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KIPS –A new Multiport Valve-based all-Teflon Fluid Sampling System for ROVs

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The recent advent of ROVs as tools for deep ocean research in Germany allows us to approach and sample discrete objects and fluid sources on the ocean floor down to 4000 m water depth, like e.g., hydrothermal vents or seeping fluids underneath mussel beds and bacterial mats in various settings in oceanic spreading centers, subduction zones, or related to asphalt volcanism. The spatial resolution of the ROV's manipulator is on the single cm-scale opening the opportunity for a precise sampling of vent orifices and concentration gradients.

We developed an inert, temperature-resistant, modular, and fully remotely controlled fluid sampling system for the storage of – in its present state – up to 15 samples with 675 ml, or 3 samples with up to 3.5 l volume. Hot fluid enters through a manipulator-operated titanium nozzle and PFA (perfluoralkoxy) tubing and is distributed to the sampling flasks by a motor-driven multiport valve (PTFE/PETP). Low temperature fluids ($<$250 $^{\circ}$C) enter directly into PFA tubing. A temperature probe mounted parallel to the nozzle inlet provides the *in situ* temperature at the point of sampling. Sample flasks are equipped with check valves, stop-cocks, and side ports for direct sub-sampling of e.g, head space gas. Sample flasks are mounted into three trays which can be easily removed from the ROV and transferred into the laboratory for sub-sampling. All sample flasks, tubing, and connectors are components from an industrial fluid handling system entirely made of PFA. A gear pump with adjustable pumping speed is positioned downstream to the sample flasks. The system is fully integrated into the

electrical, and software, control system of the ROV *Quest*, operated by Marum, University of Bremen. The modular design will make it possible to combine up to approx. 40 flasks storing variable sample volumes from 100 ml to 3.5 l according to the actual sampling needs.

During past cruises with RV *Meteor* and ROV *Quest* we successfully sampled (1) 400 ˚C vent fluids at the Mid Atlantic Ridge, 5˚ S (Turtle Pits and Red Lion, cruise M64-1, DFG SPP1144 “From Mantle to Ocean”) and 14.5˚ N (Logatchev, cruise M64-2), with up to 98 % of the hydrothermal endmember, (2) diffuse vent fluids within mussel beds, and (3) bottom water compositional transects across bacterial mats 2 cm above seafloor, and within *pogonophora* colonies and mussel beds in the Costa Rican fore arc (cruise M66-2, SFB 574).