O135-P002 **Room: Poster Session Hall** **Time: May 19**

A new method determining OBS positions for the crustal structure study using airgun shootings

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The determination of OBS position is one of the key parameters for the crustal structure study using OBSs and control sources. In order to obtain precise crustal structure in the oceanic region, we developed a new method determining OBS positions using the global search method and the non-linear inversion. OBS position can be obtained by transponder distance measurements on the ocean surface. In order to obtain good location, however it is necessary to use several transponder measurements at more than three good ship positions, and it is sometimes difficult under limited available dates for a survey. In such a case, we need to use other information. In the new method, we use precise bathymetric data obtained by SeaBeam survey and water wave traveltimes by arigun shooting recorded on OBSs in addition to a few acoustic transponder distance measurements.

The determination procedure is generally divided into two steps: a global search of the best fit location and a non-linear inversion. The global search is necessary to eliminate local minimums in the linear inversion and to find a global minimum.

The global search is a step to search a group of better fitting locations over the griddling nodes around the seismic survey line using bathymetric data and water wave travel times between a particular OBS and shot positions. The search area is approximately 2km x 2km square region. Through the grid search process, we can also obtain the secondary correction term for the OBS internal clock. The primary clock correction is obtained by the time differences between the measurement just before the deployment and just after the retrieval of the OBS.

The general procedure of the global search is as follows:

1) Generating bathymetric values for 41 x 41 size grids with a grid interval of 0.0005 degrees centering at the OBS deployment position.

2) Calculating one-way traveltimes between a node and the airgun shooting points for a every node using bathymetric data.

3) Calculating the standard deviation SDr and average AVr of the differences between the observed and calculated traveltimes for every node.

4) Calculating one-way traveltimes between a node and the acoustic transponder positions for every node.

5) Calculating the root mean square (RMS) of the time differences between the observed and calculated traveltimes of the transponder for every node.

6) The OBS position should be found along the line perpendicular to the survey line with minimum SDr. The best fit node, i.e. global minimum node, is finally obtained as the minimum RMS node along the minimum SDr line. The AVr at the global minimum node is the secondary revision term for the OBS internal clock.

Using the result of the global search, we carry out the non-linear inversion. The non-linear inverse method for simultaneous least squares estimation of hypocenter and velocity parameters by Crosson (1976) is applied to the current determination of the OBS position. The traveltimes of water wave by airgun shootings, the distance measurements by using acoustic transponder, the OBS position obtained by the global search as an initial value, and the mean water wave velocity as an initial value are used to obtain the final OBS position (x, y, z), the secondary correction term for the OBS internal clock (dt), and average water wave speed (v) (optional). The Levenberg-Marquardt algorithm is used in the program.

If the OBS internal clock is accurate enough, the secondary clock correction should be less than ~20ms. If there are some bad data among the bathymetry, transponder distances and the mean water wave speed, the clock correction term will be large. In such case, we should examine dataset we used. Finally we can determine the OBS position within ~30m in location and depth. These estimation errors will be small enough for the crustal structure study using OBS and control sources.