

The impact of volcanic tephra on weathering and soil development of Icelandic Histosols, SE Iceland

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A mixture of poorly decomposed plant remains, crystalline volcanic material and intense aeolian deposition sets Icelandic Histosols apart from other Histosols in the northern hemisphere. They exhibit a unique combination of histic (organic) and andic soil characteristics. Allophane, imogolite and ferrihydrite are common minerals in Icelandic soils while layer silicates are rare.

The volcanically active area south of Vatnajökull has received numerous tephra deposits of varying thickness during Holocene. Two distinct tephra layers, the light coloured rhyolitic tephra from the Öræfajökull eruption in AD 1362 and a black basaltic tephra from a Veidivötn fissure eruption within the Bárðarbunga volcanic system in AD 1477, are well preserved in the soils. This provides a unique opportunity to study weathering behaviour of tephra deposits of different composition and to examine their contrasting mineralogy and impact on soils south of Vatnajökull glacier. The investigated soils can be classified as Histosols with plant residues as parent material and influenced by volcanic ejecta (tephra) and aeolian material. Low pH (H₂O) and high organic matter (OM) content are the two dominating factors influencing their weathering behaviour. The soil organic carbon (SOC) content was found to be between 16 - 31%. As OM inhibits the formation of amorphous secondary minerals, the clay content in Icelandic soils is generally low while Al-humus complexes are predominant. The soil horizons developed from rhyolitic and basaltic tephra both show differences. Investigations of the mineralogy show small evidence of weathering in the basaltic V1477 tephra, whereas the rhyolitic volcanic ejecta has hardly altered since its formation.