

ABSTRACT

Late Quaternary clastic deposits of SW Jamaica and the Pedro Bank are examined to determine whether they are suitable indicators of palaeoenvironmental change. Four major siliciclastic units (Sandy Bank, Hodges, Boatman's Bay, and Portland Rock Formations) are described. The Sandy Bank Formation (a red siltstone) is interpreted as a lagoonal deposit. The Hodges Formation (quartz sands and kaolinite lenses) is interpreted as fluvial sediments, derived from compositionally mature sedimentary rocks. Surface texture assemblages (using Scanning Electron Micrographs) and sedimentological criteria were used to characterise these sands. The study found drawbacks in using surface texture assemblages alone (SEMs) to determine transportation history and depositional environment. Both the Portland Rock and Boatman's Bay Formations are interpreted as aeolian sediments. Radiocarbon dating indicates two periods of aeolian sedimentation at ~4 ka and ~26 ka, which also mark cold arid phases. Ooids from the Portland Rock Formation yielded a 32 ka BP radiocarbon age, suggesting a possible glacial highstand at ~36 m, or an uplift of 48 m since then.

A simple 3-phase model is proposed as a basis for Late Quaternary aeolian stratigraphy in SW Jamaica, using isoleucine racemisation of rhizocretions. This model identifies how each phase may be recognised in the field, and supports the use of rhizocretions to mark aminozones. In phase 1, environmental conditions are more conducive for aeolian dunefield formation (the cold arid stages); in phase 2, there is active aeolian sedimentation, followed by stage three, which marks episodes of stabilization when the climate shifted back to a more humid phase, possibly with lower windspeeds. The formation of rhizocretions occurs relatively rapidly, and indicates another climatic shift from humid to arid. The diagenesis of isoleucine trapped in the micrite concretion that forms around the root can be used as a basis for correlating rhizocretionary levels within an aeolian sequence. If calibrated (using an independent technique such as radiocarbon dating), isoleucine epimerisation can be used to develop an aminochronostratigraphy of the aeolian succession. Experiments on rhizocretion isoleucine epimerisation from samples taken from Late Quaternary aeolianites in SW Jamaica indicate that they have a high potential in aeolian stratigraphy and correlation. Isoleucine epimerization techniques are used here for the first time on rhizocretions. The accelerating effects of high temperatures on isoleucine epimerisation appear to be offset by the dense micrite concretion in which the isoleucine is trapped, which also provides a closed system with respect to isoleucine.

Although Late Quaternary climate change affected environments in SW Jamaica in a number of ways, including indirect impacts on the geomorphic and sedimentary systems (and therefore sediment supply), neotectonic activity is also an important determinant. Evidence for significant block faulting in SW Jamaica during the Late Quaternary suggests that models of tectonic quiescence or subsidence of south coast of Jamaica at that time are unlikely. The fault system bounding the island shelf may have been downthrown 265 m to 865 m after ~26 ka.