Magma feeding system of Fuji volcano, Japan

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Fuji volcano is known for its perfect cone shape and it is the largest among Japanese Quaternary volcanoes. In the last 100kya, Fuji has erupted only basalt magma (>>99 vol%), but its eruption style changed (from debris flow and tephra dominant Ko-Fuji or Older Fuji, to lava flow dominant Shin-Fuji or Younger Fuji) at ~15 kya BP. Origin of the voluminous yet monotonous basalt production in Fuji volcano have been discussed but remain unanswered. Here we report the first high-pressure melting experimental results on Fuji basalt (Hoei-IV, AD1707) and demonstrate that its main magma chamber is located at ca.25km depth. We show seismic tomographic images of Fuji volcano for the first time, which reveals the existence of strong upwelling flow in the mantle and its connection to the voluminous lower crustal magma chamber (see Fig.1).

Very frequent low frequency earthquakes just above the magma chamber (open circles in Fig.1) may be due to the injection of basalt magma and/or fluids. The total lack of silica-rich rocks (basaltic andesite and andesite) in Fuji volcano must be due to the special location of the volcano. The plate boundary between the Eurasia plate and the subducting Phillipine sea plate is located just beneath Fuji volcano (~5 km depth). Large tectonic stress and deformation associated with the plate boundary inhibit the survival of a shallow level magma chamber, which would allow the evolution of basalt to silica-rich magma (as observed in all other volcanoes in Japan, e.g., Hakone, Izu Oshima).

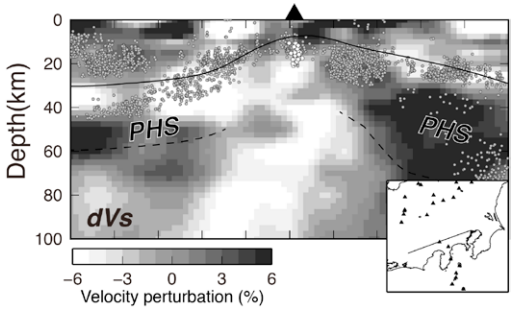

Fig.1 Seismic tomography beneath Fuji volcano. EW section

Migration of radiocesium and radioiodine in soil-water-river system related to Fukushima-Diichi Nuclear Power Plant Accident

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Radionuclides such as radiocesium and radioiodine were emitted from the Fukushima Daiichi Nuclear Power Plant (FDNPP) accident caused by the Great East Japan Earthquake and Tsunami on March 11, 2011. Highly contaminated areas spread in the northwest direction from FDNNP in Fukushima Prefecture, which mainly resulted from the distribution of the wet deposition on March 15 [1]. After the deposition, vertical profiles of the radionuclides in soil in Fukushima showed that radioscesium and radioiodine have been retained within 5 cm from the surface. Analysis of particulate matters and sedimentl partlces in rivers in the region showed that radiocesium is enriched in finer fractions.

These results suggested that radiocesium and radioiodine have high affinity to soil particles. For radiocesium, adsorption on clay minerals have been indicated. Thus, extended X-ray absorption fine structure (EXAFS) spectroscopy has been used (i) to characterize structure of surface complex of cesium with 2:1 phyllosilicate and (ii) to understand the reduction of the adsorption in the presence of humic substances. We also found a correlation between (i) the fraction of inner-sphere complex among total cesium species adsorbed on the soil particles and (ii) Radiocesium Interception Potential (RIP) value, which suggests that RIP is dependent on the mieral content and humic substances.

About 30% of radioiodine leached by NaOH solution (pH 10.5) from the soil collected one month after the accident [2]. When the NaOH solution was acidified to pH 2, more than 60% of radiodine in the solution precipitated possibly with humic materials that can bind iodine in the polyorganic structure. This leaching-precipitation behavior suggests that a part of iodine is in the organic form in the soil, which can be a reason for the low leaching rate in the soil by water. The formation of organic iodine in natural soil has been suggested also by XAFS using X-ray microbeam [3]. The formation of organo iodine species proceeds in a relatively short period, such as within a week or a month. Thus, the formation of organo iodine is possible for radiodine in the soil.

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