AOGS 2005

Where is a fault plane?

TATSUO MATSUDA[1], KENTARO OMURA[1], RYUJI IKEDA[2] and HIDEMI TANAKA[3]
[1]*National Research Institute for Earth Science and Disaster Prevention*
[2]*Hokkaido University*
[3]*University of Tokyo*

"Fault-zone drilling" is very important to research about mechanisms of earthquake occurrence. It is especially important in understanding the structure, composition and physical properties of active faults. Therefore "Active Fault Zone Drilling Project" has been conducted in the central part of Japan by the National Research Institute for Earth Science and Disaster Prevention (NIED). We investigated various active faults in central Japan and have performed the case studies. We will show about how the knowledge acquired until now is put to a future research project.
In the near future, the deep sea drilling vessel "CHIKYU" will penetrate a seismogenic zone in the plate subduction area. Probably at this time, it becomes a problem most where is a fault plane. As a matter of fact, it is difficult unexpectedly to recognize where is a fault plane in the drill cores. Of course, it is easy when the lithologic boundary it self is a fault plane. However, it is not so often. Usually, the fault plane passes in the same lithologic face. Therefore, it is useless only by observing partially, and the necessity of grasping the whole structure correctly comes out.
From our experience, we can use geophysical logging data (such as P-wave velocity and density etc.) to hold an outline at the beginning. And that mineral assemblage and chemical compositions analysis are effective in order to grasp details further [1]. Especially, the amount of water (water of crystallization) is very important. In the case of the Nojima fault which appeared on the surface by the 1995 Kobe earthquake (M=7.2), we detected plenty of water (about ten times as much as the average) in a fracture zone [2]. This is due to the greater degree of wall-rock fracturing in the fracture zone. However, it does not become evidence too sufficient in just the quantity of water. For other things (such as mineral assemblage, distribution of major and minor elements, microscope observation etc.) are needed. They will suggest the characteristics that are associated with fault activity and the nature of fluid-rock interactions in the fracture zone. Especially an important thing, even in the underground, a fault plane is not simple "plane". In many cases, it constitutes "Fault zone" with a certain width. So, we must know the threedimensional structure of it. Only by doing so, the position of a fault plane in the underground can grasp correctly.
Keywords: fault; fault plane; drilling; logging; material analysis; fault zone structure

References

[1] R. Ikeda et al, *The Island Arc*, 10, Issue 3/4, 199-205 (2001)
[2] T. Matsuda et al, *Tectonophysics*, 378, 143-163 (2004)