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Soil micromorphology, geochemistry and microbiology at two sites on James Ross Island, Maritime Antarctica

Lars A. Meier (1), Patryk Krauze (2), Isabel Prater (3), Thomas Scholten (1), Dirk Wagner (2), Peter Kühn (1), and Carsten W. Mueller (3)

(1) Eberhard Karls University Tübingen, Institute for Geography, Department for Geosciences, Tübingen, Germany (lars-arne.meier@uni-tuebingen.de), (2) GFZ German Research Centre for Geosciences, Helmholtz Centre Potsdam, Section 5.3 Geomicrobiology, Potsdam, Germany, (3) TU München, Lehrstuhl für Bodenkunde, Freising, Germany

Referring to the fundamental question in ecosystem research, how biotic and abiotic processes interact, only a few studies exist for polar regions that integrate microbiological and soil scientific studies . Soils comprise the complex structure and environment that fosters water storage and nutrient cycling determined by its unique chemical, physical and biological properties with respect to the specific climate and parent material. In the extreme environment of Antarctica, soil biological processes are primarily controlled by microbial communities (Bacteria, Archaea and Fungi), and thus microbiota may also determine soils chemical and physical properties in a landscape lacking higher plants at an average air temperature below 0°C.
James Ross Island, Maritime Antarctica, offers a pristine laboratory and an exceptional opportunity to study pedogenesis without the influence of vascular plants and burrowing animals.
We analysed micromorphological features, chemical and microbiological measures at two sites on James Ross Island (Brandy Bay and St. Martha Cove) with similar substrates (mostly fine-grained calcareous sandstones and siltstones of the Alpha Member of the Santa Martha Formation with varying amounts of conglomerates and mudstones) at similar topographic positions (small plateaus at similar elevation (80m a.s.l.)). The sites represent luv- and leeward conditions with respect to the main southwesterly winds. The climate on James Ross Island is to be described as semi-arid polar-continental, which is in clear contrast to the Southern Shetlands (e.g. King George Island) north of the Antarctic Peninsula. We will present first results of soil physical (bulk density, soil moisture and grains size distribution), pedochemical (SOC, total N and S, pH, CECeff, and pedogenic oxides) micromorphological and microbial analyses (Microbial DNA content, microbial abundances).