# Paleoclimatic and Paleohydrologic Record of Mediterranean Deep-Sea Cores in Late Quaternary

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Abstract. Temporal changes in planktonic foraminifera and pteropods as well as in the oxygen isotopic composition of their shells were used to reconstruct paleotemperatures and paleosalinities in Eastern and Western Basins.

Paleoenvironmental Reconstructions. Faunal composition and oxygen isotopic analyses of foraminiferal and pteropodal shells were utilized for paleoenvironmental reconstructions which were made separately for surface and intermediate water (Herman, 1981). The reconstruction was done by mapping recent fauna in core "tops" deposited during the Holocene and their calibration against observed present-day temperatures and salinities in the water column. The broad data base, using published faunal distributions from the world ocean covers a wider range of temperatures and salinities and a combination of these factors, than those which are thought to have existed during glacial periods in the Mediterranean. The results suggest that during glacial maximum Eastern Mediterranean surface-water temperatures were ~3°C lower during glacial summers and ~3-4°C lower during glacial winters. Western Mediterranean surface-water temperatures were ~4°C lower during glacial summers and ~5°C lower during glacial winters. Stadial and interstadial salinities were variable, reaching highest values (at least 1°/$_{oo}$ higher than today) during glacial maximum (eg., ~18,000 years ago) when climates were more arid than today, sea level stood very low, 100-140 m below present level, and the connection between the Mediterranean and Black Sea, which is a major supplier of low salinity water was severed. The surface-water of the Eastern Basins must have been more homogeneous than today, since there was no sharp salinity gradient from the Aegean to the Levantine Sea. Global warming, following the end of glacial stages, with glacier melting resulted in the discharge of large volumes of meltwater directly into the Mediterranean. When sea level rose above the Bosporus sill depth (~ -36 m) the connection between the two seas was reestablished and

the low salinity Black Sea water spilled over into the Mediterranean. A significant increase in precipitation and river runoff is also recorded during transitions from glacials to interglacials as well as during stadial-interstadial transitions in the circum-Mediterranean region. These compounded effects reduced greatly surface water salinities in the Mediterranean, particularly in the Eastern Basins establishing density stratification. The stability of water layers restricted vertical convection impeding oxygen supply to the sub-surface water and causing anaerobic conditions. Some of the sapropels including the last one deposited between 9000 and 7000 years BP (eg., Herman, 1971; Herman, 1981) were deposited during such intervals of density stratification. Surface-water salinities dropped to lowest values during the deposition of these sapropels as suggested by oxygen isotope data (Vergnaud-Grazzini and Herman-Rosenberg, 1969). Today sub-surface water forms in the Mediterranean and it probably did so in the past. I estimate that sub-surface temperatures during glacial maximum were ~3-4°C lower than today in the Eastern Basins and ~5°C lower in the Western Basins. Salinities were ~1°/$_{oo}$ higher as compared to present day values.

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Bibliography. Herman, Y. 1971. Vertical and Horizontal Distribution of Pteropods in Quaternary Sequences. In: The Micropaleontology of Oceans, B. M. Funnell and W. R. Riedel, Eds., Cambridge University Press, Cambridge, pp. 463-486.

_____, 1981. Paleoclimatic and Paleohydrologic Record of Mediter-Ranean Deep-Sea Cores Based on Pteropods, Planktonic and Benthonic Foraminifera. In: Revista Espanola de Micropaleontologia. vol. XIII. no. 2, pp. 171-200.

Vergnaud-Grazzini, C. and Herman-Rosenberg, Y., 1969. Etude Paleoclimatique d'une Carotte de Mediterranee Orientale. Revue de Geographie Physique et Geologie Dynamique, vol. XI, pp. 272-292.