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Subsurface/intermediate and deep-water oxygenation states in Mediterranean Sea during the Holocene sapropel deposition inferred from planktonic foraminiferal I/Ca and U/Ca ratios.

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Mediterranean Sea is a climate change hotspot threatened by a possible reduction of thermohaline circulation. Its sensitivity is exemplified by rhythmic occurrences of organic-rich layers called sapropels in the eastern basin, indicative of reduced oxygenation state. The deep-water hypoxia has been studied using geochemical and micropaleontological approaches whereas the reconstruction of subsurface/intermediate oxygenation states has been hampered by scarce of appropriate proxy.

We applied planktonic foraminiferal I/Ca ratio as an indicator of minimum dissolved O_2 concentration of the first 500m in the water column and U/Ca ratio of the same planktonic foraminifera as deep-water oxygenation proxy for the past 12,000 (12 ka) by focusing on Holocene sapropel S1 (10.5-6.1 ka BP). Four cores along a zonal transect were studied: MD04-2724 in the Levantine Sea and SL95 in the Gulf of Sirte, both are currently occupied by Eastern Mediterranean Deep Water. MD04-2797 at the Sicily strait is bathed essentially in Levantine Intermediate Water and ODP977 from the Alboran Sea is occupied by Western Mediterranean Deep Water.

As I/Ca is a fairly new proxy, we examined the influence of foraminifera cleaning, size fraction and species on I/Ca variability. The results confirmed negligible influence of these parameters. The I/Ca ratio varied between 0 and 7 µmol/mol for the study period with the highest ratio in the core-top, being consistent with well oxygenated present-day Mediterranean Sea. The most striking feature is a sharp decrease of foraminiferal I/Ca in the Levantine Sea and Gulf of Sirte at the beginning of S1, which is accompanied by enhanced foraminiferal U/Ca up to 120 nm/mol. These results suggest O_2-depletion in both intermediate and deep waters during S1 in the eastern basin. In contrast, only moderate U/Ca increase of around 50 nmol/mol is observed at the Sicily Strait and the ratio is stable and as low as 20 nmol/mol in Alboran Sea. We will compare our new results with planktonic foraminiferal $d^{13}C$ and $d^{18}O$ to study the relationship between oxygen consumption, hydrological perturbation and carbon cycle in the Mediterranean Sea.