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Delineation of microseism noise sources in the Indian Ocean.

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Microseisms are the continuous oscillations of the earth originated from the interaction of ocean waves with the solid earth. It is divided into two types, primary microseism and secondary microseism. Primary microseisms are generated by the interaction of ocean waves in the shallow coastal part and secondary microseisms are generated due to the interaction of two waves traveling opposite towards each other in the deeper or shallower part. Secondary microseism is also known as double frequency microseism band which is divided into two parts, long period double frequency microseism band and short period double frequency microseism band.

We have taken data from IRIS DMC for ten seismic stations of the year 2018. Our study area is on the Indian Ocean. Indian ocean is considered as one of the global sources of microseism noise. In comparison to the North Indian Ocean, the Southern Ocean generates very strong amplitudes of microseism noise. Storm activity of Southern Ocean is very hazardous and destructive. In addition to that, the Antarctic circumpolar current brings warm water to the Ocean. Therefore, every year it experiences multiple cyclones which play a major role in the generation of microseism noise.

In this study, we are using the frequency-dependent polarization analysis method. Our aim is to understand the spatial variation of noise and their possible sources. Power spectral density (PSD) is calculated using the spectral covariance matrix. Diagonal elements of the matrix represent the power spectra of each component (EW, NS, and Z). For analysing the spatial variation of PSD, we have used the vertical component (Z). We have observed higher PSD in the stations that are present close to the Southern Ocean and comparatively lower amplitudes are observed in the stations far away from the Southern Ocean. Back azimuth is used to determine the dominant source direction of the noise. From our results, major source direction of noise is from the Southern Ocean while minor sources are from Bay of Bengal and Arabian Sea. Clear seasonal variation in the source direction is not observed but seasonal variation in the number of polarized signals is observed indicating maximum polarized signal in the winter season and minimum polarized signals in the summer season. Combined results of spatial variation of PSD and back azimuth analysis help us to better understand the noise sources.