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Helium Isotope studies on hot smokers in the South Atlantic

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On this poster we present 3He and 4He concentrations directly measured at the fluid exit with a new ROV based sampling system. The data set is from the South Atlantic and encompasses several individual vents from the 5°S sites (Turtle Pits, Red Lion & Comfortless Cove) including Sisters Peak, the hottest knows hydrothermal vent, as well as the Nibelungen site at 8°16'S. The samples were taken during the RV Meteor cruise M68/1 in 2006 with a gas tight in-situ sampling device with the ROV Quest. The system consists of a copper tube which is manually closed at both ends by the ROV manipulators. The direct sampling of the hot fluids allows a comparison of the Helium isotope concentrations and ratios with other fluid parameters as e.g. exit temperature and contents of gases and metals. The observed 3He/4He isotope ratios of the 5°S fields are extremely high with values higher than 9 times the atmospheric ratio. The ratio at the Nibelungen smoker Drachenschlund is somewhat smaller with a value of 7. The difference of the systems is also reflected in the heat flux (estimated from plume rise height) of the observed plumes which range from about 10 to 20 MW at the 5°S sites to 60 MW at Drachenschlund, which is at the higher end for single black smokers . We also show from samples of the water column take with a CTD-bottle system that a distinct separation of the 3He/CH4 ratios at the two sites can be made. The ratios allows to assign the heat source of the Nibelungen site predominantly to serpentinization, whereas the 5°S site is driven by magmatic activities. The high 3He concentration emanating from these smokers is about a factor of 2000 above the ocean background concentration. Because 1% deviation from the background can be resolved, a dilution of the end member vent fluid of a factor 200.000 could be detected.