Diverse hydrothermal venting at the Jan Mayen vent fields, AMOR

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The basalt-hosted Jan Mayen vent fields (JMVF) are located at 71° N on the southern end of the ultra-slow spreading Mohns Ridge (AMOR). Over the past few years, scientific cruises have repeatedly visited and extensively sampled these vent fields. Researchers have identified several types of hydrothermal venting and have noted significant differences in hydrothermal fluid compositions within relatively short distances. The types of venting range from focused high-temperature fluid venting from numerous chimney structures, to low-temperature diffuse fluid flow areas. In addition free gas bubbles were observed being released from the seafloor. The chemical composition of the high-temperature endmember vent fluids is primarily characterized by high concentrations of carbon dioxide together with low hydrogen and methane concentrations. Fluids from the diffuse flow areas are characterized by an increased concentration of methane, which is strongly reflected in the hydrothermal plume observed above these diffuse systems. High concentrations of dissolved methane together with low concentrations of dissolved hydrogen were measured in the water column close to the seafloor for the diffuse flow hydrothermal plume, while high hydrogen/low methane concentrations were found in the high-rising non-buoyant plume. The main constituent of the gas bubbles, however, was carbon dioxide. In addition, at 560 m water depth along the flank of a high-temperature venting chimney, formations of gas hydrate were observed. A few tens of meters away, a ridge segment with several small chimneys with a flame-like discharge was observed, suggesting subcritical phase separation through boiling at relatively low pressures. Here we present a study on the diverse geochemical fluid and gas characteristics of the Jan Mayen hydrothermal systems located on the ultra-slow spreading Arctic Mid-Ocean Ridge and compare the results with the fluid composition of other mid-ocean ridge hydrothermal systems.

The SwissSIMS ion probe facility

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A new ion probe laboratory, housing a CAMECA IMS 1280-HR has been established at the University of Lausanne, Switzerland in the Institute of Earth Sciences. The SIMS facility was obtained through funding from the Swiss National Science foundation, the universities of Bern, Geneva, Lausanne, and the ETHZ. It is organized as a Swiss National Facility, with a scientific steering committee. The instrument was installed in the second half of 2012, and it passed specification late 2012. The NanoSIMS facility of the EPFL under the direction of Dr. Anders Meibom is housed in the same building. The combination of facilities offers the users a unique opportunity for *in situ* surface analysis.

We will focus on basic and applied research in all domains of earth science. The IMS 1280-HR is equipped with high-density cesium and oxygen primary ion sources, 5 interchangeable electron-multiplier spectrometers (EMS) or Faraday cup and 2 fixed Faraday cups for multi-collection and one electron multiplier and two Faraday cups for mono-collection. The magnetic sector is stabilized with a Hall probe to improve reproducibility of isotopic ratios; transmission is optimized for IMS sensitivity.

So far we have tested and adapted existing methods on using NIST or MPI-DING standards and we improved existing method for *Cl* isotope measurements [1]. We are currently developing and establishing various carbonate standards for *O* and *C* isotopes, in house quartz standards for *O* and *Si* isotopes, as well as standards for oxygen isotopic composition for olivine, titanite, biotite for *O* isotopes. We are now ready to start the first scientific projects.

[1] Bouvier & Baumgartner, Session 20l, Golschmidt 2013

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