

Preface to the Special Section on “Measurement of Crustal Stress—
Existing Techniques and Problems to be Solved”, Part 1.

The drilling induced fractures, hydrofracturing and over-coring methods are main techniques to know the complete stress field, magnitude and direction of the principal stress. The last two methods are known to be more accurate than the first one. However, even these two methods have their own problems in obtaining sufficiently accurate results for the earthquake prediction research. The over-coring method requires materials for connecting strain-cell to the bottom or wall of the borehole very firmly with sufficiently high compliance. However, it is difficult to find appropriate materials for deep vertical borehole. A solution can be obtained by the use of embedding the strain-meter with mortar compound. The stiffness of the mortar compound can not, however, be negligible, and the stress in the over-cored rock can not completely be relieved. A kind of residual stress must be considered for accurate estimation. Regarding to the hydrofracturing, two major suspicions to the reopening pressure have been published in the past. Water pressure at the mouth of the fracture just before reopening is not clarified. Besides, numerical simulation results show that the fracture initiates to open at the true reopening pressure, being much lower than the conventional reopening pressure. Numerical simulation results also show that water permeates deep into the fracture at the conventional reopening pressure resulting similar to the shut-in pressure. If the latter result is true, the data obtained by hydrofracturing method have little information on the magnitude of the maximum horizontal stress. Regarding to the suspicions, non-hydrofracturing method free from all the problems associated with water is proposed. The high-stiffness hydraulic fracturing system is also proposed. In these circumstances, a symposium “Measurement of Crustal Stress—Existing Techniques and Problems to be Solved” was held in June 2004 with the support of the Earthquake Research Institute Cooperative Research Program. The aim was to summarize the problems of existing techniques and to discuss possible solutions. After the symposium, the organizing committee planned to publish the results to the Bulletin of the Earthquake Research Institute. The report written by Mizuno and Nakai introduces their data-base of the shear-wave splitting. A review article discussing the problems of existing techniques will be issued in the Part 2.

Editor: Osam Sano