Sr and Mg isotopes of Marinoan Cap dolostones: implication for glacial lake Harland?

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Marinoan cap dolostones cap dolostones have been suggested to be formed in a lid of glacial-melt water on top of normal seawater (i.e., the "glacial lake Harland", [1]), which needs to be tested geochemically. In this study, Sr and Mg isotopes of the cap dolostones were investigated from three sections of Marinoan cap dolostones: Hay Creek Group (Canada), Ol member (Mongolia), and Nuccaleena formation (Australia). An incremental leaching technique[2] has been applied to these samples, in order to understand their diagenetic history and to constrain the Sr and Mg isotope compositions of penecontemporaneous seawater. Cap dolostones from Nuccaleena formation can be categorized into two groups based on their chemistry. Group-I samples are located in the bottom and top parts of the section, exhibiting $^{87}Sr/^{86}Sr$ values (~0.7075) similar to previously reported Marinoan seawater values [3], and $\delta^{26}Mg_{DSM3}$ increasing upwards from -2.14‰ to -1.75‰. Group-II samples are located in the middle part of the section, with elevated $^{87}Sr/^{86}Sr$ values (average of 0.7092±0.0003) and $\delta\delta^{26}Mg_{DSM3}$ values (average of -1.71±0.05‰). For Monglian cap dolostones, all samples exhibit similar $^{87}Sr/^{86}Sr$ values (average of 0.7091±0.0001) and$\delta^{26}Mg_{DSM3}$ values (average of -1.63±0.05‰) to group-II Australian cap dolostones. For Canadian cap dolostones, more elevated $^{87}Sr/^{86}Sr$ values (higher than 0.7200) are observed. However, they share similar$\delta^{26}Mg_{DSM3}$ values (~-1.60‰) to Mongolian samples and group-II Australian samples. These geochemical variations could be explained by glacial lake Harland model, i.e., the cap dolostones from Nuccaleena formation recorded seawater signals before, during and after the stage of glacial lake Harland, whereas those from Mongolia and Candada are formed exclusively during the stage of glacial lake Harland. However, other possibilities cannot be ruled out.

[1]Hoffman (2011) Sedimentology 58, 57-119. [2]Liu *et al*.., Chemical Geology, under review. [3]Halverson *et al*.., (2007) PAELEO 256, 103-129.

The Paleoproterozoic basin evolution in the Trasn-North China Orogen, North China Craton

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The Trans-North China Orogen (TNCO) has been recognized as a continent-continent collisional belt along which the Eastern and Western Blocks amalgamated to form the North China Craton. However, controversy has surrounded the timing and tectonic processes involved in the collision of the two blocks, ranging from the westward-directed subduction with final collision at ~2.5 Ga to the eastward-directed subduction with final collision at ~1.85 Ga. Detailed lithostratigraphic and geochronological analyses for the low-grade supracrustal successions in the TNCO has been carried out recently, which help us to examine current models. Lithostratigraphic data indicate that the Gantaohe, Jiangxian and Lower Zhongtiao Groups and lower parts of the Hutuo and Yejishan Groups are composed of metaclastic rocks, carbonates and metavolcanic rocks, interpreted as back-arc basin deposits, whereas the Dongjiao, Upper Zhongtiao, Danshanshi Groups and the upper parts of the Hutuo and Yejishan Groups consist only of metaconglomerates and metasandstones, interpreted as foreland basin deposits. For the Gantaohe, Hutuo and Yejishan Groups, we found major age U-Pb age peaks of detrital zircons at ~2.5 and ~2.15 Ga, which are consistent with ages of the lithological units in the middle sector of the TNCO. Besides the age peaks of ~2.5 Ga and ~2.15 Ga, detrital zircons from the Lower Zhongtiao, Upper Zhongtiao and Danshanshi Groups also gave an older age peak of 2.7 Ga, which is comparable with ages of the lithological units in the Taihua Complex. For the back-arc basin deposits, their maximum depositional ages were constrained at ~2.1 Ga, whereas the presence of ~1.85 Ga detrital zircons from the foreland basin deposits indicates that they were deposited after this time. At ~2.1 Ga, back-arc basins developed behind an "Andean-type" arc that were subsequently incorporated into the TNCO during the later collision. At ~1.85 Ga, the two blocks collided along the TNCO, resulting in the crustal thickening followed by rapid exhumation/uplift, which shifted the back-arc basins to foreland basins. Such a shift in the late Paleoproterozoic supports the model that the collision between the Eastern and Western Blocks occurred at ~1.85 Ga.

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