Evolution and The Total Budget of Fluid in Granitic Magma through Magmatism and Volcanism in The Subduction Zone, NE Japan

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Fluids (especially water) are carried by oceanic plates which are subducted into the depth of the mantle and released through the dehydration process. Water migrates upward and contributes to the melting of the mantle wedge in the formation of an arc magma. The formation of volcanoes and igneous rocks as plutons in the arc magma produces geothermal energy sources and the formation of ore mineral deposits. Throughout its migration within the crust, the fluid evolves both in temperature and pressure, composition and amount. These fluid traces can be found among the minerals as melt and/or fluid inclusions in volcanic products, igneous plutons, and the veinlets. In this study, water budget estimated on the crust by determining the condition of P-T and composition of fluids in the volcanic rocks and igneous plutons including the host rock and veinlets.

Samples were taken from caldera fill sediment and porphyry copper deposits in NE Japan region. The P-T condition and fluid composition are measured from the melt inclusion in quartz from the caldera fill sediments and fluid inclusions in the granite intrusion and the veinlets. The sample is divided into several types, namely volcanic rock samples from caldera fill sediment, granite from porphyry copper deposits, and the veinlets contained in the granite body including quartz vein, glassy vein, and hydrothermal breccia vein. In volcanic rock samples, quartz crystals were picked, encased in resin and polished for major element and water content analysis. In granite samples and veinlets, the rock thin sections were made for fluid inclusion microthermometry analysis and fluid diffusion analysis using apatite mineral. Water budget in the upper crust is estimated from caldera fill sediments to be 2.3–7.6 t /yr/m. Water budget in the deeper part of the crust can then be determined from porphyry copper deposits.

Keywords: water budget, fluid evolution, melt inclusion, fluid inclusion

