

THE SCIENCE OF ARCTIC EXPEDITIONS

Let's compare and contrast past (Fram) and present (MOSAiC) Arctic expeditions, to prepare for the future. We can investigate how scientific questions, methods, technologies, and our knowledge of the Arctic changed over time.

2019-2020 MOSAIC EXPEDITION



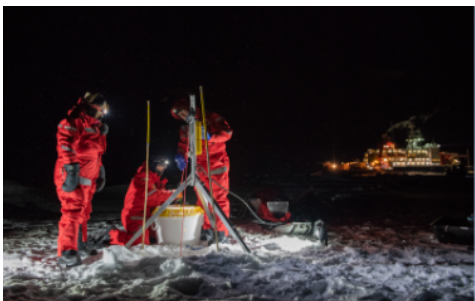
MOTIVATIONS

When comparing observed and modeled September sea ice extent datasets, we see that the models do not predict the observed measurements well after 2005. Clearly the models lack some known factor and are underestimating the sea ice loss. The science from this expedition will help fill that gap in knowledge.



NAVIGATIONAL METHODS & TECHNOLOGIES

A variety of methods were used to navigate during the MOSAIC expedition, including satellite imagery, ice cores, an EM-Bird, computer models, drifting buoys, and global positioning systems (GPS)



SCIENTIFIC INVESTIGATIONS

Hundreds of scientists from 19 countries took part in the expedition. Using instruments like satellites, ice cores and buoys, they measured cloud reflectance, cloud formation, ocean and atmosphere temperatures, sea ice extent and incoming and outgoing solar radiation.

1893-1896 FRAM EXPEDITION



MOTIVATIONS

The *Fram* expedition was the first attempt to reach the North Pole by freezing a ship in ice and drifting with the ice through the Arctic. Fridtjof Nansen got this idea when he learned that the debris from the shipwrecked *Jeannette* was found thousands of miles from where it sank, suggesting an East/West current through the Arctic. Another goal of the Fram expedition was to explore and understand the Arctic region by gathering scientific observations.



NAVIGATIONAL METHODS & TECHNOLOGIES

The Fram relied on celestial navigation to determine their location, a technique where the angle between celestial bodies (sun, moon) and the visible horizon is measured. This angle, along with the time the measurement was taken, was used to determine their latitude.



SCIENTIFIC INVESTIGATIONS

While frozen in sea ice, the crew constructed an ice camp outside the ship and studied the formation of sea ice, measured the temperature and salinity of sea water at different depths, and examined living things both on the ice and at the bottom of the ocean. They also measured air temperature and pressure, along with gravitational measurements.