Groundwater flow system of Unzen volcano (3): results from carbon isotopic composition of soil CO2

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We are studying about the mapping of magmatic fluid influence for CO2 in order to estimate flux of magmatic volatiles derived from Unzen Volcano. In the present study, the carbon isotopic approach was used for identification of magmatic contribution in soil air. A large contribution of magmatic CO2 in a dissolved carbonate of spring water in this region has already been reported (Ohsawa et al., 2002). Use of the soil air has advantages that it is easy to measure flux from soil surface and collect sample. We have collected ca. 90 soil air samples in and around Unzen Volcano, and they are analyzed for CO2 concentration, d13C and d14C using the portable gas detector, IR-MS and Tandetron accelerator mass spectrometer. A mixing model with isotopic mass balance among magmatic, biogenic and atmospheric carbon sources is found to be very useful in quantifying contribution of respective carbon sources (Takahashi et al, submitted). We used concentration, d13C and d14C values of ambient CO2 as an indicator of magmatic contamination.

The CO2 concentration inside Unzen Graben showed higher than that outside. This suggests that the magmatic contribution is high inside the graben. The flux of CO2 from ground surface was high at costal area. The spatial variation of flux might cause by the difference of biogenic activity at each point. The biogenic impact might be stronger than the magmatic one for the CO2 flux, since the almost costal region used for farm field and might contain much higher amount of organic materials. The magmatic CO2 showed high contribution in/around Shimabara City located ca. 7km east from Unzen Volcano, which agrees well with the result from ground water study using carbon isotopes (Ohsawa et al. 2002). It is noteworthy that the high contribution, flux and concentration of CO2 are appeared along the Akamatsudani fault zone located southeast of the volcano. Our observation across the Akamatsudani fault zone was also represented to be a remarkable peak of CO2 concentration and d13C values. These suggest that magmatic fluid comes up along the fracture zone like as fault system of Unzen Graben.