

**SURFACE EXPRESSION OF THE OSTLER REVERSE FAULT, AN
ACTIVELY GROWING, COMPRESSIONAL (INVERTED?) STRUCTURE IN
THE MACKENZIE BASIN (SOUTH ISLAND, NEW ZEALAND)**

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A reappraisal of the geometry and structural evolution of the Ostler reverse fault within the Mackenzie basin is under way. A new geological map of the fault zone (scale 1:50,000) is almost complete, and two seismic reflection lines across the fault will be acquired by A. Gorman in the early months of 2006 (Otago University Research Grant). The N-S Ostler fault is exposed for a length of 50 km and dips 30°-50°W. Previous studies have documented the segmented nature of the fault, average rates of deformation ≤ 1 mm/yr, and the occurrence of two seismic events in the last 6 kyr. According to S. Kleffmann (1999, PhD thesis, VUW) the Ostler fault is located along a strong gravimetric with a Bouguer low of $-120 \mu\text{N/kg}$ west of the fault. The deep geometry of the fault is largely unresolved, but the following diagnostic features revealed by surface mapping need to be considered.

A >1000 m thick sequence of continental mudstones, siltstones and gravels (Pliocene?-Pleistocene?) is exposed in the fault hanging wall only. Internal architecture reveals a growth geometry of beds tilted 60°-30° west, unconformably overlain by coarse gravels (120 kyr?). On top of this sequence, six orders of terraces can be distinguished. The three highest orders are likely correlated to the 35, 22-17 and 14 kyr moraines; the three lowest are only present along the Ohau River. Terrace distribution indicates progressive shifting of fault-transverse drainages, relatable to episodic uplift of the upthrown block during northward propagation of the evolving fault structure. Elevations in the upthrown block consistently decrease from ≤ 893 m to ≤ 564 m northward. The 22-17 kyr old terrace records on its carved surface the inversion of an early paleodrainage (from east-flowing to west-flowing), forced by backtilting of the hanging wall. The Ostler fault consists of sub-parallel, splaying segments within a deformation zone up to 2 km wide. Faults are marked by fresh scarps (≤ 20 m high) which truncate suspended drainage systems. N-S anticlinal deformation of the hanging wall is traced by deformation of the 125 and 22-17 kyr terraces, with the fold limbs truncated by systems of N-S, W-dipping normal faults.

A preliminary interpretation that incorporates the surface geology and the available geophysical information is that the Ostler fault is a footwall shortcut thrust of an inverted normal fault that bounds the eastern margin of a Mesozoic(?) -Tertiary basin hidden beneath the thick Plio-Pleistocene cover. Compressional inversion of the early normal fault and shortening of the basin infilling since Miocene times has resulted in the progressive elevation of the fault hanging wall during deposition of the Plio-Pleistocene continental sequence, and in the propagation of a number of reverse fault splays that cut the continental sequence at surface. Feasibility of this interpretation awaits for the seismic profiling, that hopefully will add on our understanding of compressional deformation east of the Alpine Fault.