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Polarized Earth's Ambient Microseismic Noise

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We quantify, analyse and characterize the frequency-dependent microseismic noise recorded by worldwide distributed seismic stations. Microseismic noise is generated through the interaction of ocean waves. It is the strongest ambient noise and it is observed everywhere on Earth. We introduce a new approach which permits us to detect polarized signals in the time-frequency domain and which we use to characterize the microseismic noise. We analyse 7 years of continuous seismograms from the global GEOSCOPE network. Microseisms are dominated by Rayleigh waves and we therefore focus on elliptically polarized signals. The polarized signals are detected in the time-frequency domain through a degree of polarization measure. We design polarization spectra and show that microseismic noise are more strongly polarized than noise in other frequency bands. This property is used to measure the directions of the polarized noise at individual stations as a function of time and frequency. Seasonal variations are found for the back azimuths and for the number of polarized signals at many stations. We show that the back azimuth directions are robust measurements that point towards the source areas computed from ocean wave models.