***Oblique Seismic Experiment Data converted to SEGY Format***

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A series of Borehole Seismic Experiments were conducted by Ralph Stephen’s group at Woods Hole Oceanographic Institution (WHOI) between 1977 and 1998. These were both Oblique Seismic Experiments (OSE) and Vertical Seismic Profiles (VSP). These data were processed and published but never put into a data repository like IRIS. This is an attempt to get these data into a format that can be widely used and to put these data into a publicly accessible data repository.

The OSE data sets are from two-ship experiments. The seismometer(s) were in the borehole down the drill pipe from the drill ship. This meant that the drill ship sat in a fixed spot. A second ship was used to steam lines and set off a seismic sound source. These sources were either explosives or towed airgun.

These data were recorded multiple ways over the years. These included Analog tapes, digitized SEGY files, and a WHOI created format on hard disk in a bottom recording package. Regardless of the recording methods these data were all converted to the ROSE format on a VAX/VMS computer. For the ROSE format see ***ARCHIVING AND EXCHANGE OF A COMPUTERIZED MARINE SEISMIC DATABASE: THE ROSE DATA ARCHIVE SYSTEM*** by Sharon L. LaTraille in 1983. We used some extra words in this format to pass information needed for our processing of these data. An example was the azimuth between the source and receiver (seismometer). We used homegrown computer programs to read these data.

Early on when these data were recorded, there was no access to GPS data as there is now in the 2000’s. Near the end of our series of these experiments accurate accessible GPS data were used. In the majority of these experiments range and bearing between the drill ship and shooting ship was used to locate the data source as the shooting ship steamed patterns around the drill ship. Radar range and bearings were taken on the drill ship’s bridge for early experiments. Some later experiments used radar ranging instruments on the 2 ships, which gave more accurate ranges, but still needed a watch on the drill ship to record bearings. These data were then processed later to get latitude and longitude of the seismic source. For early experiments that used radar information much of the data needed to be interpolated, since locations were recorded at set intervals, like every 5 minutes. Also, human reading of the radar probably put some errors or less than accurate data into the records used for navigation solutions.

Timing of these data between all of the parts of this system needed to be accurate. These experiments began before accurate satellite time data were available. Several methods were used. One method used an analog radio time code from WWV that was recorded on high precision Ultra Violet sensitive paper. These times were visually read by a human and recorded, digitized and used to get data on the analog tape into digital format. Care was used to get all of the data sources synchronized.

Over the years the recording of the seismic data and the meta-data needed for processing became automated and more accurate. Nonetheless, we do feel that we have been successful in getting the locations and timing of the multiple data streams sufficiently accurate for analysis.

The data were stored in the ROSE format on a VAX/VMS computer. This data format used a binary file format. When we were changing our computers from VAX/VMS to UNIX, I converted most of these ROSE files from a binary format to an ASCII format using the same ROSE file format, but in ASCII not binary. This ASCII format was able to be read on the UNIX computers. I was not able to find and convert every shot file from all the experiments to ASCII.

On the UNIX system I wrote MATLAB code to read the ASCII ROSE formatted data and write it out as binary SEGY formatted data. These SEGY files have been successfully read by SIOSEIS and SEGY MATLAB code available on the web. To pass the azimuth between the source and the receiver in SEGY I utilized bytes 237-240 in the trace header. This location is unassigned in the SEGY format and is available for extra information. This is passed as an integer representing tenths of a degree. To get the proper values this integer needs to be divided by 10.

Each SEGY file that I have created has data for an individual line or circle only. In this way there are many SEGY files for each experiment. The names have the experiment name, line direction and/or line “number” used in our processing, and the clamping depth below seafloor.

For each experiment there is a directory named docs. In this is a relevant publication in PDF format for the cruise. This file will have examples of the data plotted and will describe useful meta data for the experiment. Also, in the docs directory are some ASCII files with data for each shot. An example of these data are shot number, azimuth and range of the shot from the seismometer, recording gain levels, seismometer clamping depth and some other useful information unique to each experiment.