Goldschmidt 2023 Abstract
https://doi.org/10.7185/gold2023.20623

Statistical analysis of temporal cold-water coral occurrence throughout the Atlantic and the Mediterranean Sea

INGA KRISTINA KERBER[1,2], NORBERT FRANK[1], ANDREA SCHRÖDER-RITZRAU[1], JÜRGEN TITSCHACK[3] AND CLAUDIA WIENBERG[3]

[1]Institute of Environmental Physics, Heidelberg University
[2]Institute of Earth Sciences, Heidelberg University
[3]MARUM

Presenting Author: inga.kerber@uni-heidelberg.de

Cold-water corals occur in large parts of the world's oceans and are an important archive for the reconstruction of past climatic and environmental conditions. By now, a particularly large concentration of cold-water corals, i. e. of the mound-forming species *Desmophyllum pertusum* and *Madrepora oculata*, has been found in the Atlantic and the Mediterranean Sea [1]. Their aragonitic skeletons allow for precise age determination via Th/U dating [2] and provide the potential to identify spatial and temporal patterns of their occurrence. The overwhelming amount of age determinations on cold-water corals for the Northeast Atlantic by now allows for statistical analysis of the distribution (e. g. [3]), which may reflect environmental drivers and regional oceanographic change influencing their tempospatial occurrence.

Here, we use kernel density estimators (KDEs) for probability density assessment as new methodology to investigate such patterns. KDEs use Gaussian distributions with a fixed bandwidth instead of measurement precision as curve width. Consequently, in contrast to histograms or probability density plots the KDEs avoid statistical artefacts, such as shifts and peaks due to bin size selection or artificial peaks due to measurement precision [4].

We apply this technique to Th/U ages obtained for framework forming coral species, which are at the origin of coral mound formation, within the Atlantic and the Mediterranean Sea. The past 70 ka (up to MIS 4) are represented by the vast majority of the several hundred ages, which reveal multiple phases of peak coral occurrence in the Gulf of Cadiz during the last glacial.

[1] Wienberg and Titschack (2015), In: *Marine Animal Forests*, Springer.

[2] Frank and Hemsing (2021), In: *Paleoclimatology. Frontiers in Earth Sciences*, Springer.

[3] Ferreira, Robinson, Stewart, Li, Chen, Burke, Kitahara, White (2022), *Deep Sea Research Part I: Oceanographic Research Papers* 190.

[4] Weij, Woodhead, Hellstrom, Sniderman (2020), *Quaternary Geochronology* 60