



## **Physical properties of methane-enriched plumes along the Hikurangi margin of New Zealand: Thoughts on sources and life spans of water column methane anomalies**

D.F. McGinnis (1), **K. Faure** (2), J. Schneider von Deimling (3), J. Greinert (4)

(1) Surface Waters - Research and Management, Eawag, Kastanienbaum, CH-6047, Switzerland, (2) GNS Science, National Isotope Centre, Lower Hutt, New Zealand, (3) IFM-GEOMAR, Wischhofstr. 1-3, 24148 Kiel, Germany, (4) Renard Centre of Marine Geology, University Gent, Belgium

We explored methane distribution and physical mixing processes at active areas with CTD measurements utilizing a methane sensor combined with discrete water samples collected in Niskin bottles (24 bottle carousel). Evidence of a methane plume injection was obtained during a CTD cast. The plume injection is thought to be the result of a vertical advective flow driven by a source of buoyancy (e.g., heat flux, bubbles, high dissolved methane concentration). Thorpe scale analyses on the high-resolution temperature data allow us to locate turbulent overturns and the associated small- to large-scale temperature inversions. Thorpe displacement analysis shows substantial overturns of ca. 30 m at around 720 m depth that perfectly correspond with a large peak (ca. 600 nM) of methane. This is likely the final intrusion depth of a methane plume originating from the sea floor. However, it is inconclusive which buoyancy source(s) are driving the plume (e.g. heat flux, bubbles, etc.). In the corresponding profiles, a completely well-mixed ca. 35 m thick layer (in T and Sal) is observed at this location. This further suggests a local buoyancy source. Substantial energy input is required to maintain such a well-mixed structure. In absence of a supporting energy source, this signal would be vertically diffusively smeared within several days ( $t = z/Kz$ ), and much faster horizontally. Energy balances suggest that the source and

resulting upwelling are a dissolved methane-enriched thermal plume, as the number of bubbles required to produce such a plume and maintain the deep-mixed layer is too substantial.