

Ground Penetrating Radar Imaging of Pro-glacial Landforms in the upper Waimakariri River (New Zealand)

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The Waimakariri River catchment is the product of Quaternary glaciation and deglaciations as attested by the geomorphologic features left during and after the last glaciations in the Waimakariri River bend, behind the Cass basin. Several of those features that now connect the braided river floodplain and the mountain slopes have the shapes of truncated fans, but the top surface displays slopes that can also apparent them to paleo-terraces or are the product of reorganization of original features.

In the absence of topographically determining features, the question of understanding the origin and formation of those landforms remains unanswered. For this purpose, the authors have used a series of Ground Penetrating Radar (GPR) investigations across the now vegetated floodplain and the geomorphologic features creating the contact-areas with the slopes. The GPR used for the present investigation is the PulseEkko Pro mounted with a set of 50 Mhz, 100 Mhz and 500 Mhz antennas, depending on the locations.

The transects have revealed that the visibly similar features that make the connections between the valley floor and the slopes were actually a set of variable elements that encompassed (a) mixture of sediments without any apparent structure to (b) horizontally and sub-horizontally structured GPR layers, with various degrees of structure. The topographically lower locations, close to the present Waimakariri River level presented GPR structures that present the patterns of foresets and backsets typically of riverine environments.

In details, the higher-subhorizontal features that were supposed to be lateral fans are actually a mixture of elements, but interestingly the surface slopes do not correspond to the subsurface layers, suggesting that the layers must have been truncated to recreate smooth and sub-horizontal features, while the original deposits must have been deposit.

In the discussion, this set of data would point towards a "small" readvance of a glacier on top of frozen deposits, that were scalped on top, but without modifying the internal structure of the deposits. These process then left the place to more "water-borne" processes, that could be evidenced from surface rills in the topography and subsurface layers showing finer-material with a structure typical of small-scale streams.

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