

The Frasnian-Famennian events in a deep-shelf succession, Subpolar Urals: biotic, depositional, and geochemical records

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The Frasnian-Famennian (F-F) boundary is well biostratigraphically documented in the *Palmatolepis*-rich deposits exposed along the Sywiu River in the lower slopes of the Subpolar Urals. The thin-bedded calcareous-clayey-siliceous deep-slope succession of the Vorota Formation appears to represent continuous Domanic-type deposition throughout the world-wide carbonate crisis time, without evidence for the basal Famennian hiatus or a large-scale sedimentary perturbation within a regressive setting. The northernmost Laurussian sequence exhibits many well known signatures throughout the broad F-F timespan: the appearance of organic- and clay-rich deposits, icriodontid and radiolarian blooms, and a correlative shift of several geochemical proxies towards hypoxic and high-productivity regimes, perfectly recorded by positive $\delta^{13}\text{C}_{\text{carb}}$ excursions of +3.5 ‰. Integrative biotic, microfacies and geochemical data substantiate a longer-term oceanographic destabilization, attributable to multiple Earth-bound triggering factors in (episodically enhanced?) greenhouse climate and punctuated eustatic sea-level highstands, superimposed on the elevated deposition of organic carbon-rich sediments during the Upper Kellwasser Event. Unsteady eutrophicated, and oxygen-depleted ecosystems during the F-F biotic crisis interval could be assumed, especially when intensified by various spasmodic tectono-volcanic phenomena in the incipiently closing Ural Ocean.

Key words: Frasnian; Famennian; Kellwasser Crisis; conodonts, microfacies, carbon isotopes; geochemistry; Timan–Pechora Basin.

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