The Transition from Moving to Fast Ice In Western Viscount Melville Sound

An unexpected result of the recording of underwater noise under sea-ice is the ability to detect the difference in character of the noise generated by ice in motion in relation to the noise generated under shore-fast ice. The detection of motion was easily made by observing the hourly samples of underwater noise recorded by a remote instrument package (RIP). One RIP (see cover picture) was installed in the sea bottom south of Melville Island in August 1967 in the location shown in Fig. 1 and was recovered one year later[1]. A sample strip-chart record of the change of underwater noise-power with time in the 150-300 Hz frequency band is shown in Fig. 2. In this figure, the envelope is formed by the hourly noise samples where each sample is a measure of the noise power, in decibels, averaged over a 4 minute interval within each hour. The example shown covers 6 days in November 1967. The time interval, indicated by the caption "moving ice", covers a period of 32 hours in which the hourly noise samples fail to form

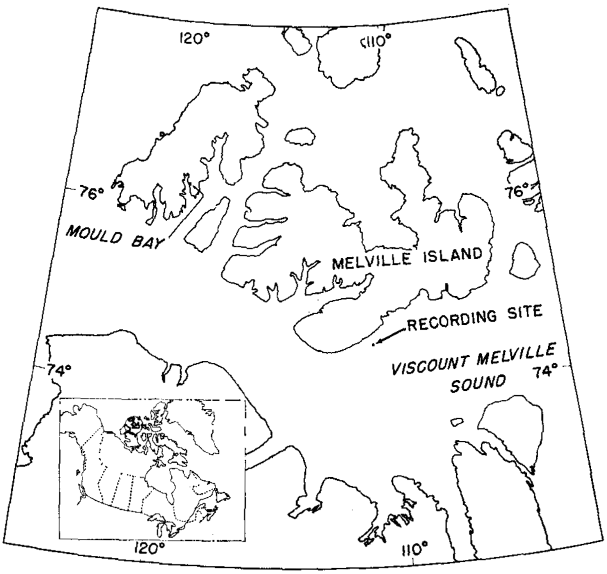

FIG. 1. Map showing the site of RIP installation.

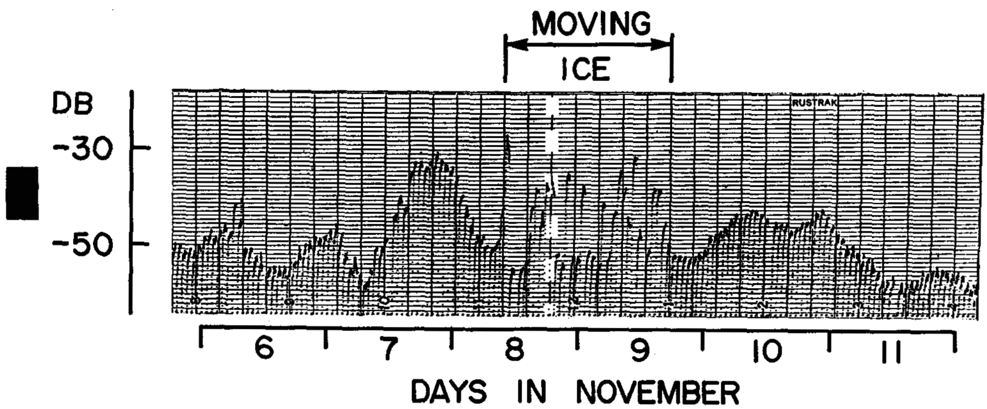

FIG. 2. A strip-chart record showing hourly samples of underwater noise recorded in the 150-300 Hz band for 6 days in November. Moving ice is indicated by the randomness of the samples compared to the smooth envelope elsewhere.

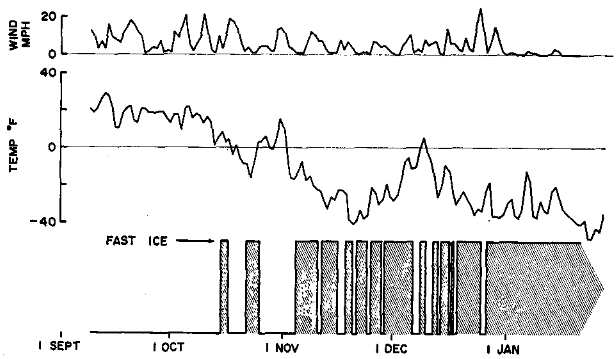

FIG. 3. Wind speed and air temperatures at Mould Bay and periods of fast ice.

a smooth envelope. In fact, this fragmented envelope is a characteristic of the noise records throughout the early fall, whereas the relatively smooth, uniformly varying envelope is a characteristic of the noise records from mid-winter through to the spring of 1968 where the ice is known to be shore-fast[2].

Time intervals of the type shown in Fig. 2 were assembled in Fig. 3 on the same time scale as air temperatures and wind speeds obtained from the nearest weather station records at Mould Bay on Prince Patrick Island. The shaded blocks indicate time intervals where the ice is not in motion; the temperatures are daily mean air temperatures and the wind speeds are the amplitudes of the resultant wind vectors for each day.

An interpretation of Fig. 3 raises the question of the geographical precision with which noise can be used as a means to detect motion. The RIP was equipped with a hydrophone having a uniform sensitivity in all directions. For the 150-300 Hz frequency band under consideration, and for a hydrophone situated on the bottom in a water depth of 300 m. in a region covered with pack ice, calculations show that if the ice cover is assumed to generate noise uniformly, the hydrophone will sense 50 per cent of its noise power from within a surface area 5.5 km. in diameter, and 75 per cent from within a surface area 11.0 km. in diameter. When the ice is in motion, the noise it makes is not uniformly distributed in area and depends on the location of ridging, rafting and other forms of relative motion. It can then be assumed that the sporadic nature of ice-motion noise will be detectable over a much greater area than is indicated by simple calculations.

The interesting feature of Fig. 3 is that during December 1967, the ice cover was frequently in motion, contrary to expectations. The change of air temperature with time reflects, to some degree, the looseness or fastness of the ice. From this figure little correlation exists between the wind speed and the existence of motion, except perhaps for the hours between 0800, 23 December, and 1400, 24 December (LST) where a buildup of wind preceded a temperature rise.

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Some Properties and Age of Volcanic Ash in Glacier Bay National Monument*

INTRODUCTION

Volcanic ash occurs in one section of marine sediments in the eastern part of Glacier Bay National Monument, southeastern Alaska. Radiocarbon dates on wood from marine deposits at nearby localities indicate that the ash was deposited about 11,000 years B. P. No other ash layers of this age have been reported from this part of Alaska (Fig. 1); Mount Edgecumbe, near Sitka, may have been the source.

The volcanic ash occurs in Granite Canyon and is exposed for a distance of 15 m. on both sides of the river. Along the bluff on the east side of the river, where better exposed, the stratigraphic section (58° 54′ 57″N. 135° 50′ 14″W.) of unconsolidated deposits consists of:

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