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Observing and modeling microseism source distribution

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The interaction ocean gravity waves travelling in opposite directions create second order pressure fluctuations at the ocean bottom. These pressure fluctuations generate Rayleigh waves that are the strongest noise recorded by seismic stations. The ocean regions where these microseisms are generated are not well known. We consider both amplitude spectra and polarization spectra of seismic data to identify the strongest sources and we combine back azimuths recorded by stations in and around a given ocean to determine likely source locations. These source locations are then compared with sources derived from the IOWAGA numerical ocean wave model, by taking into account both directional and frequency spectra of the ocean waves. We observe a good agreement between both source locations which are moving over the year.

Following Longuet-Higgins (1950) and Kedar et al. (2007) we further compute synthetic seismic spectra. The IOWAGA ocean wave model enables to take into account coastal reflection and we compare real and synthetic spectra considering different coastal reflection coefficients. Depending of the station location, coastal reflection can be dominant or negligible. We obtain an excellent fit between real and synthetic spectra for most stations, and we observe that spectra of oceanic stations are better reproduced than continental station which may be explained by 3D propagation effects that are not included here.