



The Simeulue Seep – observations on a methane seep in the forearc of Sumatra

B.M.A. Teichert (1), G. Delisle (1), V. Heuer (2), A. Lückge (1), A. Schippers (1), S. Schlömer (1), M. Wiedicke-Hombach (1)

(1) Federal Institute for Geosciences and Natural Resources, Stilleweg 2, 30655 Hannover, Germany, (2) DFG-Research Center Ocean Margins & Dept. of Geosciences, University of Bremen, PO Box 330440, 28334 Bremen, Germany

During SONNE expedition SO189 which focussed on the hydrocarbon system of the forearc basins off Sumatra, a new methane seep was discovered. The seep, called 'Simeulue Seep', is located in the southern part of the Simeulue Basin northwest of Sumatra in a water depth of about 1135 m. During the expedition the seep was mapped, observed and sampled.

Seismic investigations of the seep location indicate an up-folded structure in the underground which has no morphological expression on the seafloor and a bottom simulating reflector (BSR) at about 1245 mbsf. The axis of the structure is marked by a fault. Elevated heat flow measurements (71 mW/m^2) in the border area of the seep are indicative of a vertically upward directed fluid flow. Multiple parasound profiles across the location showed blanking of all sedimentary reflections in the center (about 100-200 square meters) indicating ascend of gas and a small, above seafloor expression of about 5-10 m height. A profile of water samples taken across the location revealed two distinctive methane anomalies with methane concentrations up to 36,000 nl, one near the seafloor and another one around 1000 m water depth. Visual observations of the Simeulue Seep exhibit a characteristic zonation. The outer most part of the seismic blanking area shows normal marine sediments with signs of bioturbation. Then, many small white spots, probably carbonates, appear. Soon after, towards the center of the seep area, black, sulfidic, patchy carpets are observed. In some of these, white bacterial mats are present. An outcrop of massive carbonate is located in the middle of the seep site. In same parts of this outcrop, the cracks between the single carbonate blocks show sulfidic sediments and possibly bacterial mats. Associated with these locations

are large numbers of white crabs (*Munidopsis* sp.) about 10-15 cm in diameter. Other seep fauna that has been observed are Vestimentifera and mytilid bivalves.

Cores taken in the seep area reveal a continuous, massive carbonate layer in a sediment depth of about 120 cm, probably representing a fossil seafloor. Below this depth yellowish glendonite minerals are found. These minerals are interpreted as pseudomorphs of ikaite minerals and are usually linked to formation in cold waters of high latitudes. While a relationship between ikaite/glendonite formation in cold waters and at methane seep locations has been described, the formation mechanisms at equatorial sites is yet unknown.