

Behaviors of Mn and Fe in hydrothermal plumes and diffused flows at the Suiyo Sea Mt., Izu-Bonin arc

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We studied for hydrothermal plumes and hydrothermal diffused flows at the Suiyo Sea Mount in the Izu-Bonin arc by using in situ Mn-Fe analyzers (GAMOS). GAMOS (Geochemical Anomalies MONitoring System) is an in-situ chemical analyzer used to detect manganese and/or iron anomalies in neutrally buoyant plumes and to map manganese distribution in bottom seawater over vent fields. GAMOS-II was designed for either tow-yo surveys from a surface ship or for submersible operations. GAMOS-II has two analytical lines for simultaneous determination of Mn and Fe. GAMOS-IV was designed for stand-alone operation of up to one month. GAMOS-IV has one analytical line. The detection range is 10nM-6,000nM. GAMOS-IV uses micro-diaphragm pumps to propel solutions. Since the micro-diaphragm pump cannot propel reagents at high flow-rate, GAMOS-IV does not have enough reaction speed for tow-yo surveys or submersible operations. However, this pump possesses the following advantages for long-term observations: (1) reducing pump size and power requirements, (2) long maintenance-free intervals, and (3) small flow rate.

During HAKUYO 2000 (SHINSEI MARU) and NT01-09 (SHINKAI 2000 / R/V NATSUSHIMA, JAMSTEC) cruises, GAMOS-IV measurements for manganese and temperature were conducted for long-term observation of hydrothermal diffused flows. Water temperature and the concentration of manganese in the diffused flows were measured successfully. High manganese concentration and temperature were observed in the diffused flows. Anomaly of manganese concentration and temperature was observed coincidentally, but the relationship is not consistently proportional. Fluctuation in the anomaly of manganese concentration and temperature was changed by tidal effect.

During NT01-09 (SHINKAI 2000 / R/V NATSUSHIMA, JAMSTEC) and KR01-15 (R/V KAIREI, JAMSTEC) cruises, GAMOS-II measurements were conducted for plume observation. Manganese, iron and temperature anomalies were observed in the caldera of the Suiyo Sea Mount. below 1050m in depth. Three maxima in temperature were detected at 1,080m, 1,200m and 1,280m. But only one peak was observed for iron and manganese. Shallower plume below has a lower Metal/heat ratio compared to deeper plume.