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Three-dimensional seismic imaging of the Subtropical Front offshore New Zealand

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Offshore New Zealand, the Subtropical Front (STF) is an important boundary separating warm, saline subtropical waters (STW) of the Tasman Sea and Pacific Ocean from the relatively cool, fresh subantarctic waters (SAW) of the Southern Ocean. In the region off the southeast coast of the South Island, the STF is located near the shelf break and it is associated with the northeast-flowing Southland Current. Two-dimensional reflection seismic data, mostly acquired by the petroleum industry, have previously been used to study mixing processes associated with the STF. In these data, water masses and their boundaries have been identified, and reflective features interpreted to be sub-mesoscale to mesoscale eddies have been frequently observed. Here we present results from a serendipitously acquired petroleum-industry 3D seismic survey in the same region. The seismic data are complemented by Conductivity-Temperature-Depth (CTD) profiles acquired by a chase boat following the seismic vessel. The data provide insight into the 3D structure and lateral variability of reflective features in the seismic images, including internal waves and a mesoscale eddy containing STW. Identification and interpretation of oceanographic features are corroborated using synthetic seismograms computed from the CTD data.