



Cryosols Formation and classification in the semiarid Antarctica: the Weddel Sea sector of northern Seymour Island

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The Seymour Island is located in the northern sector of the Weddell Sea zone, at the Antarctic Peninsular area, representing a transitional zone between Maritime and Continental Antarctica, with a subpolar, semiarid climate. The Seymour Island is predominantly composed by marine sedimentary rocks of Cretaceous to Eocene age. The aims of this work were to study the chemical, physical, mineralogical and morphological attributes of a selected, representative toposequence of soils at the northern sector of Seymour Island. Soil formation processes and taxonomical implications were discussed. Nine soil profiles were described, collected and analysed, following a toposequence according to different parent materials and landforms. Samples were subjected to textural analysis, routine chemical analysis, chemical extractions by ammonium oxalate and CBD, as well as X ray diffraction. Permafrost is continuous and widespread, generally at depths of less than 100 cm, so the Gelisols order (Soil Taxonomy), or Cryosols (WRB), are the dominant soils. Cryoturbation and organic matter accumulation were not observed. Soils were separated into two groups: acid-sulphate soils and alkaline soils, unaffected by sulphates. The first are the best developed in the study area, meaning a significant physico-chemical and mineralogical alteration. Low pH and high Al saturation and potential acidity are typical. This accounts for primary mineral dissolution, and its absence in the clay fraction. Secondary minerals are those related to sulphide oxidation: soluble and insoluble sulphates, low crystalline Fe-hydroxides and little crystalline Fe phases. The peculiar yellowish colour of these soils are attributed to the presence of Fe-oxides and Jarosite. The presence of 2:1 clays (smectite and illite) in the Clay fraction despite the acidity is due to low leaching. The alkaline soils, non affected by sulphates do not showed any marked weathering or transformation, with high pH, low potential acidity and zero Al saturation. The main process is cryoclastic and haloclastic weathering. Primary minerals are present even in the clay fraction, corroborating its low weathering degree and chemical alteration. The landform is determinant for the chemical status of these soils, by favoring or reducing leaching. Sulphurization and halomorphism are the dominant soil-forming processes in Seymour Island.