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Cyclic diagenetic alterations in drift sediments (Antarctic Peninsula pacific margin)

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The Antarctic ice sheet is the largest on earth today. It acts as key component in the global climate regime since the late Eocene. Ice volume variations influence the ocean thermohaline circulation and control the eustatic sea level. The compilation of benthic oxygen isotope data describes a general cooling trend for the global climate during the Neogene. Within this general cooling trend, a number of global warming and cooling episodes can be identified. The Pacific margin off the Antarctic Peninsula is very sensitive to climate and ice-sheet volume changes. Climatic variations on the Antarctic Peninsula continental shelf control regional sedimentary depositional processes and affect the build-up of giant deep-sea sediment drifts. These drifts are widespread features along the continental rise of the Antarctic Peninsula Pacific margin. They contain a nearly continuous sedimentary record for West Antarctic ice events and glacial-interglacial cyclicity. We used sediment physical, geochemical records and x-ray images derived from ODP Leg 178 Site 1095 (Sediment Drift 7) to show characteristics in glacial-interglacial cyclicity and associated sedimentary processes during Pliocene. The data display two boundary types dividing half-cycles: (1) interglacial-to-glacial transitions that are distinct and characterized by a sharp boundary and abrupt change in lithology and (2) glacial-to-interglacial transitions that are diffuse and characterized by a gradual decline of sediment physical and geochemical values with a marked reduction in sedimentation rates. The second boundary type is accompanied by a minima zone in magnetic susceptibility. This minima zone comprises the upper portion of glacials and lower portions of interglacials and is linked to diagenetic alterations that transform magnetic iron minerals to paramagnetic minerals. The nearly complete

loss of magnetic susceptibility is coupled with glacial controlled cyclic decreases in sedimentation rate. We assume that this loss is caused by the anaerobic oxidation of methane. This process leads to a depletion f sulfate at the sulfate/methane transition and the alteration of iron oxides to iron sulfides. The minima zones are especially prominent in sections with a drastic decrease in sedimentation rate, which causes a stagnation of the sulfate/methane transition. This stagnation effects an enhanced diagenetic dissolution of ferrimagnetic iron minerals within the sulfidic zone.