



HYDRA - A new towed electromagnetic seafloor system

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BGR has developed a new marine controlled source electromagnetic (CSEM) system to measure the electrical resistivity structure of the shallow seafloor down to some hundred meters of depth relevant for sediment bulk properties such as fluids, shallow gas, and gas hydrates. Marine CSEM is an exploration method recently adopted by the offshore hydrocarbon industry to complement seismic methods for reservoir characterisation. The instrument development is part of the SUGAR Project which is the present German Gas Hydrate Programm. HYDRA is a modular system that consists of an up to 900m long data cable that links a 100m long transmitting dipole and four electrical receiving dipoles at increasing offsets. The whole system is towed in-line along profiles on the seafloor behind a plough called 'pig'. The source signal is generated by a current transmitter onboard and is sent down to the transmitting dipole on the seafloor via the coaxial deep-tow cable. The pig hosts the control unit which sends a timing pulse along the data cable to synch the receiving units and records the current signal. It also hosts an acoustic transponder to locate the seafloor position of the system and a CTD sensor to measure seawater conductivities and velocities. The current transmitter has two output ranges for shallow (40A, 200V) and deep water applications (15A, 1000V). The signal form is typically a square wave with a period between 1 and 4 seconds. Each receiver records the transient decay of the transmitted signal through the ambient seafloor and seawater. Amplitude and signal form depend on the seafloor resistivity structure and can be analyzed for sediment properties such as gas hydrate or fluid content. The system has been successfully tested in shallow and deep waters, and is currently used to explore methane seeps and gas hydrate targets in New Zealand. We present details of the instrument design and data collected over gas hydrate targets in the Black Sea.