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Global and Environmental Significance of Enhanced Bioproductivity at the Silurian/Devonian Boundary

The transition of life from marine to terrestrial habitats represented a major impact on system Earth. Although there is no major event at the Silurian/Devonian boundary (SDB), in the Lower Devonian, the evolution of land plants continued with increasing size and complexity of their structures. In order to learn more about the casual origin of the radiation of land plants, we have evaluated bioproductivity trends at 12 locations in-between Gondwana, Laurentia and Baltica covering facies regimes from shallow- to deep-marine environments. The study is based on organic and inorganic stable carbon isotopic ratios from 790 rock samples.

At all sites, the SDB is characterized by positive shifts of +1 to +4 permill PDB in the carbon isotopic signatures. At the stratotype, this refers to peak values for initially deposited TOC of up to 18 weight percent. The overall positive isotopic shift points to imbalances in the global carbon cycle, i.e. enhanced bioproductivity at the SDB. Furthermore, the projection of the individual bathymetry of all sites on an imaginary cross-section indicates a gradual increase in organic ?13C from less than —30 for the deep-marine to —25 permill PDB for the shallow-marine region. Beside the general interpretation of a different carbon isotope partitioning at individual marine environments, we suggest that heavier isotopic values in coastal areas are related to an involvement of early land plants and/or their precursors.