Revisiting the early land forest hypothesis for a Late Devonian mass extinction process in the Southern Appalachian Basin using an organic geochemical characterization of the Chattanooga Shale (Frasnian to Famennian)

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Extensive anoxia in Late Devonian seas is thought to lead to the Frasnian-Famennian (F-F) mass extinction, but the primary cause for the widespread marine anoxia remains debatable. In this study, we test the hypothesis that enhanced terrestrial inputs to marine environment led to algal blooms and anoxia across the F-F boundary. Elemental, stable isotopic, molecular and palynological analyses were applied to the Late Devonian Chattanooga Shale in Tennessee. At the F-F boundary, positive excursion were obseved in $\delta^{13}C$ values of organic matter, which conincided with greater abundanced of short-chain *n*-alkane and plankton cysts as well as a decline in pristine/phytane ratios. This pattern suggests high marine primary productivity and enhanced anoxia at the boundary. The identification of a series of aryl isoprenoids derived from *Chlorobi* suggests the anoxia had influenced the photic zone. Corresponding to these marine environmental changes across the boundary, vascular plant biomarkers and woody materials also exhibited an increasing trend. Collectively, our data provide prelimnary support to the 'Devonian land plants hypothesis', that is, elevated nutrient inputs to coastal oceans due to plant expansion on land led to eutrophic and anoxic conditions in the Southern Appalachian Basin.