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Fragmentation patterns in the diatom genus Rouxia and their potential for identifying latent depositional hiatuses in the early Pliocene diatomite of the ANDRILL AND-1B core

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Diatom genera have traditionally been split into two primary groupings based upon the symmetry of the siliceous frustule. Diatoms symmetric about a point are classified as centrics, while those symmetric about a line are classified as pennates. This fundamental difference in shape has consequences for preservation in ice proximal settings, where an overriding ice sheet can create shearing in the upper meters of the sediment column. This leads to preferential breakage in pennate forms, and results in a higher ratio of undamaged centric to pennate frustules (Scherer et al., 2004). Similarly, an ice sheet grounded over highly porous diatomite results in significant diatom fragmentation resulting from normal load compaction.

The diatom genus Rouxia is a pennate form with a relatively wide raphe, making it particularly susceptible to breakage during ice advance and retreat, and offering the opportunity to evaluate ice advance stages in sedimentary units where glacial erosion may have removed upper depositional units.

In the ANDRILL AND-1B core, a long interval of nearly pure diatomite was recovered from 382.98-459.24 mbsf. Construction of an age model during this interval has relied primarily on age ranges provided by presence or absence of key diatom species. However, questions still remain as to the continuity of deposition. In this study, samples were collected at an average of 50-cm spacing for the length of the long diatom unit as well as for 20 meters of the silica-rich diamictite unit directly overlaying the diatomite. Fragments of specimens from the genus Rouxia were counted and classified into categories based on the size of the fragment in relation to total frustule length. These data were then used to develop a quantitative index, which was examined for changes in fragmentation through time.

Preliminary data are presented that indicate increased fragmentation at the top of the section under study, which we interpret to indicate evidence for increased glacial shearing. Below this (401.11-373.61 mbsf), fragmentation levels remain virtually constant, which is taken to indicate a relatively long interval of continuous deposition and evenly distributed effects of normal load compaction. A sharp increase in the fragmentation index at 401.35 mbsf is interpreted as evidence for a depositional hiatus and corresponds to a peak in abundance of the silicoflagelate genus Distephanus. More sporadic fragmentation occurs below 401.35. Future work will include comparing these results to sediment texture and physical properties of the core.