EGU22-6580, updated on 11 Aug 2022
https://doi.org/10.5194/egusphere-egu22-6580
EGU General Assembly 2022


# Quantifying microseismic noise generation from coastal reflection of gravity waves using DAS

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Secondary microseisms are the most energetic noise in continuous seismometer recordings, and they are generated by interactions between ocean waves. Coastal reflections of ocean waves leading to coastal microseismic sources are hard to estimate in various global numerical wave models, and independent quantification of these coastal sources through direct measurements can therefore greatly improve these models. Here, we exploit a 40 km long submarine optical fiber cable located offshore Toulon, France using Distributed Acoustic Sensing (DAS). We record both the amplitude and frequency of ocean gravity waves, as well as secondary microseisms caused by the interaction of gravity waves incident and reflected from the coast. By leveraging the spatially distributed nature of DAS measurements, additional fundamental information are recovered such as the velocity and azimuth of the waves. On average, 30\% of the gravity waves are reflected at the shore and lead to the generation of local secondary microseisms that manifest as Scholte waves. These local sources can give way to other sources depending on the characteristics of the swell, such as its azimuth or its strength. These sources represent the most energetic contribution to the secondary microseism recorded along the optical fiber, as well as on an onshore broadband station. Furthermore, we estimate the coastal reflection coefficient R$^2$ to be constant at around 0.07 for our 5-day time series. The use of DAS in an underwater environment provides a wealth of information on coastal reflection sources, reflection of gravity waves and new constraints for numerical models of microseismic noise.