Geophysical Research Abstracts
Vol. 14, EGU2012-1639, 2012
EGU General Assembly 2012

A review of shell isotopic composition as a proxy of palaeobiology of larger foraminifera

P.K. Saraswati
Indian Institute of Technology - Bombay, India (pratul@iitb.ac.in)

The informally designated "larger foraminifera" are among the foremost constituents of the tropical to subtropical shallow marine benthic communities. They were also abundant and diverse in the geologic past as recorded in many carbonate platform successions. Some of the fossil larger foraminifera have living representatives while most others are extinct. Understanding of the palaeobiology of extinct taxa, in absence of modern analogue, is limited and challenging and therefore a need to develop proxies based on shell-composition. The stable isotopes of oxygen and carbon in living larger foraminifera have given insight in to how the biology of the taxa is archived in the shells. The present paper discusses the implications of these observations in developing a potentially important proxy for the palaeobiology of larger foraminifera. The oxygen isotopic composition, expressed as δ18O, is primarily dependent on temperature of the ambient seawater. It directly or indirectly relates to temperature tolerance, relative depths of habitat, reproduction season and life span of the species. The methodology of sampling of foraminiferal carbonates is important in extracting data of palaeobiological significance. While the whole-shell analysis is not so informative in estimating the depths of habitat, the ontogenetic variation in δ18O clearly distinguishes the species inhabiting different depths. Several observations have established that among the two major groups of calcifying foraminifera, the miliolids have distinctly higher δ13C as compared with the rotaliids. This is possibly due to different mechanisms of mineralization as suggested in some experimental studies. A poor correlation between δ18O and δ13C in larger foraminifera is similar to the trend reported in symbiont-bearing planktonic foraminifera. The other attribute of symbiosis includes a large variation in δ18O and δ13C with size of the shell in shallow-water species and small variation in deeper water species. There is unambiguous observation that "vital effect" may be a significant factor in the interpretation of isotopic data. The modern foraminifera have shown that biological factors may influence δ13C in a major way although the effect may be negligible to minor in δ18O. The oxygen isotopic composition would thus remain useful as a proxy of temperature of the seawater in which larger foraminifera inhabited.