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How the gas hydrate system gives insight into subduction wedge dewatering processes in a zone of highly-oblique convergence on the southern Hikurangi margin of New Zealand

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The southern end of New Zealand's Hikurangi subduction margin is characterised by highly-oblique convergence as it makes a southward transition into a right-lateral transform plate boundary at the Alpine Fault. Long-offset seismic data that cross part of the offshore portion of this transition zone give new insight into the nature of the plate boundary. We have carried out 2D pre-stack depth migrations, with an iterative reflection tomography to update the velocity field, on two seismic lines in this area to investigate fluid flow processes that have implications for the mechanical stability of the subduction interface. The results show distinct and focused fluid expulsion pathways from the subduction interface to the shallow sub-surface. For example, on one of the seismic lines there is a clear disruption of the gas hydrate system at its intersection with a splay fault – a clear indication of focused fluid release from the subduction interface. The seismic velocities derived from tomography also highlight a broad, pronounced low velocity zone beneath the deforming wedge that we interpret as a thick zone of gas-charged fluids that may have important implications for the long-term frictional stability of the plate boundary in this area. The focused flow upward toward the seafloor has the potential to result in the formation of concentrated gas hydrate deposits. Our on-going work on these data will include amplitude versus offset analysis in an attempt to better characterise the nature of the subduction interface, the fluids in that region, and also the shallower gas hydrate system.