

Contributions of the International Quiet Ocean Experiment to Acoustic Observations in the Arctic.

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Abstract

Northern high-latitude regions, including the Arctic Ocean, are changing rapidly due to decreasing ice cover and thinning ice as a result of global climate change; temperatures in the Arctic are increasing faster than global average temperatures.

These changes are making human use of Arctic resources more economically viable and opening new transportation routes for shipping and tourism.

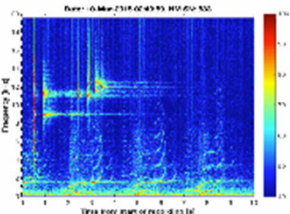
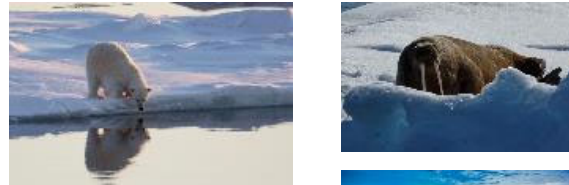
These activities produce sound, potentially altering Arctic soundscapes and affecting some marine organisms.

Sound is expected to increase in the Arctic in the coming decades from increasing human activities. To study acoustic changes in the Arctic Ocean at a variety of spatial and temporal scales, the International Quiet Ocean Experiment established a working group on Arctic Acoustic Environments in late 2017

The first activities of this working group are focused on identifying locations and times of existing and past acoustic observations in the Arctic Ocean, and synthesizing the state of our knowledge about ocean sound—natural and anthropogenic; past, present, and future—in the Arctic. The working group is cooperating with other projects and groups involved in Arctic observations.

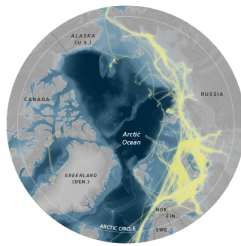
Motivation of the Working group

The Arctic Ocean is home to a diverse and unique set of organisms and increasing human activity.

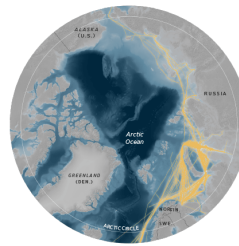


A ping from a nearby scientific instrument combined with Bowhead song.

Wildlife inhabiting the Arctic Ocean and adjacent seas are affected by both climate change and increasing ship traffic, tourism, resource extraction, and other activities.

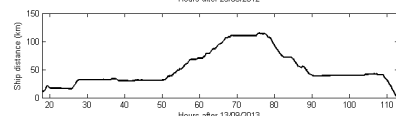
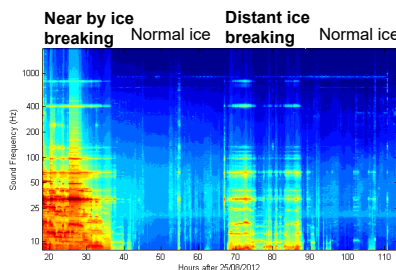


All traffic in the Northern Sea Route in 2018 (through Sept. 30)



Traffic related to the oil and gas industry

We need to establish benchmark soundscape data to assess, understand, manage and mitigate potential impact of increasing noise from human activities on the Arctic Ocean wildlife.



An example: To the left, sound produced by an ice breaker at different distances. Sound varies with operation in heavy ice and lighter ice. This figure shows how navigation of icebreakers avoiding heavy icebreaking can reduce sound pollution. Real time high resolution satellite remote sensing is vitally important for route planning. (Figure to the left from Geyer et al. 2017)

Working group activities

Identify locations of existing acoustic receivers in Arctic Ocean

Identify potential sources of historic acoustic data from Arctic Ocean

Inform Data Management and Standards and Intercalibrations working groups about historic and current data sources in Arctic Ocean

Compile existing acoustic data to determine whether time series can be created and report to Data Management and Data Access WG

Create bibliography or synthesis of research papers on effects of sound on organisms in Arctic Ocean

Identify data/research conducted on effects of permafrost and gas-saturated sediments on Arctic Ocean soundscapes

Identify ideal receiver array (location, number of receivers, types of receivers) to observe baseline acoustic environment for Arctic Ocean

Identify ongoing and planned experiments for which passive acoustics are planned or could be added.