The link between the low contents of S and Cl in Early Cretaceous basalts and flourishing of Jehol Biotas

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The destruction of the North China Craton (NCC) and the flourishing of the Jehol Biotas have obvious coincidence in time (~125 Ma) and space. As we know, the destruction of NCC was accompanied by intensive magma activities, and the volatiles (e.g., S, Cl) released by the magmatic eruptions would have significant impacts on biotas' evolution.

Here, we used SIMS to measure the S and Cl contents of clinopyroxene (Cpx) phenocrysts in early Cretaceous high-Mg basalts from the NCC. Combing with partition coefficients of Cl and S between Cpx and basaltic melts, the calculated contents of S and Cl in basaltic melts are 33-407 ppm and 117-1120 ppm respectively. The S contents of the high-Mg basalts are much lower than that of the Laki and Samalas volcano (1677 ppm; 2088 ppm), which had been considered to have obviously effects on the climate change. Although the Cl contents of the basalts are slightly higher than the Laki (310 ppm), but are significantly lower than the Samalas (3377 ppm). In addition, the high-Mg basalts have the lower S contents than the Paraná–Etendeka LIPs (730 ppm), which was believed to be not associated with a mass extinction. Meanwhile, the positive correlation between the contents of S and Cl associated with the uniform S and Cl contents within a Cpx grain demonstrate that the S and Cl contents of basalts from NCC represent the primary information in the mantle source. Thus, it seems that the S and Cl contents released by the basaltic magmatism during the destruction of NCC are relatively limited, and may have negligible ecological stress on Jehol Biotas.