

## Hot water reservoir beneath Yudamari crater lake at Aso volcano

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The Nakadake first crater at Aso volcano, Japan, emits significant amounts of volcanic gas, including 200?400 tonne/day of SO<sub>2</sub> during calm periods. The first crater contains a hot crater lake, locally referred to as Yudamari with a diameter greater than 200 m. Throughout most of the calm period, the lake temperature remains at 60 degree C which is much higher than the ambient temperature.

Precipitation cannot explain the maintenance of the lake water volume because the volume of water lost from the lake surface caused by an evaporation rate of 60?80 kg/s is an order of magnitude greater than the volume of water gained through precipitation. This suggests that the lake water is obtained mainly via inflows at the lake bottom.

The numerical model revealed seasonal changes in mass flux (75?132 kg/s) and enthalpy (1,840?3,030 kJ/kg) for the fluid supplied to the lake. The relation between the enthalpy and mass flux indicates that the bottom input fluid is a mixture of high- and low temperature fluids. Assuming a mixture of high temperature steam at 800 degree C and liquid water at 100 degree C, Terada et al.(2012) revealed that half of bottom input fluid is hot liquid water.

In February 2009, an unusual thermal event occurred at Yudamari crater lake involving a large volcanic tremor, discolored lake surface, acoustic noise and interesting changes in water level and temperature.

Precise water level and water temperature measurements enable us to quantitatively evaluate heat and mass flux from lake bottom during the event. A numerical model employed by Terada et al. (2012) reveals that 30,000 m<sup>3</sup> of hot water emit from the lake bottom. The analysis also shows the enthalpy of bottom input fluid is approximately 400 kJ/kg, corresponding to liquid water in 90 degree C. We suspect that a hot water reservoir exists beneath Yudamari crater lake.

Keywords: crater lake, Aso volcano, hydrothermal system