Reliable Measurement of Crustal Stress, Existing Techniques and Problems to be Solved.

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Precise measurements of the stress state in the Earth's crust have a potential to give answers to the questions; How is a stress state of the specified earthquake fault in the recurrence sequences?, How correctly can we estimate stress drop in the source parameters?, How is stress accumulating in the asperity regions and others?, What is the causes to the variations of strain rates in different regions estimated by GPS? and so on. However, in order to answer to these questions, contemporary stress measurement methods have several problems to be solved, and there is no unique technique available for any rock type and any depth. Although the hydraulic fracturing method is mainly used in the Earth science field, severe questions to the method have been raised from time to time since 1980s. Many researchers tried to answer these questions, and recently, a relatively large correction of the method was proposed by Ito et al. (1999). However, the ISRM suggested method of the hydraulic fracturing method (except for HTPF) published in 2003 fundamentally remains at the standpoint of 1980s. Meantime, a dry-fracturing method based on a borehole jack techniques was proposed, which is free from problems associated with water. The problems concerning re-opening pressure were suggested by several authors based on simulation results and, at the same time, based on observation facts that the re-opening pressure was almost always equal to the shut-in pressure in all over the world and in any depth. Meanwhile, the observation results were explained in terms of the Coulomb criteria. We have to now consider seriously the problems of the hydraulic fracturing method raised recently again by Ito et al. (1999), Rutqvist et al., (2000), Mizuta (2000) and Ito (2003). Measurement method itself has to be discussed before getting conclusions in the discussions on the stress state in the Earth's crust. New methods of stress measurement, corrections to the existing techniques, and re-examinations of old data should be needed. This report focuses on the establishment of the reliable measurement method of the crustal stress. Details will be presented orally.