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Detection and description of sources of microseismic P waves using numerical noise model

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Significant efforts and methodological developments have been made over the last decade to extract the information embedded in seismic noise records and to exploit it for imaging purpose. Although body waves are now reconstructed from seismic noise, their low energy makes their detection difficult and time consuming, if data mining is performed randomly. Here we show how numerical modelling of sea state-induced noise allows fast detection of sources of microseismic compressional (P) body waves. We apply recent improvements to compute seismic sources induced in the "double frequency microseismic" band (0.1-0.3 Hz) within typical teleseismic P distances (30-90 degrees) from southern California. The locations and relative strengths of the most significant sources are validated by the good agreement with beam-forming analysis performed at the South California Seismic Network (SCSN). The distribution of the microseismic P sources analyzed here is highly anisotropic; the sources cluster in well-defined regions, namely along the usual storm tracks in the Pacific and Atlantic oceans. These events occur in deep-ocean, at or near water depth of 2800 and 5600 km. The analysis of selected events shows in details how strong storms induce noise in their tail, confirming earlier results based solely on data analysis. The current study thus demonstrates the efficiency of recent numerical approaches at quickly and accurately locating localized microseismic P sources.