

ORIGIN OF THE SANDSTONE SCARPS AND HARD CRUSTS - VILA VELHA SANDSTONE, ITARARÉ FORMATION, FURNAS STATE PARK, PARANÁ

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RESUMO: The spectacular and famous scarps of the Itararé sandstones at the Vila Velha State Park which have attracted the attention of geologists and tourists formed by the combination of fracturing, water torrents and wind process along time. What formed the upper surface of the sandstones, which formed a resistant surface to erosion and weathering? This work aims to discuss and explain the geological evolution of the upper surface and the formation of a hard crust on the top of the formation. The Vila Velha sandstones form a lens-shaped sedimentary structure within the diamictites and varvites in the Itararé Gr. Altitudes at the top of the sandstones varies between 856m (Museum site) and 843m (scarp), dipping gentle northwestward, where the sandstone apparently disappear. Large areas of argillaceous red soil, derived by the weathering of diamictites and varvites, surround the Vila Velha sandstone. At the Museum the sandstones form a 1.5m thick, surficial yellow, porous and craggy sandstone overlying a white, coarse- to medium-grained sandstone, less porous than the upper sandy rock. Thin, 1cm-thick discontinuous veins of curved, hard, dense, dark brown Fe-oxides crosscut irregularly the yellow sandstone. These veins, restricted to the yellow sandstone may appear at the erosional surfaces and merge into the sandstone, vanish before reach the white sandstone. At the surface, several small accumulations of acid water, full of decomposing vegetable debris and organic matter are stained by "oily" Fe-oxide films. The Fe-oxide hard crusts can be seen irregularly scattered on top of the sandstone, mostly yellowish brown to red in color. Covering the relief, the yellow sandstone spreads everywhere at Museum area, from the ground up to the top of the little scarps, suggesting it was derived by weathering and water fluctuations. Water concentrated close to the surface is responsible for the yellow colour of the sandstone, due to its migration downward resulting in the formation of hard Fe-oxides veins. Reaction $\text{Fe}(\text{OH})_3 \cdot n\text{H}_2\text{O} = \text{Fe}(\text{OH})_3 + \text{H}_2\text{O}$ appears to dominate the system. In conclusion, the fluctuation of the phreatic water, very abundant in the region, the acid pH, the relative permeability and porosity of the sandstone significantly contributed to the formation of the hard crust to protect from erosion the sandstone and to produce the magnificent relief.

PALAVRAS-CHAVE: INTEMPERISMO; HARD CRUST; VILA VELHA.