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Soil physicochemical and biological controls on soil phosphorus status, availability and dynamics along a European continental transect

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Phosphorus (P) is an important nutrient in terrestrial ecosystems, and its availability is often limiting biological processes. The main source for P aquisition by plants and microbes in soils is phosphate dissolved in soil solution (DIP). Due to the chemical properties of phosphate, size and dynamics of this important pool are strongly limited and dependent on the physicochemical properties of the soil environment. The soil environment is closely linked to soil mineralogy and texture, which influence P dynamics on a wide range of timescales - from short term processes such as direct DIP availability being modulated through rapid phosphate fixation on Al-Fe (hydr)oxides up to long term processes such as primary P mineral weathering and build-up of occluded P pools. In this study we aimed to investigate the soil physicochemical and biological factors which drive status, availability and dynamics of soil P. For this, we sampled mineral topsoils from 95 sites across Europe, from Southern Spain to Northern Sweden, covering the major climatic and pedogenic gradients of the continent, as well as different types of agricultural management (cropland, grassland, and forest). The soils where analysed for a wide range of potentially relevant physicochemical and biological parameters (soil pH, base saturation, cation exchange capacity, exchangeable Ca2+, Al-Fe (hydr)oxides, microbial biomass, extracellular enzymes etc.) as well as for their C, N and P status. Additionally, a 33PO4-3 –labelling method was used to assess their capacities to fix and mobilize DIP over the short term, both through abiotic and biotic processes. Data are currently under evaluation and will provide new insights into soil environmental controls on soil P availability. Results will moreover cast light on the processes by which soil mineral status directly and indirectly impacts soil P dynamics.