

Global patterns of phosphorus transformation in relation to latitude, temperature and precipitation

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Phosphorus as an essential nutrient is originally derived from weathering of continental rocks. It is well known that climate drive the continental weathering. However, global patterns of climate control on phosphorus cycle remain elusive. Here we analyze literature data in which SEDEX procedure were used to sequential extraction of different forms of phosphorus in surface soils and sediments into five phosphorus forms: exchangeable, iron-bound, CaCO₃-bound, apatite and refractory organic phosphorus. This study reveals broad global patterns of phosphorus transformation that are regulated by climate variables such as absolute latitude, mean annual temperature and mean annual precipitation. The phosphorus forms in surface sediments and soils are related to climate condition through chemical weathering and biological production and decomposition of the organic matter produced. Other factors, such as bedrock lithology and dust deposition, contribute to the variability in the content of particular phosphorus forms at a given geographic location or climate condition.