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# The Role of Terrestrial N along a Frasnian/Famennian Boundary Transect of the Appalachian Basin

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A causal link between the Late Devonian emergence of forest ecosystems and episodic black shale deposition has been proposed by several authors. Most attribute increases in epicontinental basin productivity to elevated rates of terrestrial phosphorus weathering facilitated by the co-evolution of root systems and soils. Two reasons to suspect that an increase in the P weathering flux was not the primary cause of organic-rich shale deposition are as follows. First, most Late Devonian black shales were deposited during sea level transgressions, periods when riverine fluxes of sediment and mineral nutrients such as P to marine basins were diminished. Second, Late Devonian forests were restricted to warm, moist lowlands where P was sequestered in soils as inorganic, occluded forms. However, the export flux of reactive N from these forests to adjacent epeiric seas by riverine and atmospheric deposition was enhanced by the warm, wet climate and expanding areal extent of forests. Abundant terrestrial reactive N primed the marine eutrophication pump by extending the residence time of P in the photic zone, permitting extensive growth of primary biomass. The consequent flux of organic matter to the sea floor created anoxic bottom waters that, in turn, allowed for the remobilization of P into the water column. Based on abundance and isotopic analyses of organic and inorganic C, N, P, and S from terrestrial and marine environments within and adjacent to the Late Devonian Appalachian Basin, this latter scenario is supported.