# $\delta^{34}S$ and $\Delta^{33}S$ records of sedimentary pyrites across the Ediacaran-Cambrian transition from Xiaotan section, Yunnan, South China

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The geologic time interval extending from the end of the Proterozoic to the early Cambrian, particularly the Ediacaran-Cambrian (Ed-C) transition (~541Ma), is marked by dramatic environmental changes and biological innovations. Here, we present sulfur isotopic compositions of sedimentary pyrites ($\delta^{34}S$ and $\Delta^{33}S$) across the Ed-C transition from the Xiaotan section, Yunnan, South China. Our sulfur isotope measurements are aimed to test the leading hypothesis that a change in atmospheric oxygen and biological evolution occurred at this time. We also use data to evaluate processes associated with ventilation by observation of marine sediments. We observe highly positive $\delta^{34}S$ values in range of 13.5‰-35.8‰, accompanying large variations in $\Delta^{33}S$ (-0.044‰ to 0.064‰). We plot the data in $\delta^{34}S$-$\Delta^{33}S$ space and evaluate these data using a context provided by a steady-state sulfur cycle model. Two scenarios are examined. The first scenario attributes the isotopic variation to a high degree of sulfate reduction in marine sediments system, indicating the rate of sulfate reduction surpassed the rate of pore-water sulfate supply. The second scenario invokes fully exchange of sulfate between the world's ocean and the South China basin, and diagenetic pyrite is thought to be formed in open marine sediment system. The predictions of seawater sulfate-sulfur isotope based on both scenarios are testable with future measurements of carbonate associated sulfate, a proxy of ancient oceanic sulfate.