River) water. Stratigraphic correlations suggest that this subbasin-integration event occurred just before or shortly after deposition of a distinctive tephra layer within the Manix subbasin; the tephra has not yet been found in the Afton subbasin. The ~7 m of sediment above the tephra had been interpreted as perennial-lake deposits, but new mapping and core analysis suggest that these sediments were deposited in a fluctuating environment of shallow lakes and mudflats. Deposits in the Afton subbasin interpreted as correlative with the 7-m interval consist of perennial-lake muds intercalated with sands that thicken and coarsen shoreward. These relations indicate that lake depth and distance from fluvial inputs were greater in the newly incorporated Afton subbasin than in the correlative Manix subbasin. By this time the Manix area, having been the depocenter of Lake Manix for possibly hundreds of thousands of years, had lost much of its sediment storage capacity; thus, relatively small changes in runoff and lake level could easily cover or expose previously deposited sediment. Sediment patterns in the core suggest that millennial- to centennial-scale cycles of wet and dry periods may be recorded by alternating soils and fluvial, shallow-lake, and mudflat beds.

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Micromorphological analysis of the basal processes of an Antarctic Peninsula palaeo-ice stream

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During the Last Glacial period the Antarctic Peninsula Ice Sheet was drained by ice streams flowing through cross-shelf bathymetric troughs to the outermost Larsen shelf. Swath bathymetric data reveal mega-scale glacial lineations (MSGL) on the floor of these troughs (water depths greater than 500 m) indicating fast flow of grounded ice and the pathways of former ice streams. Sediment cores collected from the troughs contain a stiff till overlain by soft till, with the latter interpreted as deformation till. Shear strength data indicate a very sharp boundary between the soft and stiff till. Sub-bottom profiler (TOPAS) data indicate an acoustically transparent layer which is underlain by a sub-bottom reflector and corresponds to the soft till. This transparent layer only partially covers the trough floors and its surface, as well as that of the underlying sub-bottom reflector, varies between rough and smooth. This change in surface roughness suggests that some parts of the ice stream were sliding over the stiff-till bed while other parts were deforming it. We have selected cores for micromorphological analysis in order to sample spatially and temporally the record of basal processes beneath these ice streams. A new micromorphological technique has been developed for quantifying the abundance of characteristic structures. Thin sections were divided into a 1 cm x 1 cm grid and the number of each microstructure within 10 randomly selected cells was counted. The soft and stiff till share similar features such as circular structures, shears, irregular fractures, grain alignments and the development of masepic plasmic fabric. Planar and circular structures observed in close association in both units suggest that internal deformation, i.e., shearing and rotation, occurred at some point during grounded ice flow across the trough bed, and that the stiff till was also subjected to subglacial deformation. The stiff till differs from the soft till by higher numbers of crushed grains and micro-boudins. This finding indicates lower porewater concentrations in the stiff till compared to the overlying soft till. Overall, the results of micromorphological analyses show a diffuse rather than an abrupt transition between the soft and stiff till, and suggest that the soft till is derived from the stiff unit rather than deposited on it. Spatially the distribution of these micro-features in the tills shows a systematic pattern from the inner shelf to the shelf break, and documents changes in basal conditions and the flow regime along the ice stream bed.

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Quantifying Environmental Change Associated with Deforestation, Waipaoa Basin, NZ

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In addition to natural disasters, human land use practices hold the potential to force catastrophic environmental change. Near total conversion of indigenous forest to pasture over the past century in the erosion-prone Waipaoa River Basin, along the tectonically active eastern margin of New Zealand's North Island, has resulted in some of the most dramatic and widespread erosional features on the planet. High-resolution records of sediment delivery, channel response, and offshore deposition, anchored by well-dated tephra deposits across the region, demonstrate the severity of anthropogenic landscape disturbance. Today, the 2200 km^2 Waipaoa River delivers a disproportionately large 15 Mt of sediment to Poverty Bay annually, suggesting a basin-wide average denudation rate of >2 km/My. Recently compiled detailed seismic surveys of sediment accumulation on the continental shelf and slope yield an average rate of sediment delivery from the Waipaoa of ~1 Mt/yr over the Holocene, implying that human induced sediment delivery is elevated by as much as 15 times over background. While these high-resolution data provide a previously unattainable mass flux from the Waipaoa outlet to the sea through time, there is evidence to suggest that they do not portray the full extent of landscape disturbance caused by deforestation. In regions of the Waipaoa Basin most heavily impacted by land clearance, massive gully complexes and extensive shallow landslides shed prodigious amounts of sediment from pastoral hillslopes. Repeat surveys of channel aggradation in one such basin demonstrate that nearly 50% of the sediment eroded from hillslopes is retained in valley bottoms, indicating that river-outlet sediment yields are not wholly representative of current landscape erosion. In an attempt to establish baseline rates of landscape erosion during the late Holocene, we collected ~60 samples of active channel sediment within and around the Waipaoa River Basin for ^{10}Be and ^{36}Cl analysis. 23 of these samples are from prominent tributary basins, and will help determine how quickly various parts of the basin erode, and where most sediment is produced under natural conditions. The remaining samples are from smaller sub-basins characterized by certain erosional processes and/or different vegetation cover classes (gully vs. landslide and/or paddock vs. natural vegetation dominated basins). When coupled with other high-resolution datasets, these cosmogenic basin-scale erosion rates will define better our understanding of the environmental consequences of pervasive deforestation in tectonically active terrain.