

ICDP DSeis 8: the M5.5 fault structure and reflective intrusives in legacy 3D seismic reflection data

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ICDP drilling into the aftershock zone of the 2014 M5.5 earthquake near Orkney, South Africa commenced on 2017 and was completed in 2018. Hiroyuki et al. (2017 AGU) reported on legacy seismic reflection to analyze geological structures in the southern most area of the M5.5 aftershock zones. They found vertical structures in four 2-D lines that were potentially responsible for the M5.5 earthquake and illustrated cross-cutting relations of the M5.5 structure and other known faults that dislocated gold reefs more than several hundreds of meters both horizontally and vertically. Another legacy seismic reflection data which was recorded in 1996 and covered much wider area of the M5.5 aftershock zone was found. We calibrated velocity structure by tying with borehole data including DSeis Holes A and B, we found some of intrusives (sills) that Hole A and B were strong reflectors in the legacy 3D seismic reflection data.

Aftershocks located by in-mine 46 geophones are dense at the southern upper fringe, with a sharp cut-off dipping about 20 degrees to the south; some clear stripes of aftershocks are also seen, in parallel to the upper fringe (Tadokoro et al., JpGU2019, ICDP DSeis 9). It is interesting to note that the reflector (sills) are also in parallel to the upper fringe of the aftershock zone and the aftershock stripes. It is also notable that stress concentration is reported at the intrusives by Sugimura et al. (JpGU2019; ICDP DSeis 5) and Kanematsu et al. (JpGU2019; ICDP DSeis 6). Some mechanism that controls the extent of the aftershocks should exist.

This paper is one of nine papers (ICDP DSeis 1-9). Refer other papers for other topics, e.g. on drilling, logging, stress measurements and evaluation, fault materials, and relocated aftershocks.

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