Synthetic Parameter Tests for Ambient Noise Tomography

Simon Lloyd and Götz Bokelmann
Dept. of Meteorology and Geophysics, University of Vienna
simon.lloyd@univie.ac.at

Introduction

Ambient noise tomography has rapidly become a powerful tool with which seismologists throughout the world study the velocity structure of the crust and uppermost mantle using ambient seismic noise instead of earthquake recordings. Typically the noise is recorded at periods ranging from 4 to 10 seconds, as the amplitudes are highest in that range. It is called the range is called the microseismic band, and contains the noise generated by ocean waves interacting with the coast and the seafloor. It is also well suited because the noise sources are fairly well distributed, and the methodology actually requires randomly distributed sources. Newer studies are now also using shorter periods (see figures to the right). However, these studies only go as far as determining the dispersion curves or inverting for phase or group velocity maps. We are therefore curious to see if it is possible to go beyond this and determine the 5-velocity structure of the uppermost crust by inverting high frequency dispersion curves. To that end we present sensitivities and synthetic tests in the period range of 0.1 to 4 seconds, and compare them with the typically used 4-to-10 seconds band.

Sensitivity Kernels

We calculate fundamental mode Rayleigh wave phase velocity sensitivities to illustrate the dependence of measured phase velocities to 5-velocities at depth. At short periods (0.1 to 1 second) phase velocity depends only on the top few hundred meters. For longer periods the phase velocity rapidly becomes more sensitive to the 5-velocities of the mid- to lower crust. Therefore we must use the short-per-