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3D ambient noise tomography across the Taiwan Strait: the structure of a magma-poor rifted margin

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Rifting along southeastern Eurasia in the Late Cenozoic led to the formation of a magma-poor rifted margin facing the South China Sea to the southeast and the Philippine Sea to the east. Further rifting along the outer part of the margin during the Middle to Late Miocene was accompanied by an extensive episode of intraplate flood volcanism that formed the Penghu Archipelago. Previous geophysical studies in the area of the Strait have focused primarily on the shallow structures of the rift basins and the depth to the Moho. In this study, we present the results of a joint Chinese and Taiwanese 3D ambient noise tomography study from which we calculate the regional-scale 3D S-wave structure of the Taiwan Strait. The S-wave model shows a thinning of the crust beneath the rift basins where, locally, thin high-velocity layers suggest the presence of intrusive bodies. The rift basins and, along the west coast of Taiwan, the foreland basin are imaged as c. 5 to 10 km thick low velocity zones that extend eastward beneath the Taiwan mountain belt. In the upper 10 km of the crust, the basaltic rocks of the Penghu Archipelago are imaged as a high velocity zone that, with depth, becomes a relatively low velocity zone. We interpret this low velocity zone in the lower crust and upper mantle beneath the Penghu Archipelago to image a thermal anomaly related to the still cooling magma feeding system and the melt reservoir area that fed the flood basalts at the surface.