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Monthly trace element trends and inter chamber variability in two planktic Foraminifera species from the northern Red Sea: a proxy calibration study

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The trace element (TE/Ca) composition of planktic foraminifer shells is influenced by environmental and biological factors and therefore is useful for reconstructing past oceanic and climatic conditions. As the use of single shells for paleo-reconstruction is increasing, it is important to understand how proxy systematics deviate between species, individual shells and across different chambers.

Here we present monthly trends of TE/Ca in planktic foraminifer shells picked from June 2014 – June 2015 from the hyper-saline Gulf of Aqaba (GoA). Single chamber TE/Ca measurements of *Globigerina ruber albus* and two phenotypes of *Turborotalita clarkei shells were performed using* laser ablation ICP-MS on individuals picked from sediment traps at five depths (120-570 m) and a proximal core top (~720 m). These measurements were further compared with in-situ water column parameters.

Results show species-specific and element-specific trends. *Generally, G. ruber albus display lower* element/Ca values than the *T. clarkei* phenotypes. Additionally, while Mg/Ca, Sr/Ca, B/Ca, and Na/Ca of *G. ruber albus* from sediment trap samples agree with core top values, other TE ratios such as Al/Ca, Ti/Ca, Mn/Ca and Fe/Ca do not correspond between sediment traps and core tops, questioning their reliability for past reconstructions.

Overall, *G. ruber albus* show higher values compared to published values which is in accordance with the relative high salinity and temperature as well as the oligotrophic nature of the GoA.

Most element/Ca exhibit significant excursions during maximum water column mixing in March-April 2015, being accompanied with a relative increase in inter-chamber variability (ICV). Despite these excursions, Mg/Ca in *G. ruber albus* and potentially B/Ca (in *T. clarkei*) remain reliable proxies for temperature and *p*H respectively.

Furthermore, the final chamber (F0) which is the last to calcify, often shows contrasting TE/Ca patterns compared to previous chambers (F-1, F-2). For example, while Mg/Ca in F-1 and F-2 of *G. ruber albus* correlate with mixed layer temperatures, F0 do not. Therefore, pooled means of F-1 and F-2 are recommended to use for reliable paleo reconstructions.

This study highlights the challenges of interpreting element/Ca variations across species and chambers while offering valuable insights into using these proxies in down-core records.