13,000 years of southeastern Mediterranean climate variability inferred from an integrative planktic foraminiferal-based approach

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Résumé

Over the past 13 ka, the hydrology for the southeastern Mediterranean was mainly regulated by Nile River runoff, which in turn was controlled by climate forcing. Being affected by orbital forcing, and the position of the Intertropical Convergence Zone (ITCZ), planktic foraminiferal data (assemblages, stable isotopes, and size properties) indicate three major periods. 1) From 13.0 to 11.5 ka, the upper water column was well-mixed, cold, and productive. 2) From 11.5 to 6.4 ka, hydrology and foraminifers were affected by intensified monsoonal circulation. The enhanced size of Globigerinoides ruber is interpreted as a response to environmental stress caused by low saline waters. 3) After 6.4 ka, the southward retreat of the ITCZ caused a decrease in freshwater discharge and hence a return to ecological equilibrium. A drop in foraminifer diversity from 2.9 to 1.1 ka was related to more arid conditions, and limited supply of nutrients from the Nile River. We suggest a link to a negative North Atlantic Oscillation (NAO) marking the Roman Humid Period in the western Mediterranean, and in anti-phase with the southeastern Mediterranean aridity. Because Nile River runoff exerted major control on surface hydrology, a connection to Indian and Pacific climate systems partially controlling precipitation over the Nile catchment area is hypothesized. From 1.1 to 0.54 ka, high foraminifer diversity indicates humid conditions synchronous to the Medieval Climate Anomaly under a positive NAO state. Over the past 0.54 ka encompassing the Little Ice Age, another arid period is indicated by a drop in foraminifer diversity.

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