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# KARMA reveals true origins of the Kermadec Ridge, north of New Zealand

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The Kermadec Ridge, a bathymetric high slightly trenchward of the active volcanic arc, north of New Zealand, has long been thought to be a volcanic feature. New seismic reflection and potential-field data, collected between 34.3 and 35.3°S as part of the Kermadec Arc MinerAls (KARMA) cruise (May 2010), across the Havre Trough back-arc basin and Colville and Kermadec Ridges, to the west and east respectively, suggest otherwise. These data show that the Kermadec Ridge consists of a 0.5-1 km thick sequence of trenchward tilted and actively back-faulted units, with clear sedimentary stratification, that continue beneath the young, horizontally stratified sediments of the Raukumara fore-arc basin to the east. The Colville Ridge consists of thin cover sequences of faulted sediments overlying a seismically massive volcanic basement indicative of a defunct volcanic arc. Flanking the Colville Ridge to the east is a 10 km wide perched sequence of sediments, previously described as the 'Western sub-basin', which are truncated by a 0.4 km high escarpment. This sub-basin is deeply dissected by faults, some still active. Eastward, the Havre Trough is characterised by volcanic complexes and small fault bounded sedimentary basins over a seismically massive basement. The 3 km-deep seafloor makes it one of world's deepest back-arc basins. Early hypotheses of seafloor spreading have been discarded with high rates of extension within what is arc crust instead being partially accommodated through dike intrusion. However, magnetic data provide constraints on the age of the basins. Correlation of the thickness and character of sediments within the 'Western sub-basin' and those forming the Kermadec Ridge lead us to hypothesise that these form the rifted sections of a fore-arc basin associated with the then-active Colville Ridge. Eastward migration of the Kermadec subduction system led to initiation of back-arc rifting, now seen as the c.180 km-wide, 2700 km-long, Lau-Havre-Taupo rift system, within the former fore-arc basin. Flexure of the plate near the present-day Kermadec Trench has led to the tilting of the old fore-arc basin sediments into the new fore-arc high and the formation of the Raukumara fore-arc basin.