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S11A-3 0830h POSTER

GEOGRAPHIC AND SEASONAL VARIATION OF MICROSEISMIC NOISE

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We estimated seismic noise spectra using a robust power spectral scheme for over 100 FDSN stations in the period band from 0.2 to 10,000 s. We use an average of 270 time-series per station per channel which are distributed evenly through both time of day and season. The main feature for periods under 20 s is the microseismic peaks, for which the seismic noise levels are similar for the vertical (Z) and the horizontal (N-E) components. The amplitude of the primary microseismic peak at about 15 s period, caused by ocean swell, shows a variation in amplitude of about 14 db (a factor of 5) and little correlation with geographic location of the stations. In contrast, the amplitude of the microseismic peak at about 5 s varies by about 40 db (factor of 100) and is strongly correlated with geographic location, island and coastal stations having larger amplitudes than stations located in the middle of the continents. The amplitude of each of these peaks is, on average, 8 db higher during summer months than during the winter in the northern hemisphere. Southern stations show less seasonal variation, but are also noisier during local winter. Power spectral estimates of noise from samples taken between the months of October to March show larger content of longer periods (up to 9 s), possibly resulting from the increased presence of storms during these months. The main variation for all stations at periods shorter than 1 s is due to differences between night and day. As a whole FDSN stations are 5 db quieter between the local times of 0-6 hours than between 6-18 hours. At periods between 50 and 1000 s the main feature is that the horizontal components are an average of 40 db noisier than the vertical. Diurnal variations of 5 db are observed between 300-1000s.

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Spatial and Temporal Variation of Seismic Noise at the FDSN Stations

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We are estimating seismic noise levels for the three components of over 100 FDSN (Federation of Digital Seismic Network) stations in the period band from 0.2 to 10,000 s.An average of 270 time-series per station per channel are used in a robust power spectral scheme that has the advantage of eliminating outliers. Whenever possible we used the broad-band (BH?) and very-long-period (VH?), high-gain channels. If these channels are not available we used the long-period (LP?) and mid-period (MH?) channels. For the CDSN and DWWSSN stations we used the triggered channels for periods less than 10 s.
In general, the seismic noise levels for the vertical (Z) components are the same as for the horizontal (N-E) components at periods below 20 s.However, between 50 and 1000 s the horizontal components average 40 db noisier than vertical components. At longer periods the difference diminishes. All stations show similar variations when we analyze the data by time of the day. When we average all the stations, we find that for periods between 0.2 and 1 s, the noise is 5 db lower between 0 and 6 hours (local time for each station), than between 6 and 18 hours, with intermediate values for time-period between 18 and 24 hours. At periods between 300 and 1000 s there are night-day variations of about 5 db. The main feature of the noise estimates is the micro-seismic peak at periods between 2 to 15 s, with a median value of -120 db at 5 s for all the FDSN stations. The spatial variation in the micro-seismic peak is strongly correlated with the distance of the station to the large oceans.The island stations in the Pacific are the noisiest with values of nearly -100 db at 5 s. In contrast, stations within the continents often have values close to -140 db. The median value for all northern hemisphere stations analyzed by season shows that during the "Spring and Summer" (April-September) the seismic noise level for the FDSN stations is about 5 db lower at 2-15 s than for the "Fall and Winter" (October-March).Though we have not analyzed all of the southern hemisphere stations, the stations analyzed to date show the opposite trend with April to September being slightly noisier. There are no strong, consistent seasonal trends outside this period range.

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