

Escape of magmatic carbon dioxide into shallow groundwater systems at Unzen volcano

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Chemical and stable carbon isotopic analyses of dissolved inorganic carbon (DIC) were carried out for groundwater samples collected from cold springs and shallow wells in Unzen volcanic region in 1999 and 2000. All of the data sets plotted on the $\delta^{13}\text{C}$ vs. $1/[\text{DIC}]$ diagram can be explained by mixing of magmatic carbon dioxide with DIC equilibrated with soil carbon dioxide. Groundwater DIC showing a high mixing ratio of magmatic carbon dioxide appears to have a tendency to distribute along two major faults nearby the activity center of the 1990-1995 eruption. This suggests that these faults are escape routes of magmatic carbon dioxide diffused into volcanic edifice. Total flux of the magmatic DIC discharged from the cold springs is shown to be one to two orders of magnitude lower than the roughly estimated flux of carbon dioxide discharged from the summit craters and/or fumaroles during the eruptive period.