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Differential dissolution susceptibility in late Paleocene to early Eocene planktonic foraminiferal assemblages: comparing experimental and distributional data from Shatsky Rise (Pacific Ocean)

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We carried out dissolution experiments on well-preserved planktonic foraminifera species from the upper Paleocene to lower Eocene ODP Sites 865B (Allison Guyot) and 1209B, 1210B, 1212A (Shatsky Rise) in the Pacific Ocean. The purpose of this study is to investigate the differences in dissolution susceptibility between taxa, unravel the impact of dissolution on the composition of the assemblages, and from this, improving the reliability of paleoenvironmental interpretations of this time interval. The topic is of particular interest, since the time interval under investigation includes the Paleocene-Eocene Thermal Maximum (PETM), which is frequently characterized by signs of carbonate dissolution.
The preservation state of chosen specimens of the most common genera occurring in the late Paleocene to early Eocene assemblages (Acarinina, Morozovella, Subbotina and Igorina) was checked under binocular microscope. These specimens were then subjected to the experiment through exposure to acetic acid buffered solution pH of 6.6 with experimental duration increments of 2 and 10 hours. After every period of acid treatment, specimens were cleaned with distilled water, dried and the state of preservation of the specimens was again assessed. After this, SEM studies were carried out, together with quantitative studies.
The results show that at generic level, Acarinina is the most resistant genus, followed by Morozovella and Subbotina, respectively. This dissolution susceptibility ranking is in good agreement with inferences on differential dissolution based on quantitative records from Sites 1209 and 1210 (Petrizzo, 2007; Petrizzo et al. 2008). Focusing on the interval of high shell fragmentation, these studies indicated that among Acarinina, Morozovella and Subbotina, the number of fragments of Subbotina exceeds its number of whole specimens, and only fragments of Subbotina occur in the interval of maximum fragmentation. Statistical analysis also confirmed Subbotina to be the most dissolution-susceptible taxon, whereas Morozovella and especially Acarinina are less dissolution-prone. These results are also consistent with experimental data performed on planktonic foraminiferal assemblages from the PETM in Egypt (Nguyen et al., in prep.). In addition, various species of Acarinina show differential susceptibility, with A. soldadoensis being most resistant, followed by A. subsphaerica and A. nitida, respectively. Amongst Morozovella, in decreasing order of dissolution resistance we find M. aragonensis, M. subbotina, M. aequa, M. occlusa, M. pasionensis, M. acuta and M. velascoensis. Igorina pusilla and I. tadjkistanensis show a similar dissolution resistance. A dissolution ranking scheme and a new dissolution index are being developed on the basis of these data, which should allow for a more objective and quantitative evaluation of dissolution phenomena in early Paleogene planktonic foraminiferal assemblages.

References:
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