



Exploring the link between microseism and sea ice in Antarctica by using machine learning

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The most continuous and ubiquitous seismic signal on Earth is the microseism, closely related to ocean wave energy coupling with the solid Earth. A peculiar feature of microseism recorded in Antarctica is the link with the sea ice, making the temporal pattern of microseism amplitudes different with respect to the microseism recorded in low-middle latitude regions. Indeed, during austral winters, in Antarctica the oceanic waves cannot efficiently excite seismic energy because of the sea ice coverage in the Southern Ocean. Here, we quantitatively investigate the relationship between microseism, recorded along the Antarctic coasts, and sea ice concentration. In particular, we show a decrease in sea ice sensitivity of microseism, due to the increasing distance from the station recording the seismic signal. The influence seems to strongly reduce for distances above 1,000 km. Finally, we present an algorithm, based on machine learning techniques, allowing to spatially and temporally reconstruct the sea ice distribution around Antarctica based on the microseism amplitudes. This technique will allow reconstructing the sea ice coverage in both Arctic and Antarctica in periods when the satellite images, routinely used for sea ice monitoring, are not available, with wide applications in many fields, first of all climate studies.