Characteristics of Infragravity Waves Observed along Japanese Coasts

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ABSTRACT

As the characteristics of infragravity waves are different depending on the frequencies and the sea areas, it is presumed that the mechanism of generation and development of each frequency component in each area is different. We analyzed wave height data of four components (30 - 60 s, 60 - 300 s, 300 - 600 s and 600 s -) of infragravity waves compiled by the NOWPHAS (Nationwide Ocean Wave information network for Ports and HArbourS) system of Japan to get information on generation and development of each component. This study reveals that the spectral characteristics of the time changes of the longest component (600s-) are very different from those of the shorter components and that development of the longest component has very much to do with the barometric depression.

KEY WORDS: infragravity wave; frequency component; NOWPHAS; spectral characteristic; longevity

INTRODUCTION

Infragravity waves are generally analyzed as components whose frequencies are more than about thirty seconds. However, as the range of frequencies is wide, the characteristics of the infragravity waves are not uniform.

Aoki(2002) showed that the wave heights of components whose frequencies are from 30 seconds to 300 seconds are proportional to the products of significant wave heights and periods, but that longer components whose periods are more than 300 seconds have little to do with wind waves and swell. He named such longer components as “meteorological infragravity waves” and presumed that the generation mechanism of the “meteorological infragravity waves” is different from that of shorter components whose frequencies are less than 300 seconds.

In this paper, we analyzed the differences of characteristics of various components of infragravity waves to get information on generation and development of each component and discussed the relationship between the longest component and the meteorological condition.

TARGET DATA

We analyzed wave height data of four components (30 - 60 s, 60 - 300 s, 300 - 600 s and 600 s -) of infragravity waves compiled by the NOWPHAS (Nationwide Ocean Wave information network for Ports and HArbourS) system of Japan. The wave height of each component is defined as four times of square root of the total energy for each frequency range. The location of the wave stations and the meteorological stations are shown in Fig.1 and Table 1. Detailed information on the target data is shown in Table 2.

THE RELATIONSHIP BETWEEN WIND WAVES AND INFRAGRAVITY WAVES

Fig.2 shows the relationship between infragravity wave heights and the products of the significant wave heights and the periods observed at Hitachi-Naka in 2001. As for the shorter component (30-60s), the infragravity wave heights are proportional to the products of the significant wave heights and the periods, but as for the longer component (600s-), the infragravity wave heights are not proportional to the products.