Monitoring of the Ice Cover Changes in Polar Regions Based on Acoustic Detection of Cracks in It

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Currently, the number of perennial glaciers is decreasing. However, there are no objective ways to monitor this process. I propose a monitoring scheme based on acoustic methods. There is a direct relationship between the melting rate of glaciers and regularity of cracks. Therefore the first thing required for proposed scheme is locating an area with cracking and respectively melting of ice. It was implemented using a triangulation scheme. It is several synchronized microphones that detect the signal by sound arrival time difference at each one. 2 full-scale experiments were conducted using a hydrophone triangulation scheme to accomplish the locating of the crackling area. The second thing has to be done is revealing specific features of the sound of cracking ice. It is required for a monitoring scheme to distinguish pack ice and one-year ice. Signals recorded in experiments were compared to make it. The calculated location of the crack (crackling area) was consistent with an actual location in both experiments. Similarly, the trajectory of the propagating crack was calculated. It was noticed that specters of the signals have overall characteristic frequencies in both experiments by comparing them. It seems possible to locate the crackling area using a triangulation scheme with an accuracy of about 17%. Likewise, the similarity of specters of signals which qualitatively characterize the sound of cracking of the processed ice has detected. Further experiments will be devoted to detecting characteristic acoustic features of different ice types.

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