

# ***Interactive comment on “Evaluating the carbon sequestration potential of volcanic soils in South Iceland after birch afforestation” by Matthias Hunziker et al.***

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Received and published: 5 September 2018

Review of Hunziker et al. This manuscript describes a very interesting study of the accumulation of carbon, particle density fractions and the clay fraction that would be relevant to adsorption of carbon in volcanic soils. It would be relevant to the literature on soil development during primary succession on volcanic soils, and perhaps to secondary succession on volcanic soils. One thing that is unique is that unlike in many studies of soil development during succession, there is only one species of tree involved, with one “variable” removed (with the exception of the grassland which provides an interesting contrast with deposition of carbon at different depths).

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5 cm in diameter at given soil intervals (0- 5, 5-10, 10-20 and 20-30 cm). The five sub-samples per depth interval were immediately mixed in order to form one composite sample. Thus, each depth interval per category was represented by three composite samples (Figure 1), resulting in a total of 84 composite samples.” It is difficult to figure out the experimental design from paragraph and figure (Figure 1) seems to have some contradictions. There were 5 pits in each site. Part of the problem is the use of the words “land cover types” and “sites”. Many authors use “site” to indicate the “treatment” and “plot” as the unit that serves as a replicate. I realized these were not randomly allocated treatments, but the nomenclature is confusing making it difficult to tell that there are 3 replicates per “vegetation/age” class. What is “category” in “depth interval per category, is this the same as site? Could site be referred to as “plot”? In Figure 1, the map is useful. But, in the maps B, C, and D I do not see asterisks, triangles, etc. as it says in the caption. The list of sites, profiles, and composite samples is only confusing. Perhaps you could list “vegetation/age” classes, “number of plots or sites within each class”, “subsamples composited within each plot”... to make the number of true replicates apparent.

In the discussion, there are a couple of very relevant references that are comparable in terms of (1) the rate of carbon accumulation over time on volcanic soils, (2) the development of allophane and iron and aluminum oxyhydroxides and the role of adsorption of carbon, and (3) the use of density fractionation to examine the role of association of C with volcanic minerals and its refractory nature. These are listed below: Sollins, P., Spycher, G., Topik, C., 1983. Processes of soil organic matter accretion at a mudflow chronosequence, Mt Shasta, California. *Ecology* 64, 1273– 1282.

Lilienfein\*, J., Qualls, R.G, Uselman\*, S.M, and Bridgham S.D. 2003. Soil formation and organic matter accretion in a young andesitic chronosequence at Mt. Shasta, California. *Geoderma* 116:249-264.

Lilienfein J, Qualls R.G, Uselman\* S.M.and Bridgham S.D. 2004. Adsorption of dissolved organic carbon and nitrogen in soils of a weathering chronosequence. *Soil*

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Science Society of America Journal 68 292-305.

Other specific notes are listed below:

Abstract lines 26 through 29. The cause and effect does not seem clear. Suggested revision: "After 50 years of birch growth, the SOC stock is lower than that of a naturally growing birch woodland. Suggesting that afforested stands could sequester additional SOC beyond 50 years of growth."

please spell out sodium polytungstate

Page 14, lines 14-15 needs rewriting.

Robert G. Qualls

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Interactive comment on SOIL Discuss., <https://doi.org/10.5194/soil-2018-26>, 2018.

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