SHALLOW WATER MULTIBEAM ECHOSOUNDING IN JAPAN HYDROGRAPHIC DEPARTMENT

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Key words: multibeam echosounding, hydrographic survey, bathymetry, nautical chart.

ABSTRACT

Japan Hydrographic Department is now on the stage that we have to use them for practical hydrographic survey to get valid soundings for nautical chart. For this purpose, guidelines for survey and data processing have been designed mainly by regional HDs. We would like to introduce our hydrographic survey systems and review practical operations of them.

INSTRUMENTS

On each 20m-type survey vessel of JHD, a multibeam echosounder SEABAT 8101, RTK-OTF GPS receivers MS750, a motion sensor DMS-10 and a GPS gyro NR230mkII are installed, and data acquisition software HYPACK on a windows PC records data from these devices. A sound velocimeter SVPS is available for sound velocity correction.

SURVEYS BY MULTIBEAM ECHOSOUNDERS

1. Sandy or muddy area

More slanted beams sometimes returns irregular soundings, since they are more refracted by sound velocity distribution, and their footprints become larger. Sandy or muddy area less than 30m depth should be planned to ensonify 100%.

2. Rocky area

In order to distinguish peaks from noises and to ensonify shaded zones behind shallows, swathes from adjacent survey lines should be enough overlapped.

3 Obstructions

When fish heavens or rocks lie on sandy or muddy shallow water (less than 4m from the sonar head), sometimes soundings are dropped (because of high contrast of reflection intensity) or second echo is recorded. Adjustment of sensitivity could handle this problem, but in worse cases doubled surveys are required: first sensitive for bottom and second for obstructions.

4 Dredged area

In case we miss foreign bodies, adjacent swathes should be enough overlapped. Since dredged face sometimes can shades dredged bottom, we should plan such survey lines that can ensonify the face and inside dredged area. Same way is applicable at wharf

frontage.

5 Patch test

In order to obtain accurate soundings, it is required to compensate biases of motion sensor and time latencies. Latency of a positioning device (especially RTK-GPS) is remarkable. When sonar head is permanently installed on the under-hull, changes of these biases are not expected to be large. It is recommended to set a fixed ‘ test area’ around a specific topographic feature and to perform patch test in the same area every time.

DATAPROCESSING

As all steps proceed in digital form from survey work to data processing, enormous data files require careful handling: unintended removal or damage of data files is fatal on data processing.

Here we figure out the points to survey efficiently and to obtain valid soundings for nautical chart.

1. Checking irregular values of motion sensor

It is sometimes reported that motion sensors output irregular values in some condition. In such cases, soundings are compensated wrongly. It is important to check outputs of motion sensors and remove such irregularities.

2. Removal of noises and consideration of shallows

Where shallows such as fish heavens exists, their peaks are doubtful; floats or noises may cover their true bottom. In such cases, it is required to cover the object by enough beams of different angle from adjacent survey lines and to check if same feature appears. Where artificial features presumably exists such as dredged area or wharf frontage, same step is required.

3. Valid sounding range in a swath

As beams get slanted, deviation of soundings increases: as much as 1m at the edge. We need to limit range to adopt soundings in the swath. Permitted deviation of soundings is less than 20cm (±10cm) in flat area.

Comparison between SEABAT8101 and conventional single beam echosounder is reported. In this report, soundings by SEABAT8101(processed surface modeling) are compared with single beam soundings along a verification line orthogonal to the previous survey(consequently, along the direction of the swath of SEABAT).. This conclusion is that soundings within 65° angle can be adopted.

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BIOGRAPHICAL NOTE

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