



The importance of XRD analysis in provenance and palaeoenvironmental studies of the Piedras de Afilar Formation, Neoproterozoic of Uruguay

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The Piedras de Afilar Formation crops out in the southeast part of Uruguay, forming part of the Tandilia Terrane (sensu Bossi et al. 2005). Pamoukaghlian et al. (2006) and Gaucher et al. (2008) have published $\delta^{13}\text{C}$, $\delta^{18}\text{O}$ and U/Pb SHRIMP results, which indicate a Neoproterozoic age for this formation. The palaeoenvironment has been defined as a shallow marine platform based on the presence of interference ripples, hummocky and mega-hummocky cross-stratification. X-ray diffraction (XRD) analyses help to better constrain the palaeoenvironment: the presence of chlorite/smectite found in black shales, suggest a reducing environment, and abundant illite indicates a cold to temperate climate. Provenance studies have been undertaken that utilise a combination of detailed palaeocurrent measurements, petrographic descriptions, XRD analyses, and geochemical isotopic analyses, including U/Pb SHRIMP determinations. Mineral compositional diagrams for sandstones suggest a stable cratonic provenance. Palaeocurrents are mainly from the NNE, indicating a provenance from the cratonic areas of the Tandilia Terrane. The illite crystal index indicates diagenetic to low-metamorphic conditions for the sequence; this is important to confirm that the identified minerals are authigenic. Clay minerals identified by XRD analysis of sandstones from the siliciclastic member are illite (80 - 90%), kaolinite (5 - 10%), and chlorite (5 - 10%). This is consistent with a provenance from the cratonic areas (quartz-feldspar dominated rock types). Isotopic analyses have been undertaken to provide better constraints on the tectonic setting. U/Pb SHRIMP ages for the youngest zircons are 990 Ma (Gaucher et al. 2008), and the basal granite (Granito de la Paz) is 2056 ± 11 Ma (Hartmann et al. 2001), suggesting a provenance from the Archaean basement for the Piedras de Afilar Formation, like its counterparts in the Rio de la Plata Craton.

References

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