

Volcanism at the western termination of the Charlie- Gibbs Fracture Zone, offshore Newfoundland

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We describe a previously unrecognised mid to Late Cretaceous volcanic province developed on thinned continental crust located along the rifted northeastern Newfoundland margin at the western termination of the Charlie-Gibbs Fracture Zone. Using seismic data, we mapped fourteen volcanic seamounts, now buried below more recent sediments. The seamounts rise 0.5 to 1.7 s twt above the surrounding basement, are about 15–20 km wide, possess a conical to flat-topped morphology, and are generally highly magnetic (up to 801 nT). These features are associated with underlying volcanic flows and sills. Based on magnetic modeling of the associated large positive magnetic anomalies, the total thickness of igneous rocks locally reaches 8 km. This magmatic upwelling occurred in the vicinity of the Charlie-Gibbs Fracture Zone and extends approximately 150 km north along the rifted continental margin. The volcanic province forms the northern boundary to the Jurassic-Early Cretaceous Orphan Basin. At this boundary, deep crustal reflectors abruptly terminate against the volcanic province, suggesting the presence of a transform margin. Similar terminations of crustal reflectors extend further into Orphan Basin along trends similar to those of pre-rift Appalachian terrane boundaries on the adjacent shelf. This suggests the existence of a pre-existing weak zone in the continental lithosphere within which a leaky transform margin developed, and may have controlled the location of final continental breakup between the Rockall and North American plates in the Late Cretaceous.