



Ambient seismic noise tomography in the Lake Toba region, Indonesia

Jacek Stankiewicz, Trond Ryberg, and Christian Haberland

GeoForschungsZentrum Potsdam, Deep Geophysical Sounding, Potsdam, Germany (jacek@gfz-potsdam.de)

An array of 50 seismic stations deployed for 6 months in 2008 around Lake Toba in Sumatra was used to continuously record three-component short period seismic data. Daily recordings were cross-correlated for all existing station pairs to extract the Rayleigh wave components of the Green's function. The daily cross-correlations were stacked in order to improve the signal to noise ratio. As group velocities of Rayleigh waves is frequency dependent, the resulting stacks were filtered with different band pass filters. Coherent Rayleigh wave arrivals between station pairs were observed at periods varying from 2.5 to 12 seconds. These arrival times were picked for 5 different periods, and two-dimensional travel time tomography was performed with each set of arrival times. While each tomographic inversion showed the horizontal variations in surface wave velocity, the fact that at each period the waves sample different depths made it possible to observe velocity variations with depth by comparing the inversion results of different period ranges. Stability of the velocity models was tested by performing the inversion with varying parameters, and checkerboard tests were used to identify the size and magnitude of anomalies, which can be identified in the model. A number of features in our velocity model are consistent with the known geological record, like a low velocity zone underneath the volcanic Samosir Island; while other some results have not been previously documented, and can be used to test the validity of existing tectonic evolution models of the region.