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Climatic and environmental history of East Antarctica during the Late Quaternary: results, problems and perspectives of sedimentary archives in unglaciated coastal regions

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Sedimentary archives from unglaciated coastal regions (oases) in East Antarctica have been increasingly used during the past decades to reconstruct regional climatic and environmental changes and to form a link between ice core and marine records. Among the archives, sediment cores from inland and epishelf lakes provide information about changes in glacier thickness and extent, temperature and precipitation, and relative sea-level. For example, deglaciation and postglacial ice movements have been reconstructed for Bunger Hills (101˚E) from the ages and composition of lacustrine and marine sediment cores, marine fossils, and stomach oil deposits from snow petrels. Sediment cores from Bunger Hills and Amery Oasis (68˚E) revealed significant postglacial temperature and precipitation changes. Marine-limnic transitions in a series of lakes from the Vestfold Hills (78˚E) were used to reconstruct relative sea-level changes and to calculate the local ice thickness during the Last Glacial Maximum in dependence on the isostatic rebound.

One of the problems using sedimentary archives from oases is that their information is in general restricted to the period after deglaciation, i.e. in most areas the past c. 8-12,000 years. Another problem can arise from uncertainties in dating. The most promising method is radiocarbon dating, however, the lack of terrestrial macrofossils, contamination by coal, or various reservoir effects are common phenomena in

Antarctic sediments. Furthermore, the interpretation of the records is complicated by interactions within the abiotic environment, i.e. temperature and precipitation, glacial setting, and relative sea-level. The understanding of local, regional, and global effects on the history of oases is hampered by the discontinuity of ice-free areas along the Antarctic coast. Another pecularity of theses areas is that applicable training sets are lacking, thus excluding quantitative reconstructions of climate changes via transfer functions.

Despite the problems existing, sedimentary archives from unglaciated coastal regions have a great potential for future investigations. They do contain both climatic and environmental information in a very sensitive region. They allow the creation of independent chronologies by absolute dating methods. Depending on sedimentation rates, they may provide high-resolution information about climatic and environmental changes, and, once the analytical methods are evolved, they will enable quantitative climate reconstructions.