

Interactive comment on “Biological soil crusts on initial soils: organic carbon dynamics and chemistry under temperate climatic conditions” by A. Dümig et al.

Anonymous Referee #2

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Biological soil crusts (BSC) are known to occur on soils in arid and semi-arid regions throughout the world, but also on initial soils in spots wherever a semi-arid microclimate exists. Former military training areas and sand dunes have been well described to constitute suitable habitats for biological soil crusts in temperate regions.

In their manuscript, Dümig et al. investigated the organic carbon content and chemistry of BSC of different succession stages on a natural and an experimental dune in Brandenburg. They determined the nutrient content of BSC and the corresponding soil, determined the age of the carbon within their samples, determined their carbon content and the constituents of carbohydrates.

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Unfortunately, the experimental setup for these studies comprises a major deficit. Samples were taken of 5 different successional stages of crusts on each of the two dunes. Three replicate samples of each crust type were taken within 1 m² each, meaning that these samples clearly originate from the same patch of crust, implicating that they are definitely NOT independent from one another and thus are obvious pseudoreplicates. Consequently, there is only one value per crust type forbidding all statistical analyses.

Within their study, the authors found no evidence for soil properties affecting the BSC distribution. They observed that the mean ¹⁴C residence time of soil organic carbon decreased with increasing BSC development, being a potentially interesting result, which should be verified in a statistically correct research approach. The differences in carbohydrates should also be verified in a statistically sound experimental approach.

Due to major deficits in the methodological approach I strongly suggest to reject the manuscript in its present stage. The experiments on the ¹⁴C residence time and the carbohydrate composition could be repeated in a statistically sound experimental setup with a sufficient number of replicates and a profound statistical analysis in order to get robust and statistically significant results.

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