Geophysical Research Abstracts,
Vol. 10, EGU2008-A-01449, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-01449
EGU General Assembly 2008

Surface wave data collected during the first Hawaiian PLUME OBS deployment

G. Laske (1), A. Markee (1), J.A. Orcutt (1), C.J. Wolfe (2), S.C. Solomon (3), J.A. Collins (4), R.S. Detrick (4), D.A. Bercovici (5), and E.H. Hauri(3)

(1) IGPP, U.C. San Diego (glaske@ucsd.edu), (2) U. Hawaii (cecily@soest.hawaii.edu), (3) Carnegie Institution of Washington (scs@dtm.ciw.edu; hauri@dtm.ciw.edu), (4) Woods Hole Oceanographic Institution (jcollins@whoi.edu; rdetrick@whoi.edu), (5) Yale University (david.bercovici@yale.edu)

During the field campaign of the Hawaiian PLUME (Plume-Lithosphere Undersea Melt Experiment) project from January 2005 through June 2007, we collected continuous seismic data at nearly 80 seismic stations. Ten broadband land stations were equipped with Wielandt–Streckeisen STS-2 seismometers, and about 70 ocean bottom sites were occupied with Güralp CMG-3T, Nanometrics Trillium 40 or Trillium 240 seismometers and a Cox–Webb differential pressure sensor. Data collected with such sensors provide the ideal basis to analyze surface waves across a broad period band.

Our initial assessment concentrates on long-period teleseismic Rayleigh waves collected during the first phase of the two-stage OBS deployment from January 2005 through January 2006. In this one-year deployment, 35 sites were occupied in an elongated array centered on the island of Hawaii, with a station spacing and average aperture of roughly 75 km and 500 km, respectively. The OBSs at 32 of these sites were recovered, with 25 providing useful vertical component or pressure records. We collected records from upward of 95 suitable large, shallow earthquakes with surface wave magnitudes 5.6 or larger and source depths less than 200 km. Records from numerous smaller events are also available and initial data inspection suggests that many of these can also be used. In the first step of our analysis, the frequency–dependent phase is measured with respect to a reference station. This primary phase database contains about 1500 unique high-quality source–receiver OBS measurements and the

land stations are projected to add another 500 data. We utilize this phase database in subsequent tomographic procedures, for example when we model two–station path–averaged phase velocity curves.

We constructed dispersion curves along numerous crossing two–station paths that are each well constrained by several earthquakes. The dispersion curves are usually internally consistent between 15 and 50 s, allowing us to image the lithosphere and upper asthenosphere. Some larger events provide constraints beyond 100 s, thereby illuminating the lower asthenosphere. We find significant heterogeneity across the array. Higher phase velocities to the southeast of the island of Hawaii resemble those of 52-100 Myr old Pacific lithosphere as found by Nishimura and Forsyth (1989) though velocities do not reach the much higher off–swell velocities found to the southwest during our 1997/98 SWELL pilot experiment. The lowest phase velocities are found to the west and northwest of the island of Hawaii, suggesting a strong asymmetry of cross–swell structure.