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JOINT BODY AND SURFACE WAVE TOMOGRAPHY APPLIED TO THE TOBA CALDERA COMPLEX (INDONESIA)

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Abstract. We developed a new algorithm for a joint body and surface wave tomography. The algorithm is a modification of the existing LOTOS code [*Koulakov*, 2009] developed for local earthquake tomography. The input data for the new method are travel times of P and S waves and dispersion curves of Rayleigh and Love waves. The main idea is that the two data types have complementary sensitivities. The body-wave data have good resolution at depth, where we have enough crossing rays between sources and receivers, whereas the surface waves have very good near-surface resolution. The surface wave dispersion curves can be retrieved from the correlations of the ambient seismic noise and in this case the sampled path distribution does not depend on the earthquake sources. The contributions of the two data types to the inversion are controlled by the weighting of the respective equations.

We present a set of synthetic tests that show that the joint inversion approach gives more reliable results than those obtained with inverting the body and the surface wave data separately. We apply the developed method to a dataset collected in the region surrounding the Toba caldera complex (north Sumatra, Indonesia) during two temporary seismic experiments (IRIS, PASSCAL, 1995; GFZ, LAKE TOBA, 2008). The results of this in-version reveal a presence of several magmatic reservoirs at different depths beneath the caldera.

Keywords: seismic tomography, ambient noise tomography, volcanoes.

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