Status of the surface wave analysis for WALPASS dataset

Shantanu Pandey, Wolfram Geissler, Xiaohui Yuan, Benjamin Heit, Wilfried Jokat, Michael Weber

Introduction:

The Walvis Ridge is the connecting link between the Tristan da Cunha hotspot and the Etendeka continental flood basalt province. This is an ideal location to get a better understanding for the plane-lithosphere interaction and the breakup of the continents. It is imperative to have a clear image of this region to put forward any kind of geodynamical model in the midst of the controversial topics like plate theory and various deep-Earth processes. Within the frame of the WALPASS project twelve broadband ocean-bottom seismometer (BBOBS) had been deployed off the north-west coast of Namibia, as well as 28 land stations in northwestern Namibia. The seismological set covers an area of approximately 400 x 800 km. Data from eleven months (BBOBS) and up to two years (land stations) are available.

We are presenting some preliminary work done on the BBOBS data set. Due to problems with internal power of the instruments, the internal clock drift could be measured at only two stations. We test ambient noise correlation to estimate the clock drift for the remaining 10 seafloor instruments. First results of surface wave inversion for land station are also presented.

Surface Wave Analysis :

The techniques used in the present work for constructing 3D Sv velocity model are spread in two distinct steps. In the first stage we have used automated nonlinear waveform inversion technique in terms of secondary observables for modeling each multi-mode Rayleigh wavefront to determine the path-average mantle S-wave speed structure (Cara and Lévêque, 1987). Secondary observables which are built from the seismogram using cross-correlation technique help reducing nonlinearity on the model parameters. In second stage we combine all one-dimensional path averaged velocity models in a tomographic inversion to retrieve the three-dimensional SV wave speed structure.

Lateral smoothing is controlled by Gaussian a priori covariance function : scale length (Lcorr = 100Km) standard deviation (σ = 0.01 Km/sec)

Depth Section

References:


Time Drift Analysis :

Seismic network on land are connected with the external clock via GPS or radio signal. This is for time-to-time synchronization of the internal clock. In the case of OBS deployment the GPS is not an option, so the synchronization is done before deployment and after retrieval. In our case the second synchronization failed due to technical problem. The difference in time during this process is commonly known as skew time. Sens-Schönfelder (2008) demonstrated the clock drift for the land stations using ambient noise cross-correlation.

For cross-correlation we used 24-hour data split into 1500s of window length which overlaps 50%. Amplitude normalization used here are defined in Bensen et al. (2007). Afterwards the cross-correlation we stacked the consecutive 20 days trace with the difference of 5 days (1-20, 6-25 and so on). In order to determine the clock drift we have cross-correlated the first trace of the correlated result with all the remaining traces (after the stacking and filtering).

Preliminary result :

* South of Walvis ridge shows high velocity (oceanic lithosphere 50-75km) feature along the shore line

* From North to Damara belt marks the boundary of continental lithosphere (below 75km).

* LAB are shown with dotted lines in the profile.

Table 1: The table show the estimation of the clock drift. In cross-correlation the time drift dip over the whole period of station work is shown along with the correction of the known skew value of WPO01 and WPO04.

References:
