

## **Geochemical variability of hydrothermal fluids from four vent sites in the North East Lau Basin**

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During RV SONNE cruise SO263 in June 2018, hydrothermal fluids from four active submarine hydrothermal sites (Maka, Niuatahi, Niua South and Niua North) were sampled in the North East Lau Basin along a SW-NE transect where host rock lithologies changes from basalt to dacite to rhyolite. Samples were taken between 750 and 1700 m water depth from black and white smokers, expelling diffusive as well as focused fluids, the latter showing temperatures as high as 334°C.

Fluid compositions vary between hydrothermal sites, but can be divided into two major groups: (1) water-rock dominated systems with temperatures > 250°C and pH between 2.88 to 3.83 as well as low Mg (1.80 – 7.41 mM) and SO<sub>4</sub> (0.40 – 6.15 mM) concentrations. These fluids show Fe concentrations between 0.25 and 6.05 mM and H<sub>2</sub>S concentrations of up to 6.24 mM, as well as Fe/Mn ratios from 0.39 to 5.15 (2) low temperature fluids ranging from 65 to 110°C are significantly more acidic with measured pH values from 1.85 to 2.18 and display high Mg (48.0 – 50.4 mM) and SO<sub>4</sub> (22.8 – 25.3 mM) concentrations, indicating the input of magmatic volatiles. Concentrations of Fe (0.76 – 1.40 mM) and H<sub>2</sub>S (3.90 – 5.93 mM) are in the same order of magnitude, whereas Fe/Mn ratios are significantly higher with values between 83 and 97.

Chloride concentrations of all sampled fluids are highly variable, ranging from 309 to 635 mM, indicating phase separation and the occurrence of both vapor and brine phases. Calculated hydrothermal endmember fluids of e.g. Niuatahi indicate multiple endmembers and different reactions within the subsurface.

Our data of hydrothermal vent fluids in the North East Lau Basin represent hydrothermal processes in back-arc spreading center and island-arc volcanoes and add to the still limited data sets of such systems compared to mid-ocean ridges.