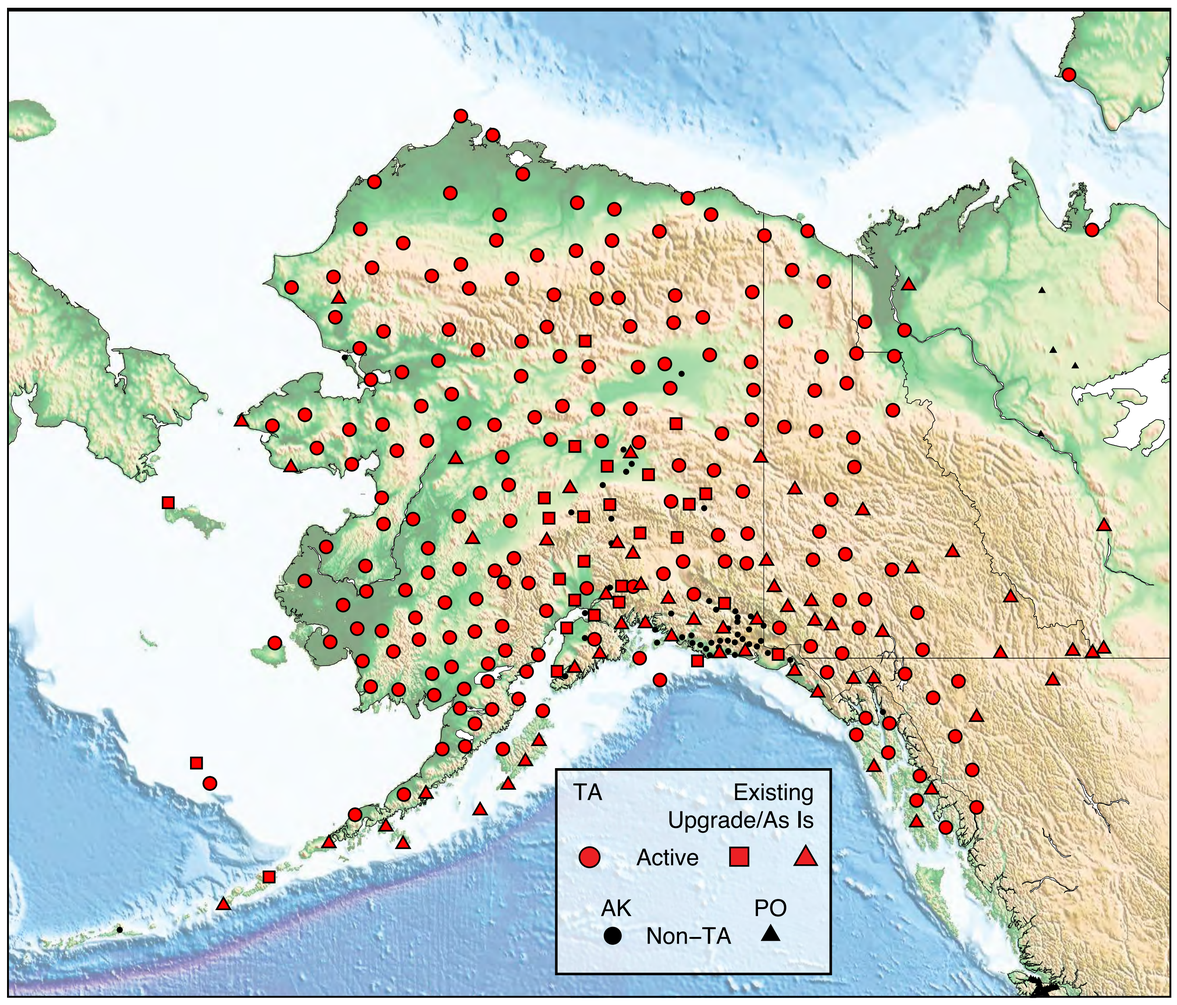
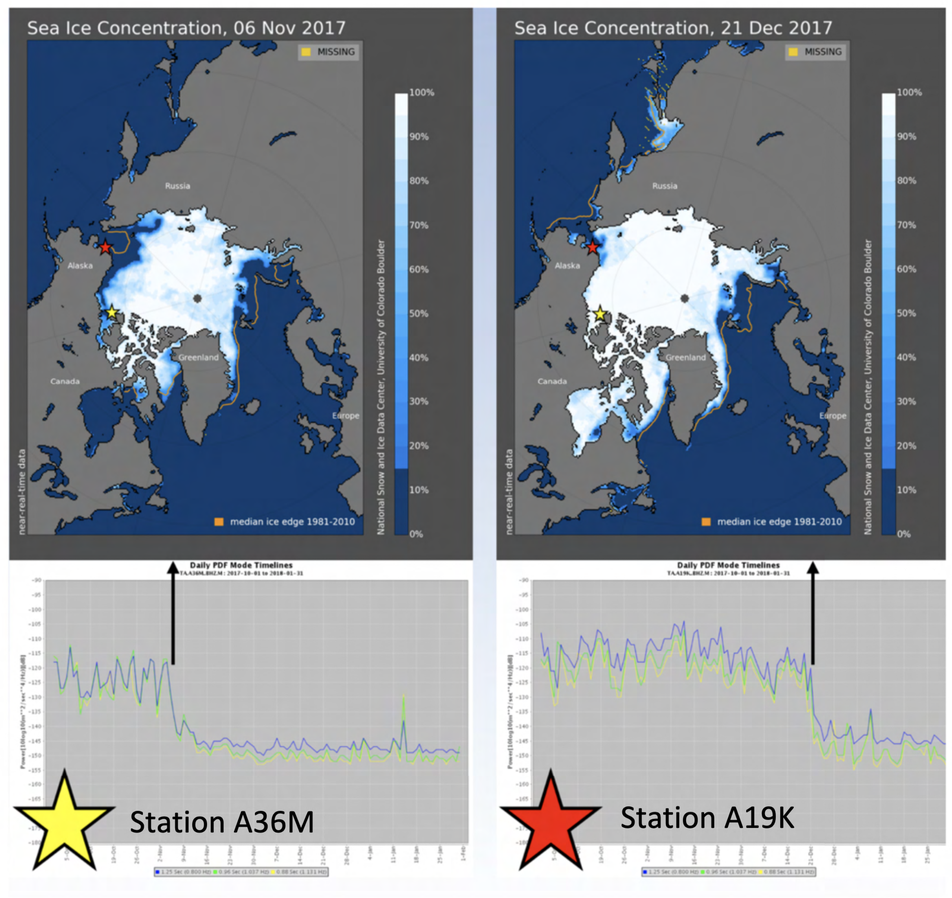
Sea Ice and the Alaska Transportable Array

Northern near-coastal seismic stations of the National Science Foundation EarthScope Alaska Transportable Array, installed between 2013 and 2017 and currently operational, are well-positioned to record seismic excitation arising from ocean waves and its modulation due to seasonal changes in Arctic Ocean sea ice.



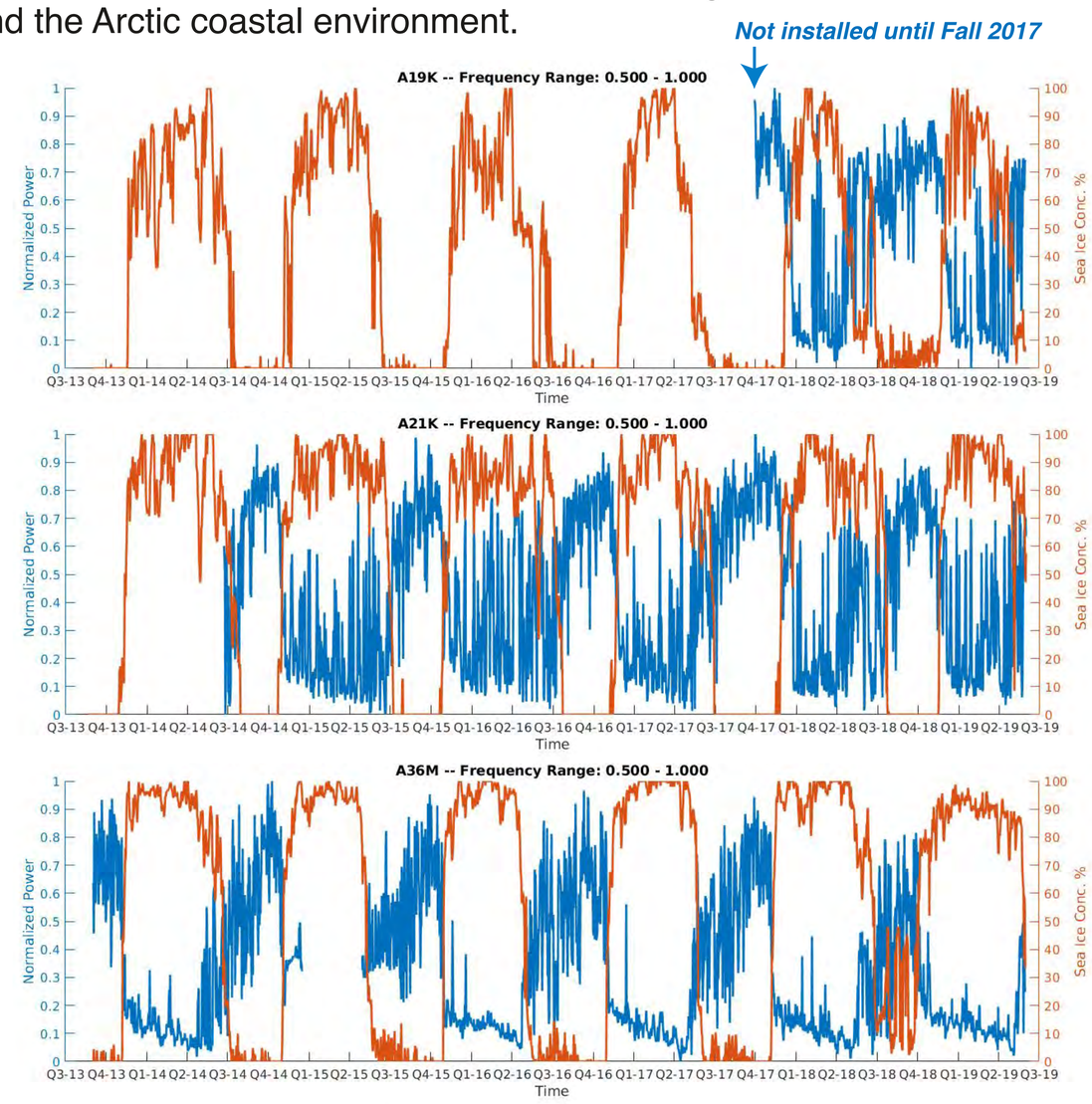
For more information, please go to www.usarray.org/Alaska

Seismic noise levels around 1 Hz at these stations anticorrelate strongly with satellite estimates of sea ice concentration near seismic stations. The reduction in noise is especially apparent during the formation of local near-shore ice. For example, station A36M exhibits an earlier drop in noise than A19K (which is further to the southwest where sea ice forms later in the season) suggesting ice growth is attenuating shore breaking waves.

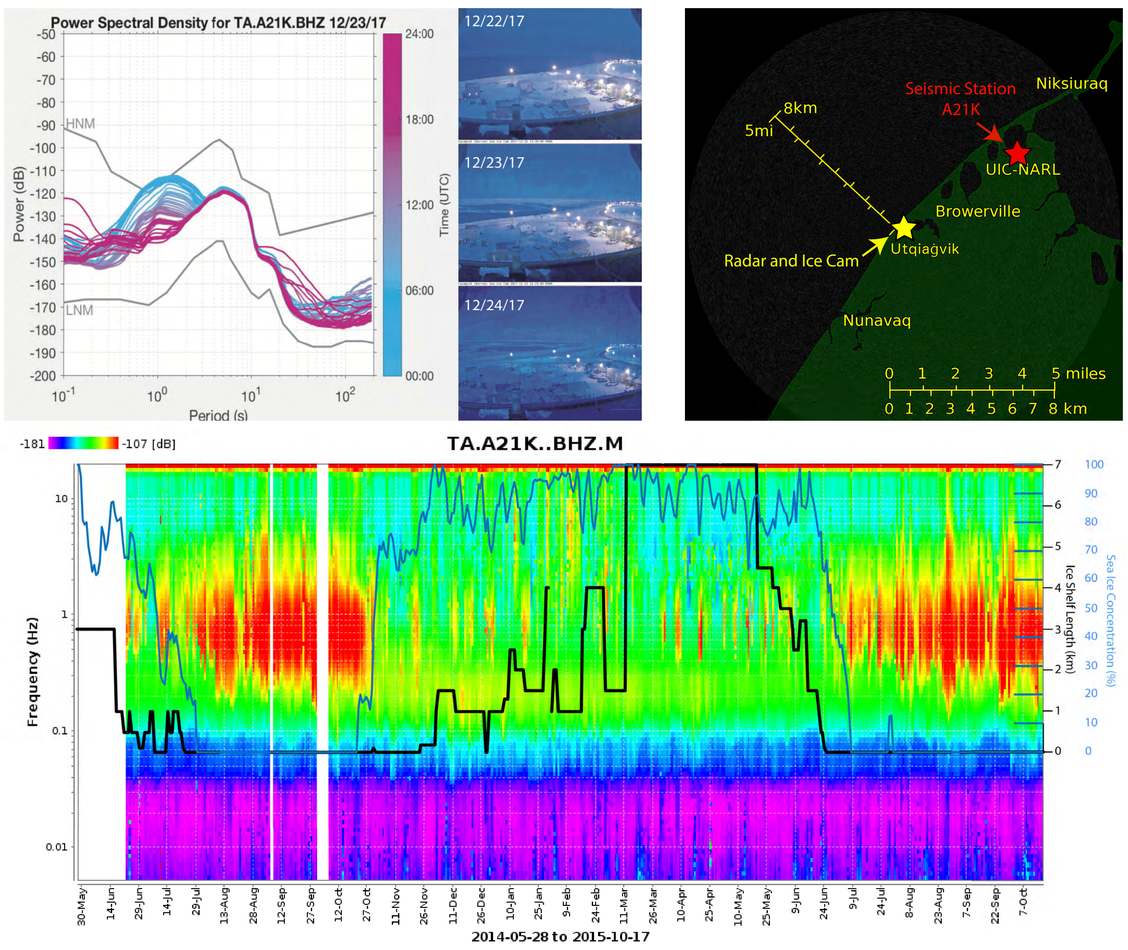


Seismic data and metrics (in acceleration) were requested from the IRIS DMC and MUSTANG service. Sea ice concentration estimates from the Defense Meteorological Satellite Program's SSM/Is and SSMIS passive microwave data and daily images were requested from the NSIDC. Radar and webcam images were obtained from the University of Alaska Fairbanks at feeder.gina.alaska.edu.

We examine data from multiple stations recording several seasonal cycles of sea ice growth and break-up along with shorefast and nearby pack ice conditions from remote sensing and in-situ observations to better understand the effect of sea ice on seismic noise and evaluate the usefulness of the seismic data for documenting the interactions of waves and the Arctic coastal environment.



At some sites, such as Utqiagvik (Barrow; A21K), we can incorporate additional observations in our analysis. At A21K, a sea ice camera and radar are located 6.7 km to the southwest of the seismic station. Using measurements of the shorefast ice width (≤ 5km) and passive microwave retrievals of sea ice concentration in the nearby pixels (~25 -100 km^2) it appears that the modulation in seismic power around 1 Hz is controlled by the extent of regional pack ice out to 10s of km from the station rather than the presence of shorefast ice.



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