

ICDP DSeis 1: Introduction into JpGU 2019 papers on Drilling into Seismogenic zones of M2.0-5.5 earthquakes in South African gold mines

*Hiroshi Ogasawara¹, Bennie Liebenberg², Martin Ziegler³, Yasuo Yabe⁴, Ray Durrheim⁵, Musa Manzi⁵, Tullis C Onstott⁶, Thomas Weirsberg⁷

1. Faculty of Science and Engineering, Ritsumeikan University, 2. Moab Khotsong mine, South Africa, 3. ETH, Zurich Dep. Earth Sciences, 4. Graduate School of Science, Tohoku Univ., 5. Univ. Witwatersrand, School of Geoscience, South Africa, 6. Princeton Univ., Dept. Geoscience, USA, 7. GFZ, Potsdam, Germany

The 2014-2019 ICDP Science plan states: “reaching the depths of the seismogenic zone where earthquakes nucleate has always been a challenge for fault-zone drilling projects” (Mori and Ellsworth, 2013). However, during 2016-2018, we could recover cores with a total length of about 1.6 km from seismogenic zones ahead of mining faces, M3.5 and M5.5 earthquakes by drilling collared from depths of 1.0 to 3.3 km below surface in deep South African gold mines. The drilling targets had been already elucidated by tens of near-field seismic sensors. Talc, biotite, and amorphous were found at the M5.5 fault intersection (Kaneki et al. SSJ 2018).

The reliable measurement of the magnitude and orientation of stress at depth is a significant challenge (Brody et al., 2009). However, we overcame the difficulty. We intersected hypersaline water where geomicrobiologists started water and gas monitoring.

This paper reviews the scientific drilling and associated activities and briefly introduces the other reports (ICDP DSeis 2-10) presented in JpGU 2019 as shown below:

Hirono et al. (ICDP DSeis 2) ICDP DSeis 2: Preliminary results of physical property measurement and XRD analysis of the M5.5 fault material recovered from DSeis Project,

Yabe et al. (ICDP DSeis 3) on the spatial variation of stress in the seismogenic zones,

Yoshida et al. (poster; 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.

Sugimura et al. (poster) ICDP DSeis 5: Diametrical Core Deformation Analysis of the M5.5 aftershock zone core - stress concentration at reflective intrusives and transition in stress regimes.

Kanematsu et al (poster) ICDP DSeis 6: Deformation Rate Analysis of the M5.5 aftershock zone core - stress concentration at reflective intrusives.

Higashi et al. (poster) ICDP DSeis 7: compilation of stress information and comparison with calculated stresses in the M5.5 aftershock zones,

Noda et al. (poster) ICDP DSeis 8: the M5.5 fault structure and reflective intrusives in legacy 3D seismic

reflection data

Tadokoro et al. (poster) ICDP DSeis 9: streaks in the M5.5 aftershocks potentially located on highly stressed intrusive

Mori et al. ICDP DSeis 10: Near-field Observations for the M5.5 Orkney, South Africa Earthquake

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