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Pedotransfer functions for soil biodiversity

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Indicating changes in soil biodiversity is generally considered a difficult task due to the complexity of soil biota. Current attempts to open the black box of the microbial community uncover an immense diversity at the local scale. At regional or landscape scales, however, the challenge is to define indicators describing the below-ground system as a whole. It is argued that soil organisms such as earthworms, having a strong metabiotic impact on other soil organisms, can be regarded as system indicators that allow to predict overall characteristics of a specific soil biota system. System indicators are commonly used in soil monitoring programmes to assess changes in soil biodiversity (e.g. within the EU project ENVASSO).

Data from some 50 soil monitoring sites in Germany, which have been investigated during 20 years, will be used to relate biological parameters, such as species composition and abundance of earthworms and enchytraeids, to soil variables such as pH, soil moisture, soil texture, humus form and land use. The emerging patterns serve as a basis for defining pedotransfer functions which allow to predict the characteristics of soil biota, where direct measurements are not feasible. Pedotransfer functions are the tool for upscaling soil biodiversity data up to the landscape scale and for mapping soil biota related soil functions. They may also be used to define the benchmarks for assessing decline in soil biodiversity caused by soil contamination, soil compaction and other soil threats. Examples will be discussed using data from German pilot sites.