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Re-assessing the nitrogen signal in continental margin sediments: New insights from the high northern latitudes

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Organic and inorganic nitrogen and their isotopic signatures were studied in continental margin sediments off Spitsbergen. We present evidence that land-derived inorganic nitrogen strongly dilutes the organic signal in coastal and fjord settings and accounts for up to 70 % of the total nitrogen content. Spatial heterogeneity in inorganic nitrogen along the coast is less likely to be influenced by clay mineral assemblages or various substrates than by the supply of terrestrial organic matter within eroded soil material into selected fjords and onto the shelf. The δ^{15}N signal of the inorganic nitrogen ($\delta^{15}N_{inorg}$) in sediments off Spitsbergen seems to be appropriate to trace terrestrial organic matter supply from various climate- and ecosystem zones and elucidates the dominant transport media of terrigenous sediments to the marine realm. Moreover, we postulate that with the study of sedimentary $\delta^{15}N_{inorg}$ in the Atlantic-Arctic gateway, climatically induced changes in catchment's vegetations in high northern latitudes may be reconstructed. The $\delta^{15}N_{org}$ signal is primarily controlled by the availability of nitrate in the dominating ocean current systems and the corresponding degree of utilization of the nitrate pool in the euphotic zone. Not only does this new approach allow for a detailed view into the nitrogen cycle for settings with purely primary-produced organic matter supply, it also provides new insights into both the cycling of marine and terrestrial nitrogen and its ecosystem response to (paleo-) climate changes.