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The Origin of Ocean Microseisms

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Non-linear wave-wave interactions in the world's oceans are a continuous source of seismic energy resulting in what is often referred to as ocean microseismic (OMS) noise. The seismic energy results from unattenuated pressure oscillations on the seafloor resulting from the non-linear wave-wave interaction of opposing waves at the ocean surface. Observations of the timing, frequency, and geographic distribution of these seismic signals correlate well with the frequency spectrum and geographical distribution of ocean swell amplitude. The physics of ocean microseismic generation, demonstrated theoretically and experimentally decades ago, suggests that acoustic resonance in the water column may be an important condition for generation. Application of the theory to ocean wave action models (WAMs), bathymetry, and seismic data suggests that certain regions of the world have a higher potential for generating ocean microseims. Analysis of WAMs and seismic data from these regions during times of high ocean microseismic excitation shows strong spatial and temporal correlations between the timing of OMS excitation, the amplitude of OMS observations, and theoretical predictions, suggesting that resonance is the dominant mechanism for OMS generation.