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Indications of temporal water masses variability at the junction of Eastern and Western Mediterranean sub-basins (ODP Site 963) during the Middle Pleistocene Transition.

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The study and comparison of the dinocyst record with the G. bulloides 18 fluctuations obtained from the same stratigraphic levels from ODP Holes 963 A/B reveal some good correspondence during the lower and upper part of the studied section and some discrepancy during the middle part. Site 963 is located in the Strait of Sicily which separates the Eastern from the Western Mediterranean sub-basins at a water depth of about 470 m and represents a key position for determining the intermediate water mass (MIW) exchange between the two basins which provides insights to the palaeocirculation patterns during the Early–Middle Pleistocene. The study of 71 dinocyst samples corresponding to the depth interval 137.51–178.5 mcd of Holes 963A/B and the time interval c. 0.63–1.14 Ma (sedimentation rate 8.5 cm/kyr) resulted in the designation of five cool and four warm ecozones based on both constrained cluster analysis on assemblage data and qualitative judgment. These ecozones broadly compare well with the G. bulloides 18 fluctuations particularly during the lower part (c. 0.957–1.14 Ma) and the upper part (c. 0.736–0.63 Ma) of the studied section. This accordance is revealed with high abundances of such warm-water species as H. rigaudiae, O. israelianum, S. mirabilis–hyperacanthus, I. patulum, S. cf. pachydermus, T. vancampoae, L. machaerophorum and I. paradoxum during depleted 18 values. Similarly, increased values of the cool-water species indicators, such as B. tepikiense, N. labyrinthus, and cyst of cf. P. dalei correspond to elevated 18 values. Furthermore, the occurrence of five organic rich layers (which are the equivalent of sapropels), during the lower part of the section, is accompanied by a dinocyst assemblage which seems to support the sapropel-favouring hydrographic and climatic setting of stratified and lower salinity waters, higher precipitation, increased productivity and anoxic/dysoxic bottom waters.

However, this correspondence is not that successfully depicted during the middle part of the section, namely c. 0.957–0.736 Ma, because MIS 26, 25, 20 and 18 are not accompanied with the respective cool/warm water assemblages. Nevertheless, the distinctive MIS 22, 21 and 19 are indeed represented by cold- and warm- water assemblages respectively, where S. mirabilis–hyperacanthus and B. tepikiense are the principal determinants of the warm/cold assemblages, but with lower amplitudes in abundance than expected. The time interval between 0.957 and 0.736 Ma indisputably involves a discrepancy which more likely reflects the different ecological affinities of G. bulloides and those of dinocysts, which potentially signal environmental conditions of different water masses. For this reason, salinity is suggested as one of the possible reasons of the discrepancy as it largely regulates the density of the water column and therefore the configuration of different water masses. Evidence of some climatic anomaly during this interval is also recorded from other studies by pollen data which suggest relatively humid winters and drier summers. In turn, salinity variations might be the effect of precession which is known to have a strong impact (e.g. sapropel formation) in the Mediterranean along with the African monsoon system.