SOIL Discuss.,
https://doi.org/10.5194/soil-2020-33-RC1, 2020

Interactive comment on "Comparison of soil characteristics from geophysical and geochemical techniques along a climate and ecological gradient, Chilean Coastal Cordillera (26° to 38° S)" *by* Mirjam Schaller et al.

Colin Pain (Referee)

colinpain@gmail.com

Received and published: 3 July 2020

Manuscript soil-2020-33 "Comparison of soil characteristics from geophysical and geochemical techniques along a climate and ecological gradient, Chilean Coastal Cordillera (26° to 38° S)" Review by Colin Pain

General Comments

This paper reports on correlations between GPR profile data and physical and chemical soil properties. The soil properties come from work that has previously been published,

while the GPR data are new. The correlations are discussed and demonstrate that GPR can be used to infer soil thicknesses and to a lesser extent soil properties. The paper is well written and is a very useful contribution to our knowledge of the value of using geophysical methods to study soil properties and distribution. I suggest a change to the title: "Comparison of soil physical and chemical characteristics with geophysical data along a climate and ecological gradient, Chilean Coastal Cordillera (26° to 38° S)"

Specific Comments

There is some confusion in soil/regolith terminology. Regosol, cambisol, and umbrisol are World Reference Base for Soil Resources (WRB) classes. I think it would be useful to mention this, and to briefly discuss the soil classification. Part of the confusion is the distinction between soil and saprolite – the saprolite is the C horizon and is therefore part of the soil. While there is clearly a difference between the mobile zone (A and B horizons) and the underlying saprolite zone (C horizon), both are parts of the soil profile. (The mobile zone may be transported by creep or surface wash, or it may simply be re-sorted, as by termites or earthworms, or it may be a combination of both, so it is a very general term.) For this reason, I disagree with Riebe and Granger (2013) when they restrict the term "soil" to the mobile zone. I would find photos of the soil/saprolite profiles useful. Perhaps you could include photos and soil profile descriptions in the supplementary file? Or refer to Figure 2 in Bernhard et al (2018) – perhaps even reproduce it. It is a very useful figure and should be easily available to readers of this paper. Lines 162 and 163. "In Pan de Azúcar, the soil is part of a regosol and consists of a 20 to 25 cm thick A and B horizon." A regosol is a soil, so how can the soil be part of it? I suggest rewording: "In Pan de Azúcar, the soil, a regosol, consists of A and B horizons with a combined thickness of 20 to 25 cm and an underlying saprolite zone (the C horizon), which is coarse-grained and jointed (Oeser et al., 2018). The total organic carbon content of the A and B horizons is <0.1% (Bernhard et la., 2018). Angular fragments in the soil increase in size (> 1 mm) with depth." I also suggest rewording soil descriptions for the other areas in the same section. Section 2.2. For La

Campana and Nahuelbuta there is no mention of the characteristics of the saprolite.

Technical Corrections

Line 88. What do you mean by “sub-surface”? Figure 3 caption – what do the colours in the pedons represent? Line 254, also 278 “In this way, the move-outs of linear events” – I/m not sure what this means – what are “move-outs”? Check figures for text size. In some (e.g. Figure 4, Figure 6, some of the text is too small. I attach a file with suggested edits.

Additional Comment

This is not a comment on your paper, but a general comment on the research. Have you considered using ground-based electromagnetic sensing? This measures conductivity and might supplement GPR as a way of mapping sub-surface soil units. See, for example: Ahmed, M.F., Odeh, I.O.A. and Triantafilis, J. 2002. Application of a mobile electromagnetic sensing system (MESS) to assess cause and management of soil salinization in an irrigated cotton- growing field. Soil Use and Management 18, 330-339. Triantafilis, J. and Buchanan, S.M. 2009. Identifying common near-surface and subsurface stratigraphic units using EM34 signal data and fuzzy k-means analysis in the Darling River valley. Australian Journal of Earth Sciences 56, 535-558. Amezketa, E. 2007. Use of an electromagnetic technique to determine sodicity in saline - sodic soils. Soil Use and Management 23, 278-285.

Please also note the supplement to this comment:
https://soil.copernicus.org/preprints/soil-2020-33/soil-2020-33-RC1-supplement.pdf

---

Interactive comment on SOIL Discuss., https://doi.org/10.5194/soil-2020-33, 2020.