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Submarine flatulence along the Hikurangi margin of New Zealand: Linking geochemical methane anomalies in the water column with hydroacoustic evidence of bubble transport

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High methane concentrations of up to 3200 nM have been measured in the water column along the Hikurangi margin. The methane is a manifestation of common and wide spread cold fluid seepage that is linked to considerable gas hydrate resources. Three methods were utilised to explore for active seeps: by continuous, qualitative measurement of dissolved methane gas in the water column, using a methane sensor (METS) which was attached to a CTD; by qualitative measurement of discrete water samples collected in niskin bottles on the CTD; and by hydroacoustic detection of gas bubbles with a single beam echosounder. Prior to cruises on the TANGAROA RV in 2006 and the SONNE RV in 2007, only a few studies have been performed in this region. Here we present data of methane distribution from three different seep locations along the Hikurangi Margin. The Rock Garden seep site is in the northern part of the Hikurangi margin and occurs at the gas hydrate stability boundary (about 700m water depth in this area). The Omakere Ridge site is also in the northern Hikurangi margin, but occurs within deeper waters (1200m). The Wairarapa area is in the southern Hikurangi margin and is only 6 miles offshore (about 1200m depth) in the Cook Strait. Qualitative methane data have been obtained by onboard GC-based analyses using head-space equilibrium and vacuum extraction methods. The ability to define and corroborate by

direct measurement, narrow (10-15m wide) methane anomalies in the water column was made possible only by the availability of a very responsive METS. Hydroacoustic flare imaging shows that bubble release is a common process at almost all of the 12 studied seep sites. Particularly at Rock Garden, ROV observations show pulsed bubble release with outbursts lasting minutes. The fate of methane along the Hikurangi margin will be discussed based on CTD-cast sections across seep sites and detailed sampling at seeps and in flares. The results are linked with bubble dissolution models, incorporating ADCP current data, physical water column properties, bubble-induced advection as studied by thermistor-moorings and knowledge about currents and eddies in the area.