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Fractured Reservoirs on an Oblique Subduction Margin, East Coast, North Island, New Zealand

Deformation driven by subduction along the Neogene Hikurangi margin has produced fracture porosity in siliciclastic and bioclastic reservoir units. This first, regional study of these mostly dilational fractures from a hydrocarbon perspective compares outcrop analogue with subsurface data. Regional fracture sets strike WNW and NE and are likely to be encountered in most wells.

Widespread, siliceous mudstone (Late Cretaceous-Paleocene Whangai Fm) has closely spaced (1-10 cm) fractures likely to enhance both expulsion and reservoir potential in this low TOC, tight lithology. Fractures occur mainly on the regional trends though not as consistently as in younger formations.

Outcrop fractures in Early Miocene limestones have the two regional strikes, with fracture spacings of 5-30 cm. FMI logs show similar fracture strikes in Kauhauroa-2.

Early Miocene thin-bedded turbidites (Whakataki Fm) have bedding-terminated fractures striking NW with spacings controlled by turbidite thickness. FMI of thin-bedded turbidites at Titihaoa-1 shows c.90 NE fractures over a 500 m interval.

The NE and NW fracture trends show as lineaments on digital elevation models, even in areas of Pliocene outcrop. We suggest these trends relate to Pliocene-Recent stress although not all the fractures might be so young, as pre-existing strain might have had similar orientations. However, fractures with these trends were probably opened or closed by latest Neogene deformation, during maximum expulsion and migration.

Borehole breakouts are oriented NE-SW and ENE-WSW indicating present maximum horizontal stress in the SE quadrant, subparallel to the WNW fracture set and near-orthogonal to the NE fracture set and NE regional fault trend.