Major radiations of microscopic and macroscopic eukaryotes occurred respectively in the early and middle Ediacaran Period. Various hypotheses have been proposed to attribute these evolutionary events to changes in ocean redox conditions. To date, published models of the Ediacaran ocean in South China have largely been focused on the Upper and Middle Yangtze blocks, as opposed to the slope and basin sections of the Lower Yangtze Block, where the oldest complex macrofossils of the Ediacaran (i.e. the ~600 Ma Lantian Biota) are preserved. To achieve a holistic understanding of the record of ocean chemistry in the entire Yangtze Block, we carried out carbon ($\delta^{13}C_{carb}$ and $\delta^{13}C_{org}$) and sulfur ($\delta^{34}S_{CAS}$ and $\delta^{34}S_{pyr}$) isotopic investigations of four new sections in the Lower Yangtze Block, in addition to one previously reported drill core at Lantian. In conjunction with previous work on sections of the Upper and Middle Yangtze blocks, our study reconstructs the redox structure of the entire Ediacaran ocean in South China.

Regulation of the Earth's surface redox conditions commonly replies on the variations of sulfur isotopes between seawater sulfate ($\delta^{34}S_{CAS}$) and sedimentary sulfide ($\delta^{34}S_{Py}$) phases. However, traditional studies based on bulk-rock $\delta^{34}S_{Py}$ have ignored the complication of sedimentary pyrites in aspects of morphology, and diagenetic and metamorphic processes. To untangle the complexity of pyrite sulfur isotopes ($\delta^{34}S_{py}$), we applied nano-SIMS (secondary ion mass spectrometry) and SEM (scanning electron microscope) to analyze *in-situ* SIMS $\delta^{34}S_{Py}$ in different pyrite crystal types throughout an Ediacaran basinal Lantian drill-core of South China. SIMS isotopic spotting on distinct morphological pyrites provides new insight into the utility of sulfur isotopes for geological reconstructions of global ocean chemistry.