ICDP DSeis 4: Drilling, core logging, and in-hole geophysical logging of ICDP DSeis drilling into the M5.5 aftershock zones in a South African gold mines.

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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. This M5.5 earthquake started from a depth about 5 km and ruptured West Rand Group below mining horizon on unknown geological structure in a deep gold mine. The mechanism of left-lateral slip of this M5.5 earthquake contradicted normal-faulting mechanisms of typical mining-induced earthquakes on mining horizons. The upper fringe of the aftershock zone was several hundreds of meters from the deepest level of the mine. Two NQ holes were collared at a depth of 2.9 km (95 level) below surface at a deep gold mine. Hole A (817m) deviated too much to intersect the M5.5 fault but Hole B (700m) intersected the M5.5 fault. A 3-m double-tube couldn't recover the fault material much, while a 1.5m triple-tube could recover the fault material more in Hole C branched from 544 m in Hole B. Geophysical logging, core logging, and water/gas monitoring followed drilling. All the core was transported to Mandela Mining Precinct, CSIR, Johannesburg and systematically described and scanned by the ICDP DMT scanner. Some of the core were selected for core stress measurements.

In JpGU 2019 meeting, nine papers (ICDP DSeis 1-9) report on the outcomes. This poster (ICDP DSeis 4) compiles drilling, core logging, and in-hole geophysical logging of ICDP DSeis drilling into the M5.5 aftershock zones in a South African gold mines. A core orientation tool was used during drilling but not 100% reliable because there was a case that a bottom line in a core run was different by more than 90 degrees from the bottom line in the next core run. We elaborated to compare OTV image with core to carefully check the core orientation. The modified core orientation allowed us to modify the maximum stress direction that Ishida et al. (2018) measured. We could confirm good consistency with borehole breakout analysis (Richenbacher 2018; ETH master thesis). We will report on other associated outcomes. Refer other papers (ICDP DSeis 1-3, 5-9) for other related outcomes.

Acknowledgement: The DSeis team includes co-authors of the papers ICDP DSeis 2-9 and members shown at https://www.icdp-online.org/projects/world/africa/orkney-s-africa/details/. We thank Harmony Gold, Anglogold Ashanthi, Lesedi, Digital Surveying, OHMS, Seismogen, 3D Geoscience. ICDP, JSPS, SA NRF, MEXT Japan, US NSF, German DRF, and Ritsumeikan Univ. financially support the project.

