Three Dimensional array observation of crustal movements, active experiments and their application to poroelastic theory

Yasuhiro Asai[1], Hiroshi Ishii[1], Harumi Aoki[1], tsuneo yamauchi[2], Torao Tanaka[3], sigeo matsumoto[4]

[1] TRIES, [2] RCSV, [3] Sci. & Tech.,

Meijo Univ., [4] ERI

http://www.tries.jp

Crustal movement observations in deep boreholes have many advantages as disturbances caused by rainfall or artificial noises become much smaller than observations at vaults. High S/N ratio observations are very important especially for the short-term earthquake prediction research.

We have developed a new multi-component borehole instrument for boreholes with smaller diameter than 98mm and for deeper ones than 1km. Low power consumption and high sensitivity of the sensors have been taken into consideration, based on former Ishii-type multi-component borehole instrument with a diameter of 110mm.

The instruments were installed into the basement rock of the following borehole sites, and have been continuing observations under an excellent condition. Togari station consists of two boreholes with depths of 350m and 165m (TGR350 and TGR165). The instruments are equipped with horizontal strainmeter of 3 components,tiltmeter of 2 and seismometer of 3, a thermometer, inclined strainmeter of 2 (for TGR165), a vertical strainmeter (for TGR165) and geomagnetometer of 4 (for TGR165). The groundwater levels have also been monitored at these boreholes. TGR350 and TGR165 are located at about 6m horizontal distance. Observation vault of Nagoya University (NAMZ) is also located at a distance of 150m from them. The instruments are composed of the quartz-tube extensometer of 3 and water-tube tiltmeter of 2.

We have constructed three dimensional array observation systems of crustal movements by these stations. Under these circumstances, we have carried out the active crustal movement experiments by pumping up groundwater. In addition to these, we have Kawai borehole station (KWI) where two instruments were installed at different depths with 5m distance in the same borehole. Both of them are equipped with horizontal strainmeter of 3 components and upper one has tiltmeter of 2 components and a thermometer. KWI is located at about 2km west of TGR350, TGR165 and NAMZ. We will present three dimensional array observation system and results obtained.

We also discuss preliminary results by applying the poroelastic theory.