



Soil evolution in the active environment of Öraefi district, S.E Iceland

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Soil is a resource of critical importance to life on earth. It is the foundation for the growth of vegetation and therefore food production and our existence. Soil also regulates and distributes nutrients and water. Soils of Iceland are in many respects special; they are relatively young and have only been forming since the end of the Pleistocene when glaciers retreated from the land. To this date new soil is continually forming on land where glaciers are retreating or where new land is formed due to volcanic activity. Volcanic soils (andosol/andisol) generated from airborne volcanic ejecta (tephra) are the most common form of soils in Iceland. Windblown material also contributes to their formation. Rapid chemical weathering of tephra hastens soil genesis and the resulting soils tend to be fertile and can act as large carbon sinks.

This research focuses on soil evolution, with emphasis on the role of tephra in soil formation, as well as climate and human utilization of the environment in the district of Öraefi in south east Iceland. The study area has been impacted numerous times by explosive volcanic eruptions in neighbouring central volcanoes. Such as the Grímsvötn-Bárðarbunga systems and Öraefajökull. Of special importance to this area are the 1362 eruption in Öraefajökull and 1477 eruption in Vatnaöldur 1477 which originated in the Bárðarbunga system. The resulting tephra layers make it possible to ascertain the age of the soil and therefore calculate the soil accumulation rate. Five soil profiles were excavated and sampled at various distances from Öraefajökull glacier. In total 58 horizons were examined. The profiles and horizons were described using physical and chemical methods. Carbon and nitrogen content, bulk density, soil pH (H₂O, KCl and NaF), clay content and weathering state were measured to describe soil properties and soil stability.

Results show that the devastating eruption in Öraefajökull in 1362 and to a lesser extent the Vatnaöldur 1477 eruption caused an abrupt discontinuity in soil development. Clay, carbon and nitrogen content has in many cases not reached pre-1362 levels to this date. These results in conjunction with soil accumulation rate and other factors indicate continued pressure on the environment since the occurrence of these explosive eruptions, probably compounded by deteriorating climate and continued human utilization of the area.