Morphologic evolution of *Discoaster multiradiatus* from the Late Paleocene to the Early Eocene: abiotic and biotic causes

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A detailed investigation of sediments recovered at ODP Site 1209 (Shatsky Rise, Pacific Ocean) shows a significant change in *Discoaster multiradiatus* (*incertae sedis*) morphology and size during the Late Paleocene-Early Eocene. This analysis was extended to selected samples from other sediment sections at various paleolatitudes and from different sedimentary basins to decipher local *vs*. global changes.

This time interval is crucial, both for biotic evolution and environmental changes, being characterized by a series of hyperthermal events. Significant modifications in calcareous phytoplankton morphometry are known in the geological record but the causes of these size variations are still under debate. Several authors suggested that size variations could be triggered by paleoceanographic conditions; however, size variability also occurred during times of environmental stability. The goal of the present study is to understand if the observed changes in size result from ephemeral adaptation-malformations or true evolutionary changes.

For size determination, images of *D. multiradiatus* were collected using a digital image-capture system (Young *et al*., 1996), then an image analyses program (NIH-IMAGE software) was used in order to document fluctuations in their maximum diameter. At least 100 specimens were randomly selected through the smear slide of each sample, to provide accurate size estimate.

Results from morphometric analyses highlight a clear increase in size through time, overprinted by rapid shifts to gigantic forms. The relative timing between climate perturbations and biotic evolution in the Late Paleocene-Early Eocene, and specifically during the Paleocene/Eocene Thermal Maximum (PETM) interval, indicates that short-term size variations and malformations were strongly influenced by environmental pressure. The size variations of *D. multiradiatus* suggest that both long-term evolutionary trends and transient adaptations are somehow controlled by environmental pressure.

References

Young, J., Kucera, M. & Chung, H.-W. 1996. Automated biometrics on captured light microscope images of *Emiliania huxleyi*. *In*: A. Moguilesky & R. Whatley (Eds). *Microfossils and Oceanic Environments*. University of Wales, Aberystwyth Press: 261-280.