

## ***Interactive comment on “Geochemical zones and environmental gradients for soils from the Central Transantarctic Mountains, Antarctica” by Melisa A. Diaz et al.***

**Peter Convey (Referee)**

pcon@bas.ac.uk

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This study builds on and extends previous research on the influence of geochemical gradients on biology/biodiversity that has focused on the Victoria Land Dry Valleys. This work already leads this field of research in Antarctica, and the extension described here to soils of part of the Transantarctic Mountains is a welcome and significant development. The study region is, as the authors state, one of the most extreme on the planet hosting active terrestrial ecosystems, while other recent studies in different fields have identified particularly distinctive and evolutionarily divergent communities of microarthropods in this region, within which very few biological specialists have ever

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worked. Improved understanding of the drivers and influences on terrestrial biodiversity in this remote and rarely accessed region is an important step in improving our ability to predict the distribution of this biodiversity, in turn a fundamental component of improving conservation and management strategies in this region. The ms, combining inputs of leading researchers in this field, is written very well, and my comments are very minor. Literature cited is thorough and appropriate; indeed, in drawing together literature across multiple fields, this paper is also in itself a very valuable compilation. L45-6: as written, the sentence unintentionally I think implies these ecosystems might be restricted to the Dry Valleys. More accurately, systems containing only microarthropods and microinvertebrates are known throughout Antarctica, and in the Antarctic Peninsula/Scotia Arc actually extend up to the South Orkney and South Sandwich Islands (60 and 55-59 deg south, respectively), where there are no native true insects (two species of which do occur in parts of the Antarctic Peninsula and South Shetlands). Admittedly these communities are more diverse in species numbers and with greater biomass than those of the Dry Valleys. To expand the ‘most extreme environment’ literature beyond the Dry Valleys, there is a recent publication by Collins et al. (2020, PNAS) on part of the Transantarctic Mountains, Hodgson et al. 2010 (Antarct Sci) on the Dufek Massif (far eastern Transantarctic Mountains), and Convey & McInnes 2005 (Ecology) on nunataks in Ellsworth Land, with the latter two reporting invertebrate communities in which even nematodes are absent. L54: repeat of word ‘concentrations’ L59: the two Collins et al papers would be appropriate to cite here, as the most recent and detailed examples of such studies. L61: I would add water availability here too Methods are clearly described and cited, and I have no questions as to their appropriateness. L155-6: my ignorance, but what drives the choice of the proportions of samples included in the training and testing sets? L232: is ‘out of the bag’ a widely used phrase? L299: did the study referred to here use any culture, molecular or eDNA approaches to assess whether any evidence for biota being present? Section 5.2: is there a case that much of the text in this section might be more appropriate as a subsection in Results? L366: the description of this process whereby ‘refuges’ are ef-

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fectively mobile, moving as the glacier front/edge expands or contracts, reminds me of the suggestion of 'temporal refugia' that has been made in the entirely different situation of areas containing multiple but individually short-lived geothermal refugia (Convey & Smith 2006 J Veg Sci; Fraser et al. 2014 PNAS).

Peter Convey British Antarctic Survey

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