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インフラサウンド及び地震波動からみた極域の多圏融合物理現象
Interdisciplinary physical phenomena within multiple spheres in polar regions inferred from infrasound and seismic waves

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Several characteristic waves detected by seismographs in Antarctic stations have been recognized as originating from the physical interaction between the solid-earth and the atmosphere - ocean - cryosphere system surrounding the Antarctic and may be used as a proxy for characterizing ocean wave climate. A Chaparral type infrasound sensor was installed at Syowa Station (SYO; 39.6E, 69.0S), East Antarctica, in April 2008 during the International Polar Year (IPY2007-2008). Matching data are also available for this time period from the existing broadband seismic recorder located close by. Continuous infrasound data for 2008-09 includes background signals (microbaroms) with a broad peak in the wave period between the values of 4 and 10 seconds. Signals with the same period are recorded by the broadband seismograph at SYO (microseisms). This period band is identified as Double-Frequency Microseisms/baroms (DFM). The DFM has relatively lower amplitudes during winter. We suggest that this is due to the sea-ice extent around the coast causing a decreased ocean loading effect. In contrast, the Single Frequency Microseisms/baroms (SFM) with a peak in period between 12 and 30 seconds are observed under storm conditions, particularly in winter. On the infrasound data, stationary signals are identified with harmonic overtones at a few Hz to lowermost human audible band, which we suggest is due to local effects such as sea-ice cracking and vibration. Microseism measurements are a useful proxy for characterizing ocean wave climate, complementing other oceanographic and geophysical data. At SYO, continuous monitoring by both broadband seismograph and infrasound contributes to the Federation of Digital Seismographic Networks, the Comprehensive Nuclear-Test-Ban Treaty in the high southern latitudes, and the Pan-Antarctic Observations System under the Scientific Committee on Antarctic Research.
Keywords: infrasound, seismic waves, physical interaction, multi-spheres, polar regions