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Quantification of individual foraminifer protein content using nano-spectrophotometry

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The marine carbon pool is important because it buffers the atmospheric carbon pool on short time-scales. Planktic foraminifera are major part of the biogenic marine carbonate flux (Schiebel, 2002), but their biomass and rain ratio, and hence their part in the biological pump is unknown. Due to the huge methodological effort, no attempt has been made to measure foraminiferal biomass since the work of Altenbach (1985).

In this study, a method developed by Smith (1985), and based on nano-spectrophotometry was used to measure the foraminifer biomass. The method is based on spectrophotometry on proteins. When applied on hard shelled foraminifers, contact between the organism's cytoplasm and the analytical chemicals are hampered, and the yield is thus incomplete. The easiest way to use the method on foraminifers is to crush the organism. This method has been used by Mojtahid et al. (2010), but prevents any further chemical and morphometric analyses on the test. Here, we present a series of experiments designed both to quantitatively analyse foraminifers for their amount of cytoplasm, and to preserve the foraminifer test in order to measure the morphology and calcite weight. The new method developed here utilizes an osmotic shock to break the cellular membrane and expose the proteins for measurement. The method is quick and easy to apply, and the data are reproducible.

References

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