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In-situ processing of deep biosphere cores

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High pressure and low temperature processes of the deep biosphere are of great commercial and scientific interest and need to be sampled and studied under conditions as close as possible to those in-situ, if environmentally relevant results are to be obtained. A suite of research technologies to maintain benthic conditions of sediment structure and gas hydrates, temperature, pressure and bio-geochemistry during the sequences of sampling, retrieval, transfer, storage and downstream analysis have been developed by Technische Universität Berlin (TUB) and European partners in the EU Projects HYACE and HYACINTH.

Within these Projects TUB developed PRESS (Pressurized Core Sub-sampling and Extrusion System) which enables well defined sectioning and transfer of drilled pressure-cores [obtained by HYACE Rotary Corer (HRC) and Fugro Percussion Corer (FPC)] into transportation and investigation chambers. Coupled with DeepIsoBUG (University Cardiff) it allows sub-sampling and incubation of coaxial core-sections to examine high-pressure adapted bacteria or remote biogeochemical processes in defined research conditions of the laboratory; all sterile, anaerobic and without depressurisation.

Appraisals of successful PRESS deployments in the Gulf of Mexico (US JIP; DFG: Am 119/3-1), on IODP Expedition 311 (in facilities of Canadian Geological Survey; DFG: MU 1752/9-1) and as part of the NGHP expedition 01 demonstrate the general concept to be feasible and useful.

Aided by Deutsche Forschungsgemeinschaft (DFG) TUB currently works on concepts to scale down the systems immense proportion (8m length, 1t weight) to reduce lo-

gistical and financial expenses, to enhance the handling and likewise to enlarge its implementation. Redesigning the cutting mechanism shall simultaneously adjust the system to harder cores (e.g., ICDP). Novel transportation chambers for processed subsamples intend to make the system more attractive for a broad spectrum of users and reduce their interdependence. Advanced design, improved functioning, high performance materials and safety engineering continue to guide further technology developments.