Shear wave splitting across Australia

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At the global scale, shear wave splitting observations find that fast polarization directions often align with plate motion, which may represent some form of mechanical coupling between the lithosphere and asthenosphere. However, in some regions, there is considerable mismatch between plate motion and fast polarization direction, suggesting that other dynamic processes in the mantle may play a role and/or that other anisotropic fabrics, the product of prior tectonic activity, may be "frozen" into the lithosphere. The Australian plate is one of the fastest moving, yet shear wave splitting results across the continent do not align with absolute plate motion, instead exhibiting considerable regional variations. Furthermore, anisotropic tomography models require considerable variations in anisotropy within the lithosphere, suggesting that complex shear wave splitting observations are tied to the heterogeneous lithospheric structure, a product of the complex deformational history of the continent.

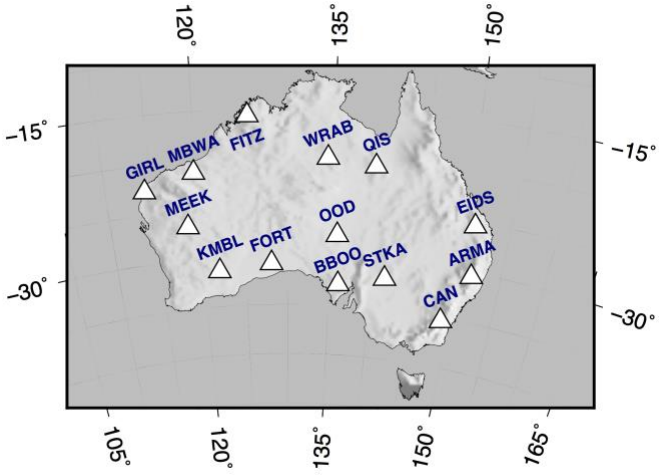

Figure:Map of stations used in this study.

To begin our assessment of depth dependent anisotropy in Australia we have made shear wave splitting measurements at 14 stations distributed across Australia. Key to our analysis is repeated measurements over a range of frequency bands (6 in total), similar to the methodology employed by Eakin and Long (2013). To limit contamination from upper mantle, source-side anisotropy, we have limited our analysis to SKS/SKKS phases from epicentral distances of 85-130°. In total, 171 measurements were made, for an average of 12 measurements per station. Calculation of shear wave splits was performed in Splitlab following methodology set out in Wüstefeld *et al.* (2008), visually inspecting data quality and checking for null measurements. Initial calculations of shear wave splitting show some variation from previously published results, but in general results are in good agreement. To increase the number of potential measurements, further analysis will be performed on particularly noisy stations using StackSplit, a Splitlab plugin, following methodology developed by Grund *(2017)*. Further constraints on the nature of Australian seismic anisotropy will be placed through the calculation of receiver functions at all stations used; this data will then be used with splitting data for a joint inversion.