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Studying Submarine Volcanic Activity Using IMS Hydrophone Data: Detection and Implications for Ocean Noise

Little is known about active volcanism in the ocean. As eruptions are attenuated by seawater and fallout does not regularly reach the sea surface, timing and exact location of volcanic processes remain poorly constrained. This problem can be overcome by the study of long-range underwater acoustics: It has recently been shown that eruptions at Monowai, a submarine volcano in the Kermadec Arc, can be remotely detected by IMS hydrophone arrays at Ascension Island, and over a geodesic distance of ~15,800 km. In this study, we analysed 11 years of continuous measurements at station H10N to construct a long-term record of hydroacoustic activity at Monowai. Preliminary results from direction-of-arrival calculations and density-based spatial clustering suggest that more than 200 discrete episodes of volcanic activity may have occurred between March 2005 and June 2016, ranging from a few hours to weeks in length and amounting to more than 120 days in total. Hence, Monowai represents one of the predominant sources of persistent low-frequency noise in the southern Equatorial Atlantic Ocean, despite its almost antipodal location. Our findings highlight the exceptional capabilities of the IMS hydroacoustic waveform component for the scientific study of active volcanism in the global ocean.

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