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Soils characterisation along ecological forest zones in the Eastern Himalayas

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Elevational gradients are commonly used to characterise vegetation patterns and, to a lesser extent, also to describe soil development. Furthermore, interactions between vegetation cover and soil characteristics are repeatedly observed. Combining information on soil development and easily to distinguish forest zones along elevational gradients, creates an added value for forest management decisions especially in less studied mountain regions.
For this purpose, soil profiles along elevational gradients in the temperate conifer forests of Western and Central Bhutan, ranging from 2600-4000m asl were investigated. Thereby, 82 soil profiles were recorded and classified according to the World Reference Base for Soil Resources. Based on 19 representative profiles, genetic horizons were sampled and analysed. We aim to provide fundamental information on forest soil characteristics along these elevational transects. The results are presented with regard to ecological forest zones.
The elevational distribution of the reference soil groups showed distinct distribution ranges for most of the soils. Cambisols were the most frequently recorded reference soil group with 58% of the sampled profiles, followed by Podzols in higher elevations, and Stagnosols, at intermediate elevations. Fluvisols occurred only at the lower end of the elevational transects and Phaeozems only at drier site conditions in the cool conifer dry forest zone. The humus layer thickness differs between forest zones and show a shift towards increased organic layer (O-layer) with increasing elevation. The reduced biomass productivity with increasing elevation and subsequently lower litter input compensates for the slow decomposition rates. The increasing O-layer thickness is an indicator of restrained intermixing of organic and mineral components by soil organisms at higher elevation.
Overall, the soil types and soil characteristics along the elevational gradient showed a continuous and consistent change, instead of abrupt changes. We interpret these as manifestations of changes of temperature and precipitation with elevation which also drives forest zonation in these least anthropogenically influenced forest ecosystems. The elevational distribution of forest zones is correlated with the distribution of soil types and thus also reflects soil characteristics.