Satsuma Iwojima: estimates of the volcanic and hydrothermal fluxes

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The Satsuma-Iwojima Island, southwest Japan, is a complete active volcanic system presenting high and low temperature and different type of hydrothermal systems: on the island and submarine.

The fluxes of volcanic gases and aerosols have been estimated using a Correlation Spectrometer. In order to be sure that no significant error were made on the sulfur species an artificial tracer gas (SF6) has been used to validate the fluxes measurements at the crater. The atmospheric contribution of the volcanic plume has been evaluated as 620 t/day of SO2; 1.5 t/day of Al; 0.6 to 1.2 t/day of Fe; 0.22 to 0.15 t/day of Zn; 900 t/day of F and 135 t/day of Cl.

Around the Island numerous hydrothermal systems are contributing to submarine flux detectable by the yellow or white water discoloration. In order to evaluate the contribution of one of these hydrothermal sources one liter of rhodamine WT has been injected in the hydrothermal source of Higashi Onsen. The hydrothermal flow rate being measured as 20 l/s, the chemicals flow rates obtained were respectively: Si 0.155 t/day, Al 0.5 t/day and Fe 0.120 t/day. These values are of the same order of magnitude as those obtained from the crater.

Higashi Onsen is only a small part of the hydrothermal submarine contribution on Satsuma Iwojima. We have also mapped the thermal anomalies due to hot water convection in Nagahama Harbour, Akayu, Yunotaki, Ketsunohama and Heikenojo. These different locations may provide 6 to 10 times the flow rates observed at Higashi Onsen. In addition submarine surveys made around Shin Iwojima pointed out two anomalies on the North and the South of the Island. Anomalies on the sea floor temperature have been detected down to a depth of 20 m on the South West of Shin Iwojima. He Isotopes measurements of He shows a magmatic origin for these gases. These results are pointing out that the hydrothermal contribution is of the same order of magnitude and may be an order of magnitude higher than the fluxes measured from the main crater. They probably derive from the same source of gas (as pointed out by the helium measurements).