



## **Full-waveform inversion of bottom-simulating reflections and anomalies in the regional gas hydrate stability zone beneath Porangahau Ridge, New Zealand**

**G. Crutchley** (1), A. Gorman (1), I. Pecher (2) and S. Henrys (3)

(1) Geology Department, University of Otago, Dunedin, New Zealand (cruaga548@student.otago.ac.nz), (2) Institute of Petroleum Engineering, Heriot-Watt University, Edinburgh, UK, (3) GNS Science, Lower Hutt, New Zealand

1-D full-waveform inversion methods have been applied to reflections beneath two anticlines of the Porangahau Ridge system to investigate their fine-scale velocity structure with respect to the gas hydrate system. Beneath the western Porangahau Ridge, a strongly-reflective dipping amplitude anomaly extending upwards from the bottom simulating reflection (BSR) is characterised as comprising a high-velocity zone overlying a low-velocity zone. We interpret the high velocity zone as caused by gas hydrate partial saturation, and the low-velocity zone as caused by free gas partial saturation. Beneath the eastern Porangahau Ridge, we observe a strong BSR close to the apex of the anticline. The intensity of the BSR decreases markedly away from the apex towards the limbs. Eight evenly spaced inversions, spanning  $\sim 1$  km from the apex into the western limb, revealed significantly more pronounced low-velocity zones (at the BSR level) close to the apex compared with further westward. The low-velocity zones are again interpreted as due to free gas partial saturation. Our results, in particular the evidence of elevated gas hydrate saturation beneath the western ridge, support previous suggestions that highly-concentrated gas hydrate deposits on this margin are likely to be associated with fluid flow focussing.