Chemical evolution within a hydrothermal fluid circulation system at the Aira caldera, Kyushu, Japan

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A caldera structure provides a geological setting suitable for development of a hydrothermal fluid circulation system, since it is equipped with a heat source magma and fluid conduit of fault networks. The Aira caldera is one of Quaternary calderas which formed within the Kagoshima graben in south Kyushu. At present, most part of the Aira caldera (30 km x 20 km in size) is submerged to be a part of Kagoshima Bay.

The Wakamiko submarine crater is considered as the volcanic center of the past giant eruption that formed the Aira caldera. On the seafloor of 200 meters water depth at the Wakamiko submarine crater, venting of high temperature fluid (around 200 degC) was observed during dive expeditions using ROV (Remote Operation Vehicle). On the other hand, along the shoreline at northern part of the Kagoshima Bay where corresponds to the rim of the Aira caldera, some hot springs are pumped up from the aquifers situated at 650-1100 m depth. The hot spring waters showed temperature of 40-80 degC and NaCl-rich chemistry. In order to reveal similarities in these fluids, geochemical studies were conducted for submarine hydrothermal fluid and onshore hot spring waters.

Relationships among delta-D and chloride concentration of these fluids are commonly explained by around 1:1 mixing of the meteoric water and seawater. This result implies they share the same fluid reservoir that may distribute across subbasement of the caldera floor. Comparison of water chemistry would provide important keys to understand how fluid chemistry evolves during fluid circulation from a recharge zone to discharge zone.