



## **Foraminiferal Na/Ca as a tool to reconstruct salinity**

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Reconstructing changes in thermo-haline circulation critically relies on our ability to quantify both past temperature and salinity. Several proxies have been developed and implemented for temperature. However, lacking reliable proxies for past salinity remain a major obstacle in fully reconstructing the paleoceanographic environment. Indirect reconstructions rely on combining temperature and ice volume assessments to deconvolve surface water oxygen stable isotope values, which are then used to calculate salinity. This approach relies on local calibration and is inherently inaccurate as progressive errors add to the uncertainty. The lack of an accurate more direct method to estimate past seawater salinity thus currently limits reconstruction of past ocean circulation. Here we show a new approach to independently and accurately reconstruct seawater salinity using Na incorporation in foraminiferal test carbonate. Foraminifera cultured under controlled conditions at different salinities show that test calcite Na/Ca values increase linearly with salinity. Application of this method to foraminifers living during a period of known reduced surface water salinity, i.e. sapropel S5 (~125 ka) from the Eastern Mediterranean, indicates that salinity dropped by 6 units. This salinity decrease is in line with previous reconstructions for this time interval. Culturing results and paleoceanographic application thus show that foraminiferal Na/Ca values provide an accurate and robust tool to reconstruct past salinity changes.