# Ambient Earth Noise: A Survey of the Global Seismographic Network

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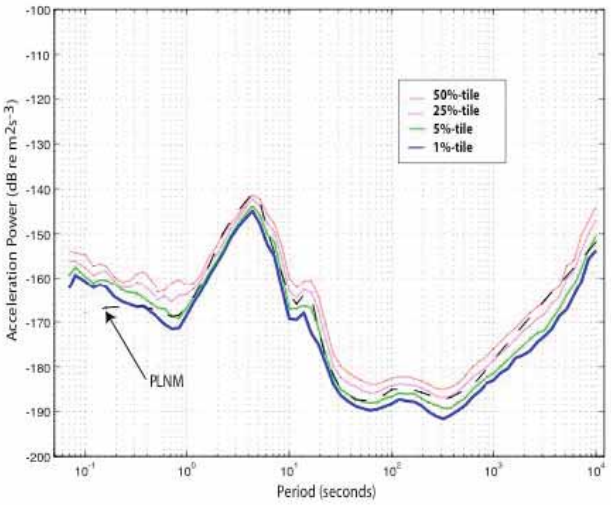
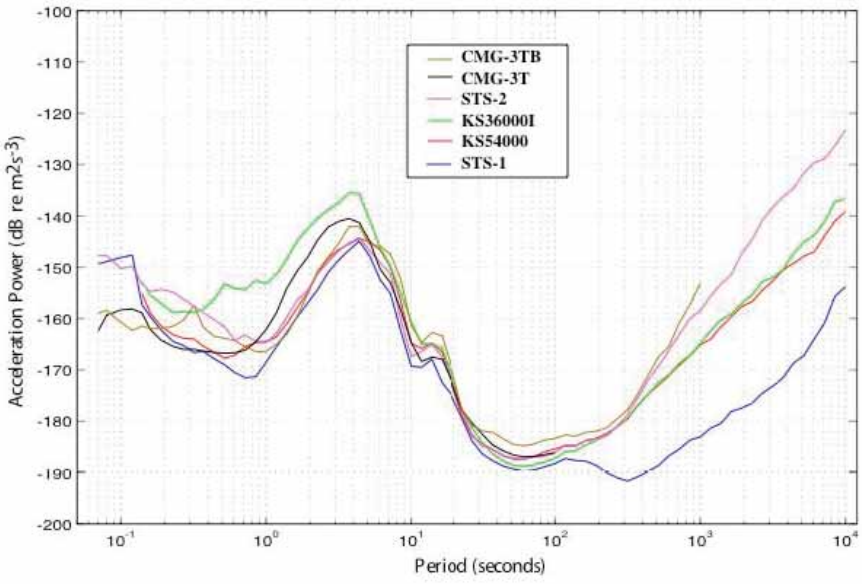
In the decade since the last comprehensive model of ambient earth noise was published (Peterson Low Noise Model, Peterson, 1993), observations of ambient earth noise from the IRIS Global Seismographic Network of widely distributed, similarly equipped, and well-calibrated stations have become available. We have analyzed data from the 118 GSN stations operating during the year July, 2001, through June, 2002. Based upon over 738,000 hourly spectral estimates computed from these stations' data, we have developed a robust noise model that exhibits significant differences from previous models both in the normal mode and body-wave bands.

The figure at the right shows our results for the various percentile distributions of the spectral estimates of GSN noise levels. Over most of the bandwidth covered by the GSN, the 1st percentile spectral values are significantly lower than those of the Peterson Low Noise Mode (PLNM). The exception to this is for periods less than about 0.4 seconds. Here the minimum spectral values of the GSN Noise Model are significantly higher than those for the PLNM. As Peterson (1993) noted in his analysis, there was inadequate data to determine the noise for periods shorter than 0.5 seconds - the data set from the latter two stations consisted of a single 4096–sample section.




The GSN minimum noise levels at the 1st, 5th, 25th, and 50th percentiles for all station and channels with the Peterson low noise model for comparison.

The minimum horizontal component noise levels are less than the vertical component noise levels through the microseism band but considerably higher for periods longer than about 30 seconds. There is no systematic bias between the levels of the two directions of horizontal noise. At long periods, some of the horizontal component noise may be caused by local atmospheric pressure fluctuations but a more likely source is thermally induced tilt. The lowest horizontal-component noise levels are observed at stations where the seismometers (all STS-1) are located in tunnels or very well-insulated vaults. All minimum noise levels, both horizontal and vertical, are observed on STS-1 seismometers for periods longer than 1.4 seconds. At periods longer than about 120 seconds, the observed vertical component minimum noise levels are lower than the theoretical KS54000 seismometer instrument noise. At periods longer than about 300 seconds, the observed vertical component noise levels are close to the theoretical STS-1 seismometer noise. These results point to the need for improved seismometers at many of the stations.




The GSN 1st-percentile noise plotted by sensor.