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Shallow structure of Deception Island volcano, Antarctica, using the spatial autocorrelation method on a dense set of seismic arrays

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The spatial autocorrelation (SPAC) method to analyze ambient vibration records was introduced by Aki (1957). Currently, this method is being used for the analysis of microtremor data from a circular array of stations. Recently, Chávez-García et al. (2005) proposed the idea of exploiting recordings of microtremors over long times as a substitute for spatial averaging, and computed crosscorrelation functions between pairs of stations. The method uses microtremor data to derive a phase velocity dispersion curve in a certain frequency range. A Rayleigh wave inversion technique is subsequently applied to determine 1D S-wave velocity models for the array site.

In this work we use the SPAC method to investigate the shallow seismic structure of Deception Island volcano, Antarctica. We analyze microtremor data recorded by small-aperture seismic arrays deployed around the caldera of Deception Island. The arrays were installed during different field surveys between 1994 and 2005 at twelve sites along the coast of Port Foster. The average distances from one site to the next is about 2 km. The arrays were composed of 6-12 seismometers, with apertures ranging between 0.3 and 1.1 km. We applied the SPAC method to long time records of microtremors and estimated local 1D velocity models for each array site. The combination of these models allows us to obtain a comprehensive model of the velocity structure around the coastline, an information that could be useful to shed light on the origin of the Deception Island caldera.