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Soils of the coastal area of Santa Fé and Santa Cruz islands (Galápagos). Their micromorphology, mineralogy and genesis compared.

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Santa Fé is a small island situated about 15 km SW of Santa Cruz and has a similar petrographic composition. The centre of Santa Cruz reaches up to 950 m a.s.l., Santa Fé is nowhere higher that 255 m. Even in the dry season the high mountain region of Santa Cruz profits therefore of an almost continuous drizzly rain (garrúa) resulting from the cooling of the rising moist air. The dry coastal zones are covered by sparse Opuntia vegetation.
In the coastal soils a double to open spaced porphyric c/f related distribution pattern prevails. The micromass is greyish to yellowish brown on Santa Fé, reddish on Santa Cruz. The b-fabric is weakly granostriated, rarely calcitic crystallitic. The coarse material is restricted to fresh grains of plagioclase > iddingsite > augite > rare olivine, and some fresh basalt fragments. Remnants of illuvial clay coatings are more common on Santa Cruz. Only on Santa Fé hard, yellowish nodules (up to 700 μm) with a strongly mosaic speckled b-fabric and first order grey interference colours occur; their nature and genesis is a point of discussion.
X-ray diffraction revealed the clay fraction of these soils to be comparable: poorly crystalline 2:1 phyllosilicates with broad irregular 001 reflections swelling to 1.8 nm after glycolation and collapsing to 1.0 nm after K-saturation and heating. Poorly crystalline kaolinite reflections are more prominent on Santa Cruz, whereas mica-like components (1.00 nm reflections) are restricted to Santa Fé.
The presence of unweathered coarse material in an abundant micromass of alteration clay indicates a disequilibrium, and points to a transport of the fine material, in solid phase (colluvium) and/or as solution rather than an in situ weathering.
Comparing the total chemical composition (corrected for LOI) of the coastal soils of Santa Cruz and Santa Fé with the average rock composition of both islands, one notes in the soils an increase in Al, Fe, Ti and K, and a loss of Mg, Ca and Na. On Santa Fé the increase of Al, Fe, Ti and the decrease of Ca and Na are less pronounced, pointing to a lower degree of weathering, also reflected in the clay mineralogy. Especially the decrease of Mg is much smaller on Santa Fé, probably due to neoformation of montmorillonite or sepiolite. Similarly the increase of K may be related to the formation of mica-like components in the clay fraction, or in iddingsite. Although the material on Santa Fé seems less weathered, the increase in Ti is much more pronounced.
As Santa Fé is much older than Santa Cruz, the observed micromorphological, mineralogical and chemical differences can be explained only by geomorphology and related climatological factors, since the present environment of the soils is similar. The balance between transport as solid material and lateral transport in solution therefore needs to be discussed.