive sandy layers; b) the very close Semiramis section (21 m thick), already studied by Darbaş & Nazik (2010). Also at the Semiramis section, the Kuzgun Formation is characterized by fine-grained silty deposits with the intercalation of sandy layers. From the Adana-1 section, 22 samples (ADA-1 1-22) were collected, while 10 samples were analysed from Semiramis section by Darbaş & Nazik (2010). Biostratigraphical analyses carried out integrating biostratigraphic results from calcareous nannofossils, planktonic foraminifers and ostracods yielded a possible age interval of 7.226- 6.83 Ma for the Semiramis section and 7.226- 6.43 Ma for the Adana-1 section, both included in the early Messinian.

From the lowermost part of the Handere Formation, the 50 m-thick section of Adana was studied, which consists mainly of fine grained deposits (marls) and several thick layers of resedimented evaporites, mainly gypsum rudites, made up of fragments of selenite, different gypsum clast size, and huge blocks of banded selenite, suggesting debris-flow processes. From the Adana section, 42 samples (ADA 1-42) were collected for microplaeontological analyses. Stratigraphic and biostratigraphic analyses carried out on ostracods have suggested for the Adana section ages comprised between 5.60 and 5.55 Ma, during the step 2 of the Messinian Salinity Crisis (CIESM, 2008) corresponding to the deposition of the Resedimented Lower Evaporites and the lagoon-biofacies.

The palaeoenvironmental analyses on the three studied section showed that the Kuzgun Fm deposited in true marine conditions. The slightly most ancient Semiramis section documents a littoral open marine environment, characterised by the presence of abundant planktonic foraminifers among which warm water species of *Globigerinoides* and *Orbulina* are dominant, and by infralittoral ostracods accompanied by infra-circalittoral species such as *Occlusacythereis oclusa*, *Bairdoppilata subdeltoidea*, *Costa tricostata*, *Bosquetina carinella*, and *Ruggieria tetraptera*. The presence of spicules of siliceous sponges confirms an open external neritic environment. The slightly younger Adana-1 section records a very shallow coastal marine environment testified by the scar-

city of nannofloras and planktonic foraminifers and the low diversity of benthic foraminifers and ostracods. The presence of *A. beccarii*, (dominant among benthic foraminifers), *Neomonocerotina laskarevi* and *Phlyctenophora farkasi* (dominant among ostracods), typical of shallow water environments such as marshes, lagoons and estuary, together with accompanying *Criboelphidium decipiens* testify an enclosed marine environment characterised by local sporadic freshwater inputs that lowered the salinity. There is no clear evidence for oxygen depletion, although *Ammonia beccarii* can tolerate abundant input of organic matter. Anyway, well-defined, even if limited, open-sea influx is documented in the lower portion of the section by the presence of abundant and well preserved nannofloras, more diversified ostracod and foraminifer assemblages (among which *Quinqueloculina* gr. is rather well represented) and by the presence of euhaline gastropods.

The Handere Fm, deposited unconformably over the Kuzgun Fm after a *iatus* of at least 830 kyr., documents a very unstable shallow brackish environment, characterised by high mesohaline salinity in the lower portion (“*Cyprideis-Ammonia* assemblage, Grossi *et al.* 2008) and mesohaline salinity in the upper portion (“*Cyprideis-Loxococoncha* assemblage”, Grossi *et al.* 2008).

From the present study it is possible to conclude that the palaeoenvironmental changes occurred during the Messinian in the Adana Basin can be compared with the palaeoceanographic changes that affected the whole Palaeo-Mediterranean during the Messinian.

References

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