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Ocean wave properties, and implications for seismic noise from 1 to 300 s period

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The Longuet-Higgins and Hasselman theory of seismic and acoustic noise generation has been expanded recently from Rayleigh waves only to body waves, including a strong seismic source reduction for ocean waves in finite water depth, which is very important for periods larger than 30 s (Ardhuin and Herbers 2013). In spite of uncertainties of seismic propagation effects, the theory is very well verified for periods 2 to 10 s. This verification required the improvement of directional wave properties represented in numerical wave models, in particular due to coastal reflection. Efforts are still required to improve the variability of shoreline reflection coefficients. We are now expanding the direct modeling of wave-generated noise towards lower and higher frequencies. At high frequencies, the variability of modeled directional properties are poorly represented, as revealed by new measurements of wave spectra. This results in a poor performance of the direct model compared to ocean bottom acoustic data, and will require an upgrade of wave generation and dissipation parameterizations. For longer periods, the theory for wave propagating over varying water depths (Hasselmann 1963) provides good order of magnitude for the vertical motion recorded from 10 to 300 s. However, some uncertainties remain due to imperfect knowldge of bottom topography and ocean wave coherence properties.