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# Assessing the conditions of formation of veins in Alpine Fault mylonites through a combination of classical and high-angular resolution EBSD data

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In outcrop we are able to collect mylonite samples comparable to those currently deforming at depths from 10–30 km in New Zealand's active Alpine Fault zone.

These mylonites contain variably deformed quartz veins that cross-cutting relations suggest were formed at a range of depths within the shear zone. Because the kinematics of the zone are so well constrained, we are able to estimate the formation depth of the veins from geometric relationships that show the increment of creep strain that they have accommodated. We will present and discuss comparison of the crystallographic fabrics in these variably deformed veins with those in the mylonite matrices—which have arguably accommodated the entire creep strain experienced by the zone—to assess whether measures of fabric strength alone could be used to determine total strain in comparable rocks.

From the same veins, we have acquired and processed high-angular resolution EBSD (HR-EBSD) data, which demonstrate the amount of intragranular elastic strain heterogeneity that they preserve, from which residual stresses can be calculated. These distortions reflect the increment of deformation of the veins acquired in the brittle regime as they were further exhumed to the surface. In this presentation we will explore a variety of potential sources of these residual stresses, including the geometrically necessary dislocation content, and grain interactions that preserve distortions resulting from high stress coseismic loading, or from cooling and decompression.