Phosphorus Release from Eroded Soil in the Aquatic Systems

Antti-Jussi Kallio

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University of Helsinki

Phosphorus cycle

Erosion

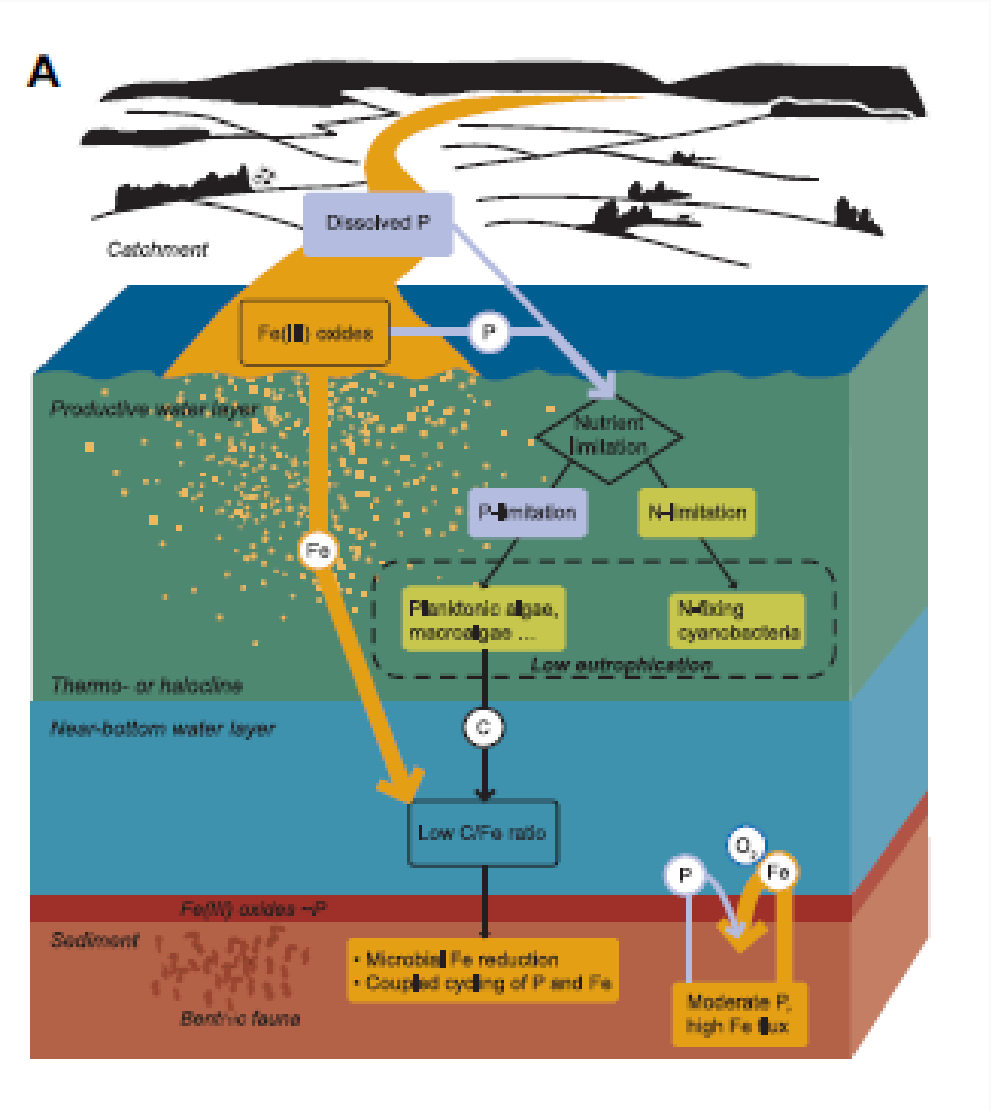
* Erosion control measures are applied all over the world, in many cases to protect the soil itself, or to reduce off- site impacts
* Does controlling soil erosion inhibit aquatic eutrophication (rehevöityminen)?
    - The main interest of our study
    - We study the mineralization pathways of Fe, which is coupled to C, S and P cycling.
    - The amount of C, S, aerobic vs anaerobic.

Possible effects of eroded soil on eutrophication

* (The following summarize applies to estuary (murtovesi), or any SO_4 rich recipient.)
* If the estuary receives a high input of Fe oxides and a modest level of dissolved P, we may see moderate levels of eutrophication.
* The settling flux has a low C/Fe ratio and the sediment is mainly in Fe reduction state.
    - As a result the estuary may respond to erosion control because the P concentrations are not maintained by strong P release from the sediment due to coupled cycling of P and Fe.
* The biotic fauna releases Fe and P from the oxides which then react with O_2 in the aerobic estuary.
    - No P release from sediment to the aquatic system, keeps the "ferrous wheel" spinning.

Possible effects of eroded soil on eutrophication

Figure 1: Fe and P cycle in aerobic estuary

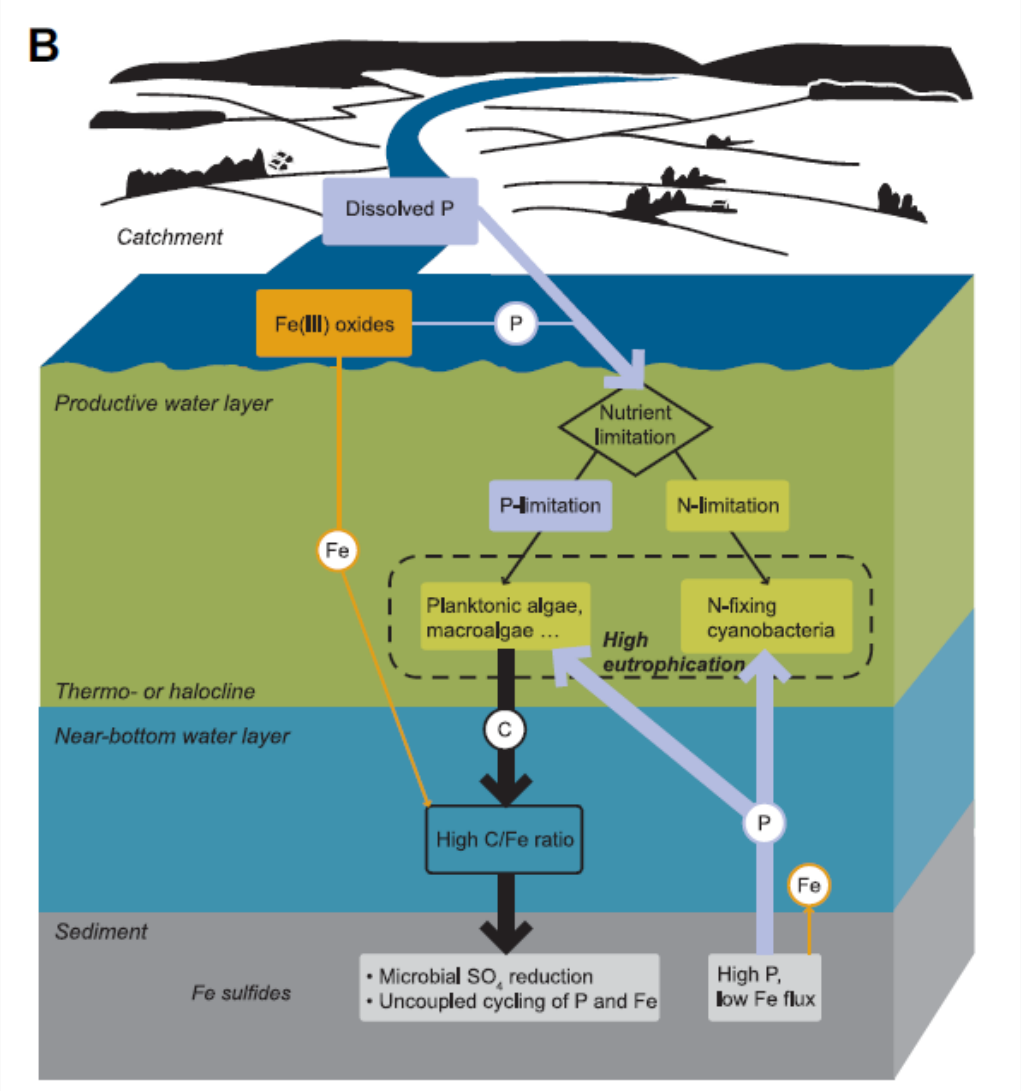


Possible effects of eroded soil on eutrophication

* If erosion control takes place, typically dissolved P increases as we reduce the input of Fe oxides.
* Increased bioavailable P triggers algal (levä) production, which increases the flux of organic C to the sediment surface $\rightarrow$ SO_4 reduction becomes important
* The lowered flux of Fe oxides means higher C/Fe ratio.
* When SO_4 reduction rates increase, more of the sediment Fe is transformed to non-sorptive Fe sulfides $\rightarrow$ massive release of Fe-bound P stored in sediments.

Possible effects of eroded soil on eutrophication

Figure 2: Fe and P cycle in anaerobic estuary



X-ray Absorption Spectroscopy

Small theory section

HelXAS

Measurement preparations

Some early results

Dry soil samples

Wet aerobic soil mixed with sea water