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A unique ~12 ka subaerial record of rift-transform triple-junction tectonics, NE Iceland

Derek Rust and **Malcolm Whitworth**

(derek.rust@port.ac.uk)

In northern Iceland the European-North American plate boundary is broad and complex but includes a remarkable subaerial triple-junction intersection between the Husavik-Flatey Fault (HFF) dextral transform and rifting in the Northern Volcanic Zone. Fortuitously, the triple junction occurs in a sheet of ~12 ka pahoehoe lavas; a tabula rasa recording innumerable fault features displayed in exquisite detail. High-resolution drone imagery, coupled with 120 field measurements of fault slip directions and opening amounts, made possible the mapping and analysis of this detail and, importantly, enabled recognition and exclusion of potentially misleading primary deformation features associated with emplacement of the lavas. Rift-transform interactions in this natural laboratory have remained spatially stable throughout post-glacial time, although with transform-affinity faults reactivated to accommodate rift extension and transform 'encroachment' into the rift domain. First-order en-echelon Riedel fault complexes are recognised, linked by transpressional faulting and compressional strike-slip relay ramps, as well as second-order R shears, R' and P shears, and previously undescribed R' Riedel-in-Riedel relationships. A pahoehoe flow front offset along a first-order Riedel fault complex records slip at $\sim 3.8 \text{ mm a}^{-1}$, which may be consistent with the published GPS-based current slip-rate estimate of $\sim 6.8 \text{ mm a}^{-1}$ across the HFF as a whole.