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Stratigraphy of the southern Norfolk Ridge and the Reinga Basin: a record of initiation of Tonga-Kermadec-Northland subduction in the southwest Pacific

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Seismic-stratigraphic interpretations of a large new 2D seismic-reflection dataset from the Reinga Basin region northwest of New Zealand constrain the history of Cretaceous fragmentation of Gondwana and Cenozoic initiation of Tonga-Kermadec-Northland subduction. The southern Norfolk Ridge system lay in a proximal location to plate boundaries that were active during both Cretaceous and Cenozoic events, and persistent marine conditions led to a relatively complete record of sedimentation. Cretaceous extension was followed by regional subsidence and transgression. Two Cenozoic contractional events are separated by substantial (>1 km) subsidence. Late Eocene contraction led to reverse faulting and folding between New Caledonia and the southern Norfolk Ridge system, and topographic highs created in the north-western sector were locally eroded by wave abrasion. Reinga Basin was located at the southern tip of this event, which had only limited impact in adjacent northern New Zealand. Regional Oligocene and Miocene subsidence was contemporaneous with Late Oligocene and Early Miocene emplacement of nappes in northern New Zealand, and the onset of arc volcanism. Early Miocene contraction in the Reinga Basin led to formation of the Wanganella Ridge. These events can be related to calculated plate motions, and are shown to be consistent with models of induced subduction nucleation that require c. 150 km of convergence. The first contraction is associated with regional inception of Tonga-Kermadec subduction, whereas Oligocene to Miocene events and the onset of Hikurangi-Northland subduction were in response to a local change in plate boundary displacement rate and consequent linkage between subduction north of New Zealand with Alpine Fault formation farther south.