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Oceanic euxinia at the end-Permian mass extinction followed by cyanobacterial blooms and land vegetation recovery

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The largest mass extinction occurred in both seas and lands at the end of the Permian, 251 Ma. We conducted a high-resolution study on sedimentary organic molecules at the Huangzhishan section located at 40 km southeast of the GSSP Meishan section, South China, deposited in shallow-water platform. In this section, fossil records indicate that mass extinction across the P/T boundary includes two extinctions. Here we report new findings on euxinic, bacterial, and land vegetation indices of organic molecules in the Huangzhishan section. The results show that (1) ocean euxinia at the end of the Permian caused the former mass extinction and terrestrial vegetation collapse, (2) after the former extinction cyanobacteria bloomed in the ocean and land vegetation recovered from lichens to ferns then to conifers but collapsed at near the P/T boundary and (3) after the later extinction the second bloom of cyanobacteria occurred in the ocean and land vegetation recovered from ferns to conifers. Terrestrial vegetation collapses coincided with spikes of photic zone euxinia indicator. This implies that hydrogen sulfide which accumulated in the ocean released to the atmosphere triggering acid rain, leading to terrestrial vegetation collapse.