

Factors controlling REY patterns in Recent Australian estuarine sediments

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Two hundred and sixty-five samples of estuarine Holocene sediments were collected from Moreton, Bay, southeast Queensland, Australia, to establish their grain size, mineralogical and geochemical composition, and to explore the factors controlling rare earth elements and yttrium (REY) abundances and fractionation patterns.

The highest REY concentrations were found in fluvial sediments and were associated with the highest mud fractions. These sediments were also characterized by unfractionated patterns with a positive Eu anomaly, with increasingly flat patterns for increasing mud fractions. The lowest REY values were measured in sand-dominated aeolian deposits.

Minerals such as plagioclase and kaolinite dominate the mud fraction and appear to be responsible for the Eu positive anomalies, with a reduction of the Eu anomalies for decreasing kaolinite contents. However, mineralogy was not able to explain the negative Eu anomalies in samples that contain over 70% quartz sand. In addition, increasing quartz content correlates with a decrease in Ho/Yb values (no significant HREE fractionation in samples with high quartz content). In contrast, increasing clay content corresponds to a decrease in La/Eu (LREE/MREE) fractionation and Y/Ho values.

The small degree of LREE/HREE and MREE/HREE fractionations in fluvial deposits appears to be controlled by organic matter. HREE enrichment in some estuarine samples appears to be related to high clay fractions, while the same enrichment in aeolian deposits may be caused by the presence of relatively large amounts of heavy minerals sands.