Quartzite-Karst in Southeastern Brazil: physical and geochemical considerations

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Karst is common in limestones, dolomites, and marbles due to the high solubilization of carbonates in acid water environment. However, similar forms has been described in silicate rocks domains (Young, 1988; Wray, 1997) also called as pseudokarst (Summerfield, 1991; Jennings, 1983). This work discusses structures and quartzite types with dissolution responsible for origin and development of karst features in the Preto river basin (Brazil) located in a stable tectonic region and presents highly weathered rocks. A sequence of neo-proterozoic metassedimentary is composed by banded biotite-gneiss and quartzite and folded at least by three deformation phases (Heilbron et al. 1995). Gneiss is rich in biotite, quartz, feldspar and garnet, with well marked metamorphic foliation and grain size between 2 and 5 mm. Detailed geological mapping (scale 1:10,000) shows two lithotypes in the quartzite layers: (i) very pure quartzite, more than 95% of quartz, crystals between 3 and 8 mm, homogeneous, poor foliation and sacaroidal texture; (ii) impure foliated quartzite, where quartz is associated with feldspar and sometimes muscovite, grain size from 1 to 3 mm. The map also shows an extensive recumbent folding and sub-horizontal boundaries. Both lithologic and structural conditions in association to vertical and sub-vertical joints favor water infiltration especially in the hillslope summit and exfiltration in the sideslopes and valley bottoms. Analysis in cave groundwater and river flow carried out by mass spectrometry methods (ICP-MS) focusing Si, Al, Ca, Fe, Mg, K, and, Na have shown values (mg.L-1) respectively between: 0.24 to 0.80; 0.04 to 3.80; 0.18 to 0.72; 0.09 to 0.50; 0.02 to 0.57; 0.08 to 1.01; and 0.05 to 1.74. Field observations point out that these morphologies associate both mechanical and chemical processes: mineral dissolution (quartz partially included) decrease rock cohesion and favor mechanical erosion by fallen rock blocks and grain transport by water flows.