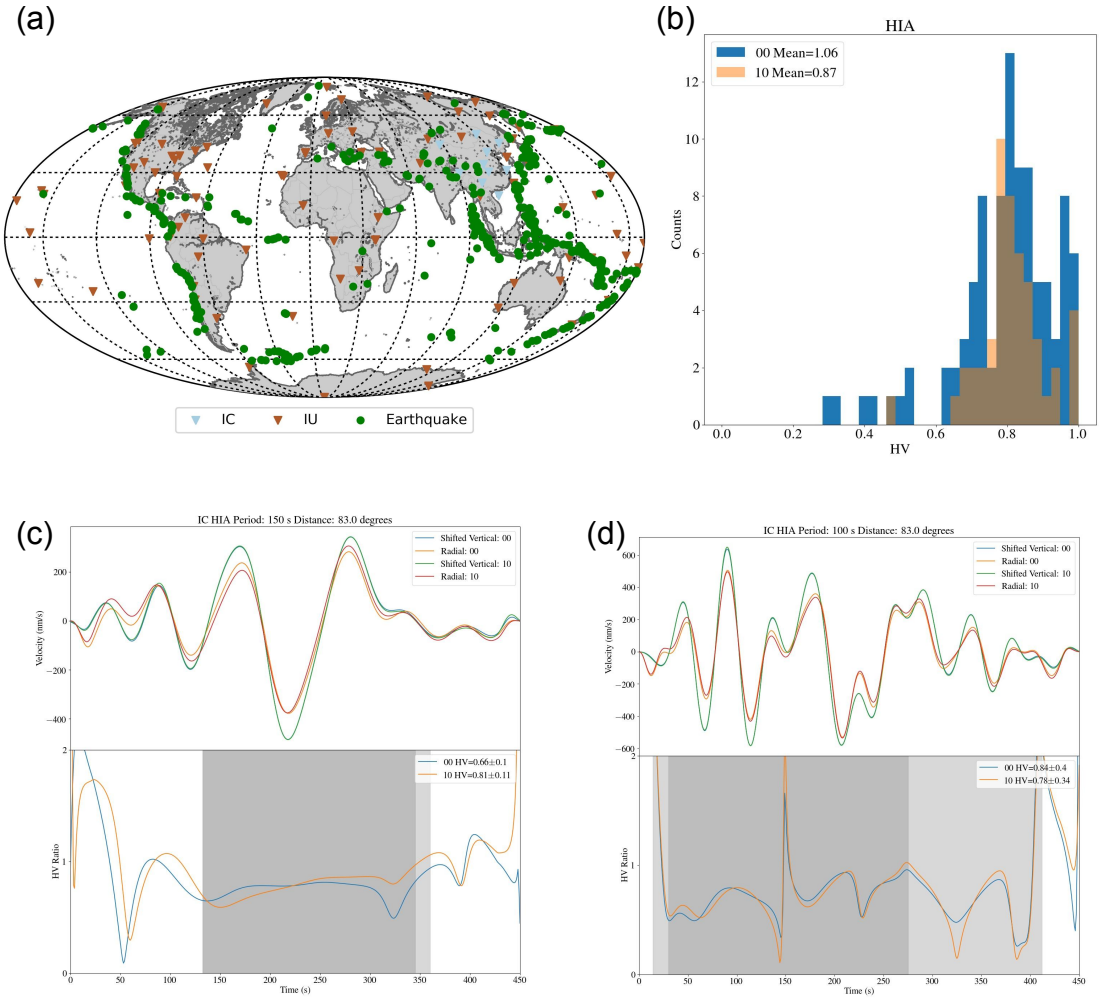
Long-period Rayleigh wave Horizontal to Vertical (H/V) ratios at a station provide additional information about local earth structure and should be controlled by local velocity and anisotropy. However, a number of studies (Ferreira and Woodhouse, 2007; Lin et al., 2012) have suggested that significant scatter appears in these measurements making it difficult to use H/V ratio measurements to resolve earth structure. Some of the scatter in these measurements has been attributed to local geological structure while some has remained unaccounted for. Most Global Seismographic Network (GSN) stations contain two nearby high-quality broadband seismometers (e.g. in the same vault, but on different piers or in different boreholes). For each broadband sensor in the IRIS/USGS component of the GSN we estimate H/V ratios of fundamental mode Rayleigh waves using M>6.5 earthquakes from 2001 to 2018 (over 4,500 measurements). We compute these ratios at a number of discrete periods (25, 50, 75, 100, and 150 s) and find that even that for well isolated Rayleigh waves (windows where the correlation between the phase shifted vertical and radial components are greater than 0.9) significant scatter in H/V ratios occurs between co-located sensors (greater than 25% at 100 s period). This suggests the scatter in H/V ratio measurements can be partially attributed to extremely local phenomena such as sensor emplacement in the vault.



(a) Events used in the study (green circles) as well as stations used in the study by network (IU brown triangles, IC light blue triangles). **(b)** Histogram of the HV ratios at 150 s period for IC station HIA (Hailar, China) for the primary STS-1 (blue, location code 00) and the secondary STS-2.5 (peach, location code 10) sensors. **(c)** An example 150 s period HV ratio calculation at HIA for the M6.8 New Caledonia event, the top shows the phase shifted vertical components (00 blue, 10 green) as well as the radial components (00 orange, 10 red). The windows where the calculations are made shown in the lower panel windows (grey, correlation greater than 0.9). The HV envelope ratios are shown for both sensors (00 blue, 10 orange). **(d)** Same as **(c)** but for a center frequency of 100 s period.