AOB Seminar

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講演題目&要旨：

Acoustic emission monitoring in South African deep gold mines

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Abstract:

We deployed a very sensitive Acoustic Emission network at 1 km depth in the Cooke 4 mine in South Africa. This network consists of 24 sensitive AE sensors (up to 50 kHz) and 6 tri-axial accelerometers (three of them have a flat frequency response up to 25 kHz, the other three up to 10 kHz). The number of triggers obtained by the three months observation between July 2011 and October 2011 reached ~ 3 million, and the same numbers of waveform records were stored for all channels (~65 ms in length for each trigger). We applied the automatic picking and location algorithm of Horiuchi et al. (2011) to them and obtained ~450 thousands reliable hypocenters. The smallest event size in the catalog was smaller than –5 in moment magnitude (Mw), and a large amount of events larger than Mw –4 to –3.5 were registered within 150 m from the network.

The numerous amounts of very small AEs and their hypocenters determined by a relative approach allowed us to study their activity in very high-resolution, revealing some new aspects of the seismicity in mines. For example, we found that numerous AEs are steadily occurred on a preexisting discontinuity such as fault, but their size are limited to very small (< –2), not enough to be detected by the conventional seismic network operated in South African gold mines. As another example, numerous AEs are also occurred in front of a mining front, where very high stress condition is expected, and they exhibited two-dimensional tabular distribution of ~2–3 m thickness, probably representing the preparation process of a large shear crack of ~ 20m scale. These AE activities very likely represent the damaging process in the rock and our data is valuable for our purpose of 'mitigating the seismic risk in mines' and 'understanding the earthquake generation process.'