# A potential indicator of eruption intensity of Archean greenstone volcanisms: $\Delta^{33}S$ values of deep marine sediments

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The ~2.7 Ga Eastern Goldfields Superterrane (EGST) greenstone volcanism in Yilgarn Craton, Western Australia, has been recognized as a plume-related Large Igneous Province (LIPs) with several episodes and cycles [1-3]. However, the eruption intensity of the EGST greenstone volcanisms is poorly constrained, due to pervasive erosion, tectonic deformation and covering of later sediments.

We report SHRIMP SI multi-isotopic sulfur analyses ($^{32}S$ $^{33}S$ $^{34}S$) of pyrites from deep marine sediments interbedded with greenstone lava flows. The results of the four principle stratigraphic units: Lunnon Basalt, Devon Consols Basalt, Paringa Basalt and Black Flag Group, show a clear positive correlation between ratios of thickness of the interflow shale to the lava flow (S/L ratio, as a proxy of eruption intensity) and $\Delta^{33}S$ values of the sedimentary pyrites. Higher the S/L ratio, more positive the $\Delta^{33}S$ of the sediments. The Lunnon Basalt, the thickest and most widespread of the basaltic lava flows, is > 1,750 m thick and has the lowest S/L ratio of $1.3\times10^{-3}$. Its interflow shale shows mantle-like $\Delta^{33}S$ values of -0.04‰ to +0.2‰. The post basaltic volcanism Black Flag Group, which features black shale beds > 200 meters thick, has a S/L ratio of ca. 1, and positive $\Delta^{33}S$ up to +3.98‰. The S/L ratio and $\Delta^{33}S$ values of the Devon Consols Basalt are higher than those of the Paringa Basalt, as the latter is thicker (~850 m), with a thickness four times that of the Devon Consols Basalt. Our findings suggest that the multi-sulfur isotopes, together with detailed volcano-stratigraphy, may help build up the time-intensity profile of the EGST greenstone volcanisms.

[1] Campbell & Hill (1988) *EPSL* 90, 11-25. [2] Barnes et al (2012) *AJES* 59, 707-735. [3] Hayman et al (2015) *Precam. Res.* 270, 334-368.