SUPPLEMENTARY MATERIAL VOLCANICA

Supplementary Material for:

Numerical modeling predicts seismic resonances in the magma chamber-conduit system due to wavefield capturing

Fabian Limberger*[α,γ] and Georg Rümpker†[α,β]

[α] Institute of Geosciences, Goethe-University Frankfurt, 60438 Frankfurt am Main, Germany.
[β] Frankfurt Institute for Advanced Studies, 60438 Frankfurt am Main, Germany.
[γ] Institute for Geothermal Resource Management, 55411 Bingen, Germany.

This supplementary material accompanies the article:

> Limberger, F., and Rümpker, G. (2024) "Numerical modeling predicts seismic resonances in the magma chamber-conduit system due to wavefield capturing", *Volcanica, 7*(2), pp. 461–470. DOI: https://doi.org/10.30909/vol.07.02.461470.

Limberger & Rümpker (2024) should be cited if this material is used independently of the article.

S1 Supplementary figures

This Supplementary material file contains the following figures:

- Figure S1: For a source situated adjacent to the conduit and above the magma chamber, resonances are notably distinct and more pronounced near the conduit.
- Figure S2: Comparison between seismograms extracted along the x-axis and y-axis (perpendicular to the source). The resonances exhibit almost the identical pattern. Differences are mainly caused by P- and S-wave travel time to the receivers. In this model the conduit width is D = 20 m and the chamber radius is R = 100 m.
- Figure S3: Illustration of the impact of high-frequency waves (10 Hz, 40 Hz, and 60 Hz) on resonance characteristics. As the frequency increases and the wavelength decreases, the amplitude of the resonances noticeably diminishes. It is important to note the scaling of the y-axis. These tests were simplified by employing a two-dimensional model and using an incoming plane wave as the source. In this model the conduit width is D = 20 m and the chamber radius is R = 100 m.
- Figure S4: 2D-Model used for simulation performed for Figure 5 in the manuscript. The S-wave velocity in the conduit is systematically reduced.

Copyright

* f.limberger@geophysik.uni-frankfurt.de
† rumpker@geophysik.uni-frankfurt.de

Editor: C. Montagna | Typesetter: J. Farquharson

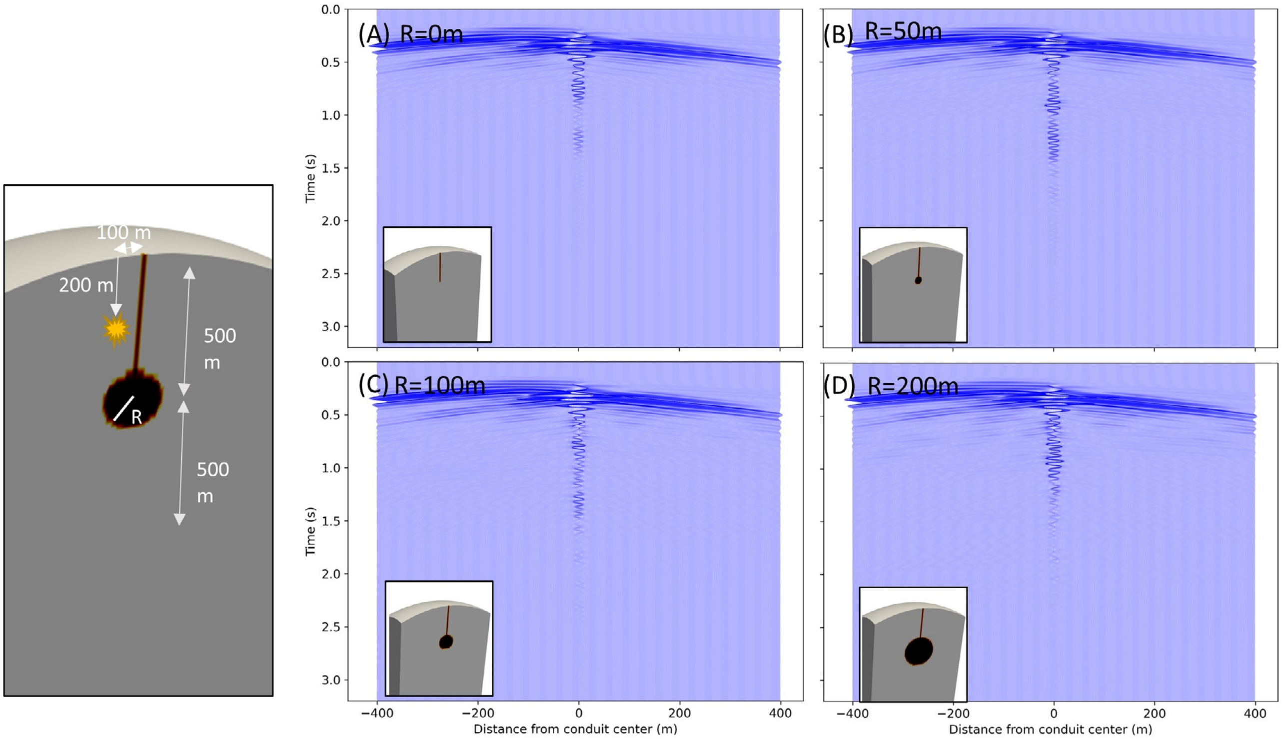

Figure S1: For a source situated adjacent to the conduit and above the magma chamber, resonances are notably distinct and more pronounced near the conduit.

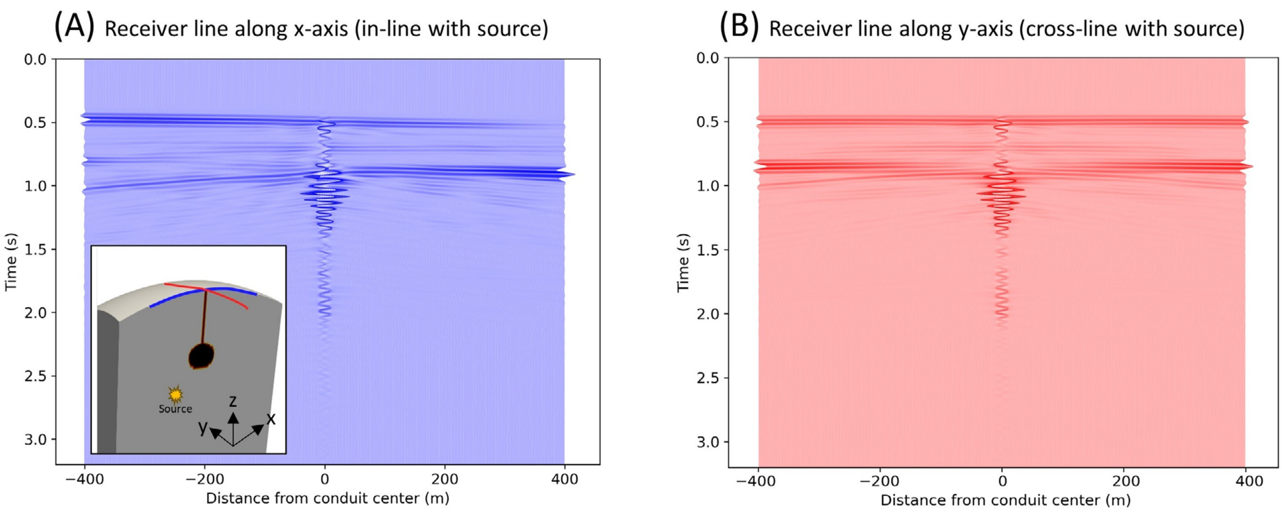

Figure S2: Comparison between seismograms extracted along the x-axis and y-axis (perpendicular to the source). The resonances exhibit almost the identical pattern. Differences are mainly caused by P- and S-wave travel time to the receivers. In this model the conduit width is D = 20 m and the chamber radius is R = 100 m.

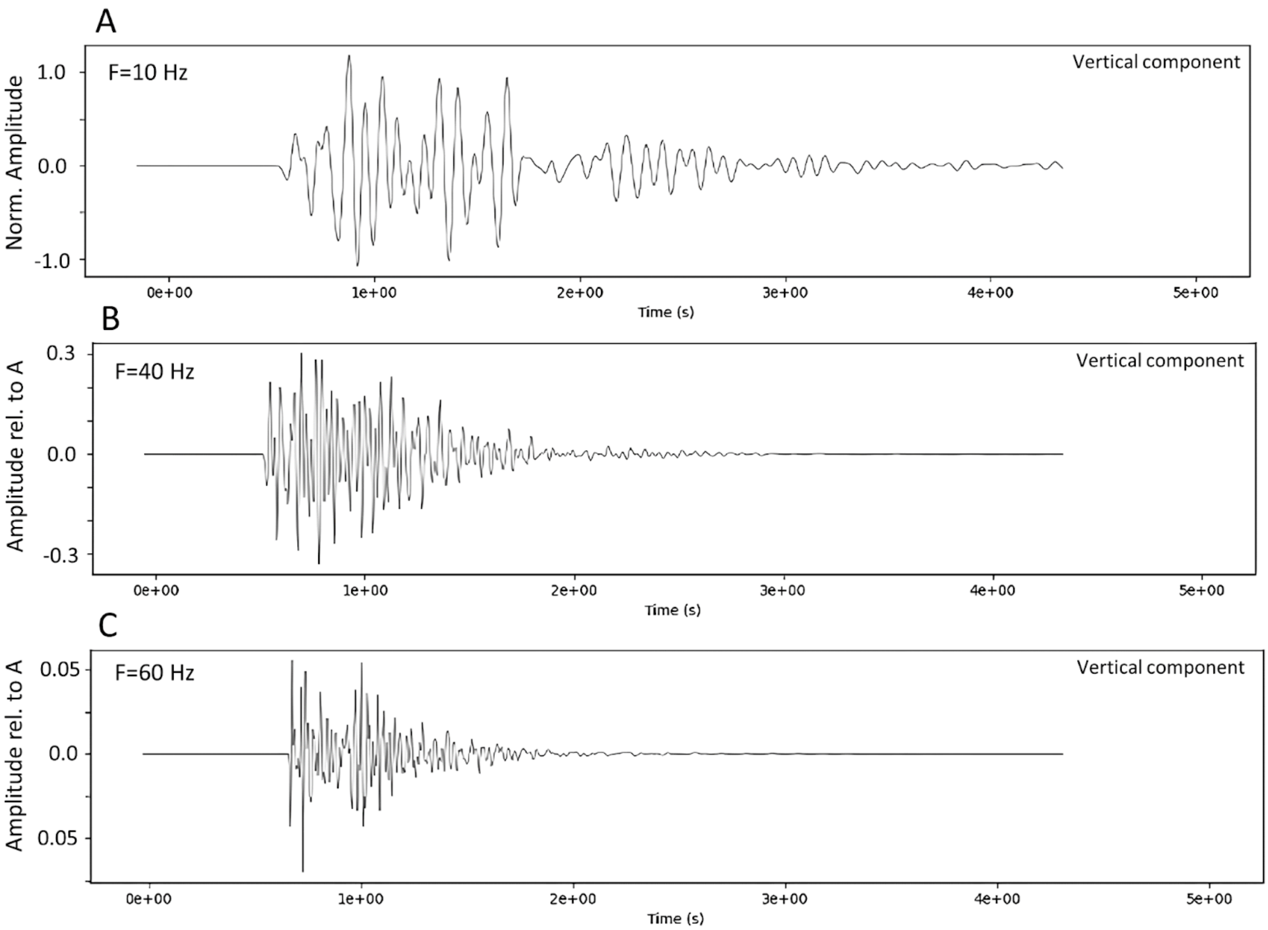

Figure S3: Illustration of the impact of high-frequency waves (10 Hz, 40 Hz, and 60 Hz) on resonance characteristics. As the frequency increases and the wavelength decreases, the amplitude of the resonances noticeably diminishes. It is important to note the scaling of the y-axis. These tests were simplified by employing a two-dimensional model and using an incoming plane wave as the source. In this model the conduit width is D = 20 m and the chamber radius is R = 100 m.

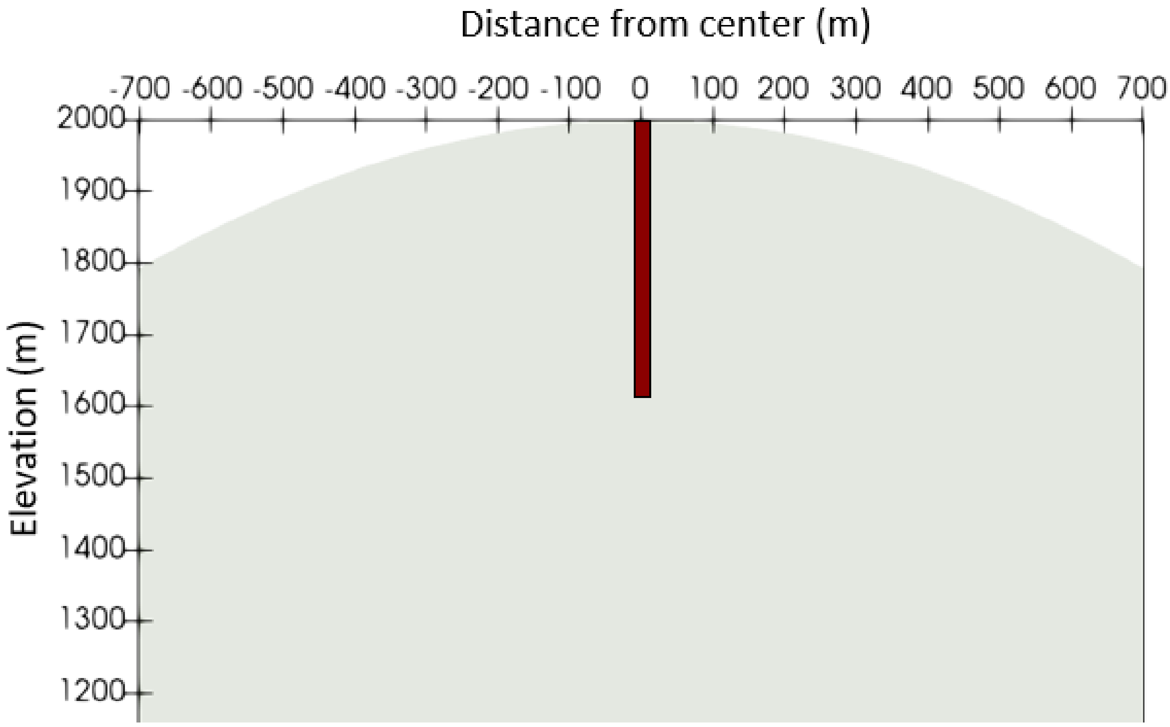

Figure S4: 2D-Model used for simulation performed for Figure 5 in the manuscript. The S-wave velocity in the conduit is systematically reduced.