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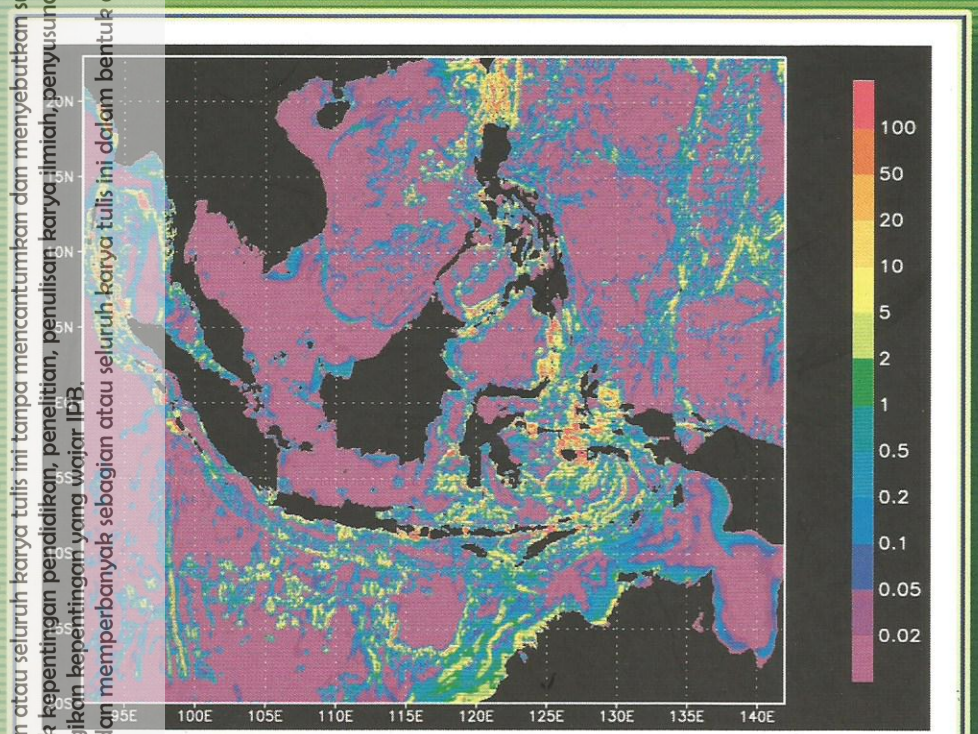

Distribution of diapycnal diffusivity vertically averaged throughout the water column

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APPLICATION OF SEISMIC DATA PROCESSING FOR SEABED IMAGING

Henry M. Manik [1)] and Susilo Hadi [2)]

Abstract. The research was conducted in April-May 2010 in North Maluku waters belonging to the District Luwuk Banggai, Central Sulawesi Province. This area is located at coordinates 2 ° S - 4 ° S and 123 ° E - 126 ° east. Data processing was done at Ocean Acoustics Laboratory, Department of Marine Science and Technology, Bogor Agricultural University and Marine Geological Institute (MGI) in Bandung. Seismic data processing using the data in SEG-Y format. The data was computed with Seisee software and band pass filtering using Matlab. Based on the results of research, it is evident that increasing the frequency band was followed by the higher the resolution. Sampling point 30 in the form of sandy clay sediments has an impedance value of 2.49 and the value of reflection coefficient of 0.23. While the sampling point 31 in the form of silty clay in the study showed the value of the impedance of 1,93 with the reflection coefficient of 0.11.

Keywords: *Marine Geology, Seismic*

1. Introduction

Developments in science and technology is increasingly in the field of marine exploration. This we can see from the many activities of the underwater exploration such as oil, sea water, energy and other minerals contained therein (Clay and Medwin, 1998; Drijkoningen, 2003). It is also a lot of mapping-related sedimentation, structural geology, disaster-prone areas, and military interests on the territory under the sea in an area (Robinson and Treitel, 1980).

The survey which is currently widely used for marine interests include bathymetric surveys, magnetic surveys and seismic surveys (Bullen, 1959). Seismic surveys are the methods currently used to determine the structure of the seabed, the depth of the sea, oil and gas and sediment (Kearns and Boyd, 1963; Hasanuddin, 2005). Seismic reflection work to change the speed as a function of depth as well as record and use all the recorded wave field (Lubis et al, 1999). Seismic exploration is divided into two namely reflection of shallow seismic and deep seismic in the usually used to find oil and gas hydrocarbons (Trabant, 1984; Lurton, 2002).

This study aimed to quantify the frequency of seismic resolution by using band pass filters processing.

2. Research Method

This study is one of a series of marine seismic surveys conducted by the Marine Geological Institute in North Maluku waters belonging to the District Luwuk Banggai, Central Sulawesi Province. This area is located at coordinates 2 ° S - 4 ° S and 123 ° E - 126 ° E (Figure 1). Processing of seismic data was conducted in August-December 2010 at the Ocean Acoustics Laboratory of the Department of Marine Science and Marine Technology, Faculty of Fisheries and Marine Sciences, Bogor Agricultural University and the Marine Geological Institute (MGI) in Bandung.

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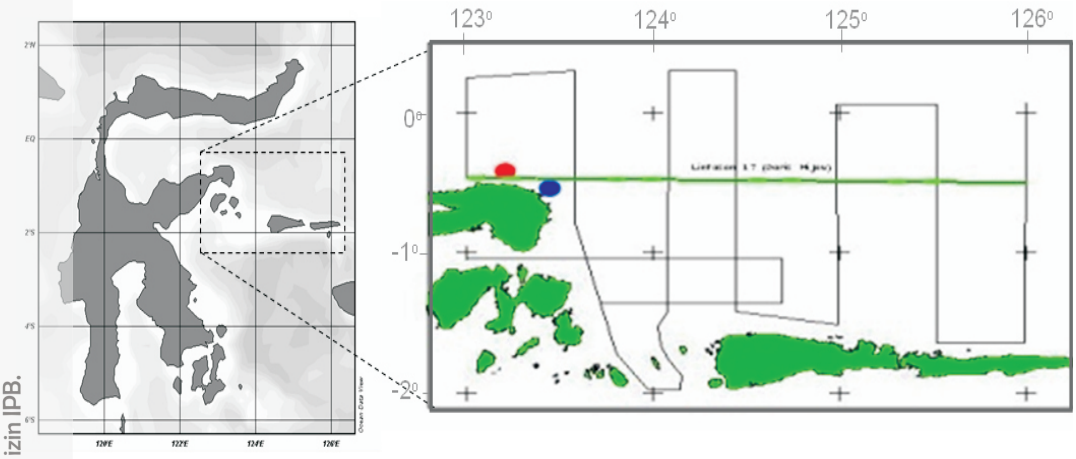

Figure 1. Survey Location.

The flow of this study was shown in Figure 2 and 3. In this survey we also conducted sediment sampling using Gravity Corer and Grab. Sediment is analyzed to obtained the value of the impedance and reflection coefficient.

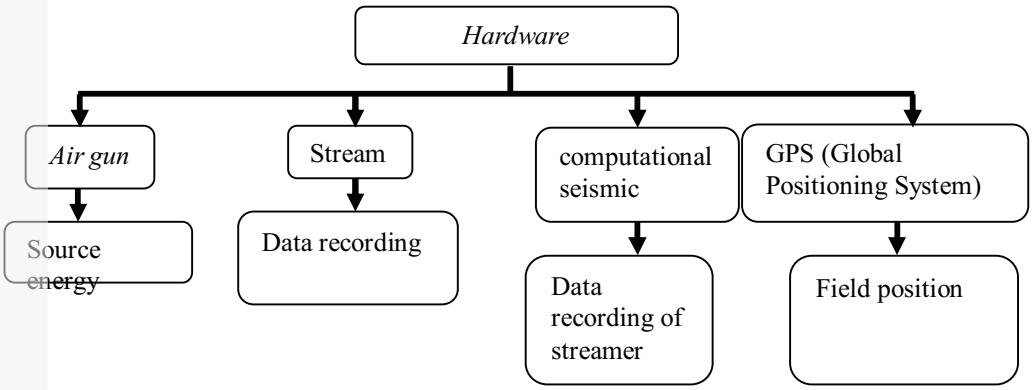

Figure 2. Flow chart of Hardware system

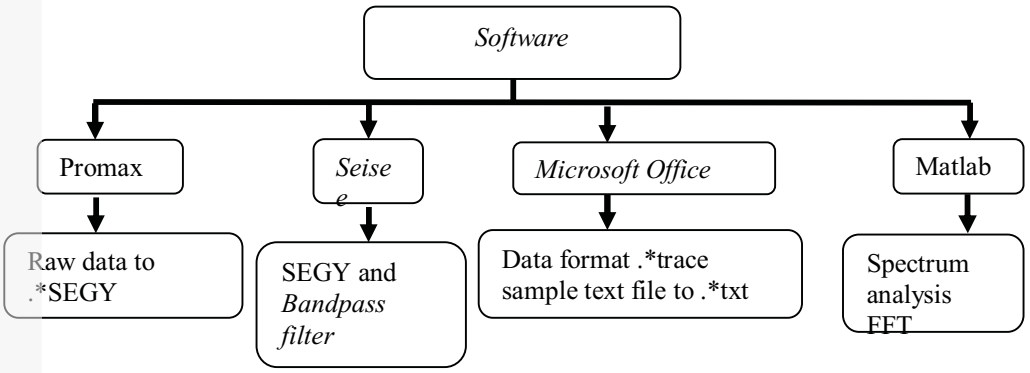

Figure 3. Flow chart of *Software* system

3. Results and Discussion

Data seismic SEG-Y format derived from marine seismic survey of Marine Geological Institute (MGI) subsequently processed in Seisee program and analyzed the frequency spectrum analysis in Matlab software. Seismic section is taken as an example to be analyzed in this study is on track 17 that is shown in Figure 4.

Figure 3. Flow chart of *Software* system

On this trajectory consists of many trace, but in this study only a few are taken to analyze the frequency spectrum, such as trace 300 and 2000 using band pass filters processing.

1. Trace 300

In the trace 300, the value of the frequency filters used in the 15-21 Hz, 15-35 Hz and 15-50 Hz. This value was taken after seeing graphic images produced using FFT. In Figure 5 describes the relationship between the amplitude and time. The high value on the image occurs when in the water column with an amplitude of 9.868 mV at 290 ms. The high value occurs when the bottom waters with an amplitude of 6.473 mV at the time of 3114 ms. While the picture that connects the amplitude and frequency (bottom image) showed the highest value of the amplitude spectrum when the frequency 107.4 Hz with an amplitude spectrum and the lowest value of 452.3 mV at a frequency of 105.5 Hz in the amplitude spectrum of -353.9 mV.

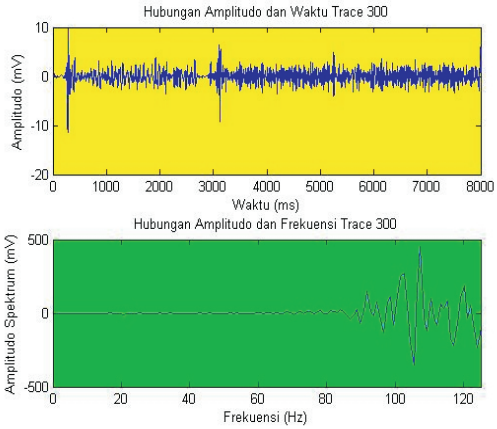

Figure 5. Time and amplitude relationship on the trace 300 (top). Frequency and amplitude relationship on the trace 300 (bottom)

The filter was used ranging from 15-21 Hz in Figure 6 (a). The resulting picture is not so clear to obtain patterned information contained therein. The difficulties was seeing the boundary between water column, base and sub-bottom waters is expected to be filtered with a frequency higher than this. In figure (b) show better results than the previous figure (6a), ie from the frequency of 19-21 Hz was increased to 15-35 Hz. Although the picture looks clear but there are a few of the visible cross section is less clear that the use of higher frequencies is expected to give a better picture. In image (c) with a value of frequency 15-50 Hz have more bright and clear results from the two previous images using a lower frequency.

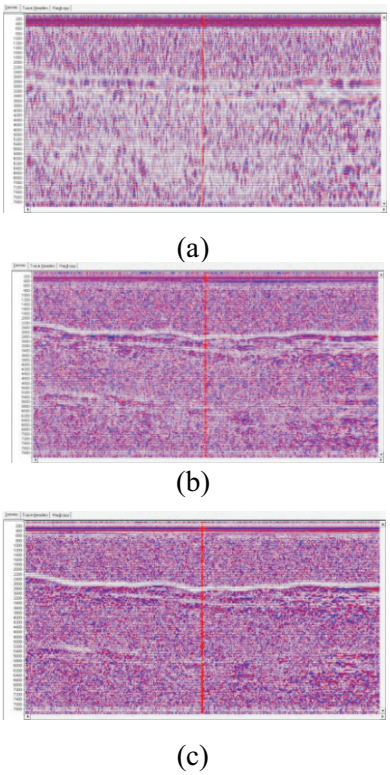

Figure 6. Trace 300 is filtered by (a) the frequency of 15-21 Hz, (b) frequency 15-35Hz (c) frequency of 15-50 Hz in the bandpass filter

2. Trace 2000

In the trace 2000, the value of the frequency filters used in three frequency ranged of 15-32 Hz, 15-42 Hz and 15-51 Hz. This value was taken after seeing graphic images produced after the FFT. In figure 7, the visible image relationship between the amplitude and time that has the highest value at a certain time and amplitude. The high value in the image occurs when the water column with an amplitude of 10.32 mV at 290 ms. Others, the high value occurs when the bottom waters with an amplitude of 5.098 mV at the time of 5388 ms. While the picture that connects the amplitude and frequency (bottom image) showed the highest value of the amplitude spectrum when the frequency 121.1 Hz with an amplitude spectrum and the lowest value of 261.9 mV at a frequency of 120.1 Hz at an amplitude of -451.8 mV.

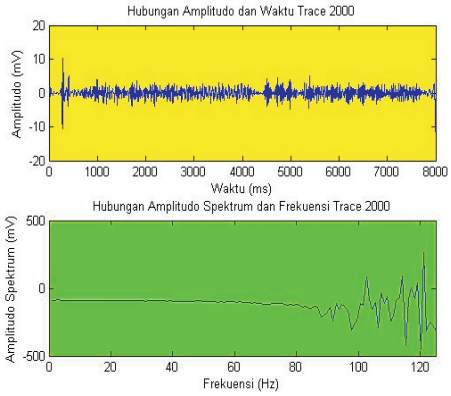

Figure 7. Time and amplitude relationship on trace 2000 (top) Frequency and amplitude relationship on trace 2000 (bottom)

The filter frequency used ranging from 15-32 Hz in Figure 8 (a). The resulting picture is not patterned so it is still difficult to obtain information in these sections. The difficulties to see the boundary between water column, base and sub-bottom waters so that the filter is increased with higher frequency in the image (b) frequency ranged of 15-42 Hz. The cross-section showed better results than the previous figure, although the picture looks clear but there are a few of the visible cross section is less clear that the use of higher frequencies is expected to give a better picture. In image (c) with a frequency of 15-51 Hz show the results of the resolution at the higher cross-sectional images as the use of the higher frequencies, this can be seen from the results of a more bright and clear from the two previous images using a lower frequency. This figure shown good cross-section column boundary waters, and sub-bottom waters so that existing information to assist in the process of subsequent analysis.

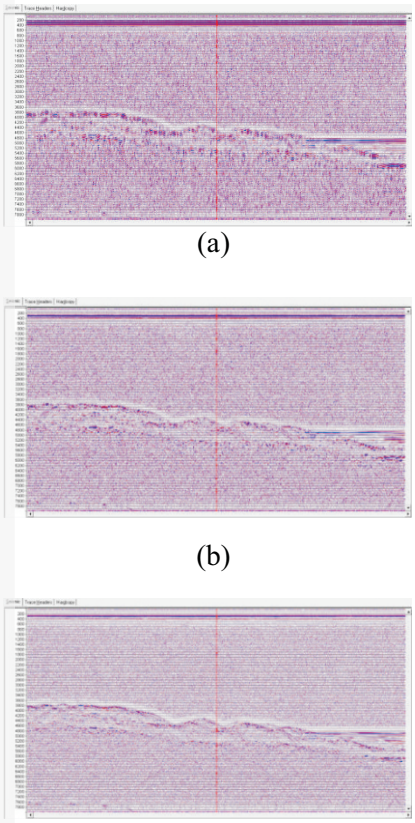

Figure 8. Trace 2000, which was filtered with (a) frequency 15-32Hz, (b) frequency of 15-42 Hz; (c) the frequency of the band pass filters 15-51

4.Conclusions and Suggestions

4.1 Conclusion

The increasing of the width of frequency processing was followed by the high resolution of image. At sampling points 30 are sandy clay sediments has the acoustic impedance of 2.49 and the reflection coefficient of 0.23. The sampling point 31, the silty clay sediments has the acoustic impedance of 1.93 and the reflection coefficient of 0.11.

4.2 Suggestions

The need for more detail research was important in order to know the areas within the cross section to search the new location of oil, gas potential areas, and areas of fault under the sub bottom layer.

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