An updated strain rate map for New Zealand: What does it tell us about the tectonics of this part of the Pacific-Australian plate boundary. Implications for slip rates on the Alpine Fault

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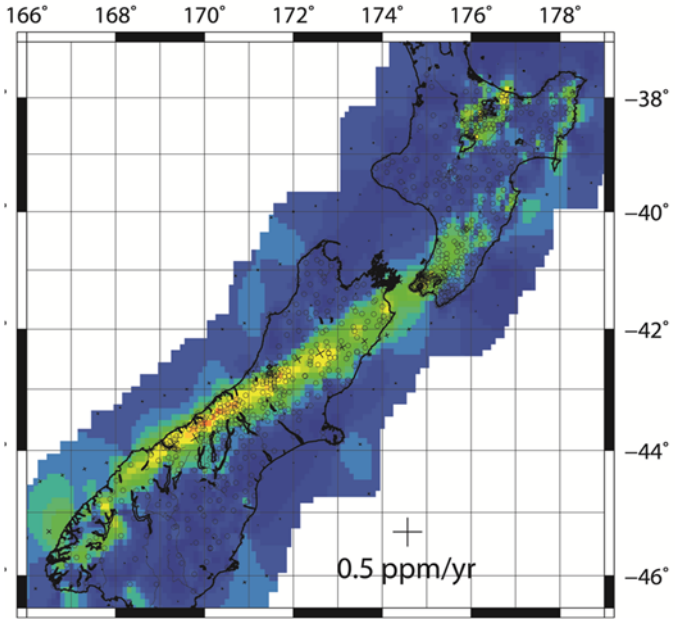

Abstract: We present an updated strain rate map for New Zealand based on the improved velocity field from Beavan et al. (2016). Elevated maximum shear strain rates define a broad corridor across the central and northern South Island following the Alpine fault and Marlborough fault system (MFS) and extending onto the lower North Island. The largest values, of about 4´10-8 40 ppb/yr, are located in the central Southern Alps near Mt Cook. Farther north, high shear strain rates are restricted to the Hikurangi margin and the Taupo volcanic zone (TVZ). Strain rate tensors in the central and northern parts of the North Island are generally consistent with transpression with a principal axis of contraction trending 145°. Farther north, the strain rate tensors indicate strain partitioning with extension in the TVZ contrasting with contraction in the axial ranges. In the southern South Island there is a region located just east of the Waitaki valley where the principal axes of contraction trends at 80°, in contrast to 120° in adjacent parts of Canterbury and Otago. This change, combined with the slightly elevated strain rates in costal Otago, may support modelling studies of Upton et al. (2009) who predicted a similar change in orientation in the stress field due to the along strike transition from a thin, stronger, crust for the Canterbury strain regime and a thicker weaker crust in the Otago strain regime.

There is a significant extensional dilatation signal associated with the TVZ and a paired contractional and extensional dilatation signal associated with the central Alpine Fault. A modeling study shows that this is consistent with a slip rate between 28-35 mm/yr. The locking depth of the fault decreases from south to north, reaching a minimum in the region of Mt Cook.

School of Surveying
Te Kura Kairūri

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