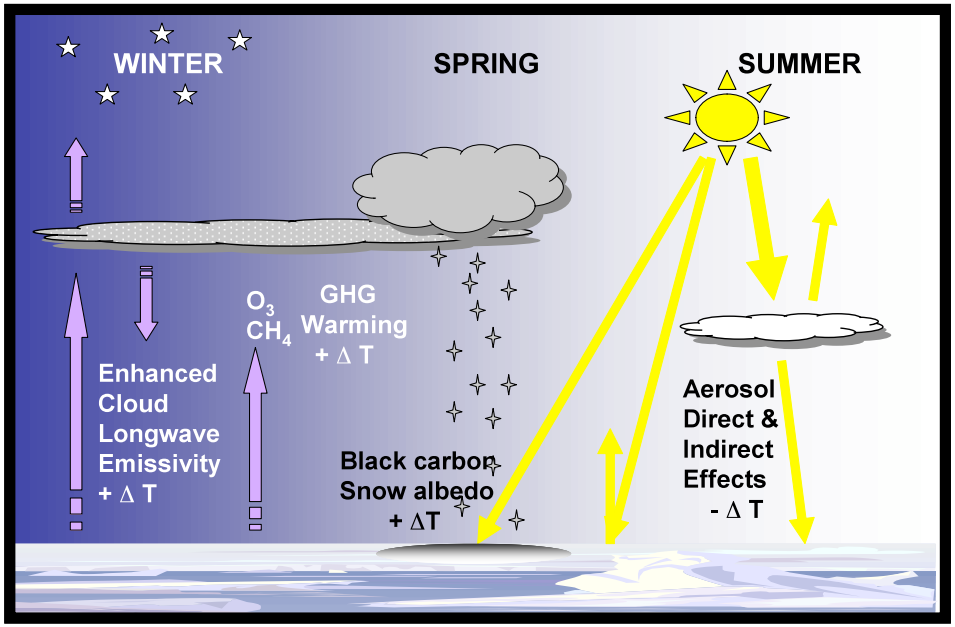
Pacific Marine Environmental Laboratory
ATMOSPHERIC CHEMISTRY GROUP

Arctic Chemistry and Climate

PMEL's Arctic Chemistry and Climate research addresses NOAA's mission to **understand and predict changes in Earth's environment** to meet our Nation's economic, social and environmental needs. Our research is driven by 2 main scientific questions:

- What are the sources and concentrations of short-lived pollutants (SLP) in the Arctic and how are these changing with time?
- What is the role of these pollutants in the accelerated warming of the Arctic?



Linkages to the NOAA Strategic Plan and Research Plan

NOAA **Strategic** Plan - Performance Objectives:

- Describe and understand the state of the climate system through integrated observations, analysis and data stewardship.

NOAA **Research** Area and Milestones

- Document and understand changes in climate forcings and feedbacks, thereby reducing uncertainty in climate projections.
  - Execute field missions to understand the transport and properties of absorbing aerosols and their precursors to the Arctic polar region as a part of the International Polar Year.
  - Initiate cloud/aerosol interaction field study.
  - Reduce uncertainty in model simulations of the influence of aerosols on climate.

Research Strategy

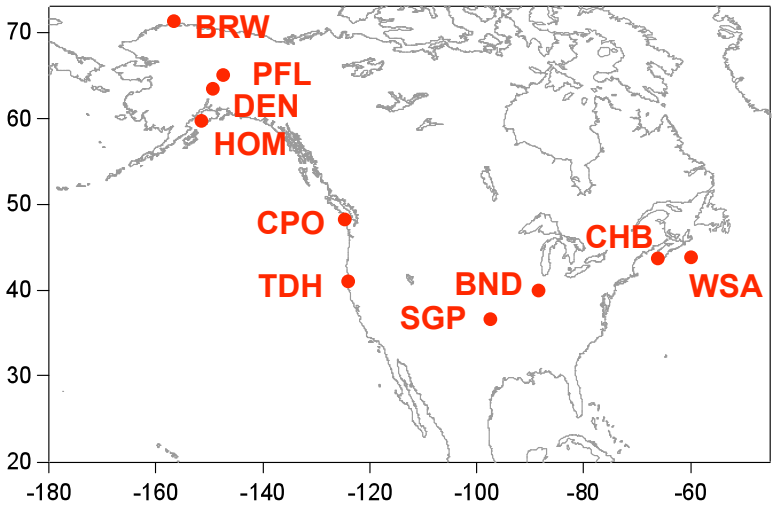
Our research strategy involves 3 activities:

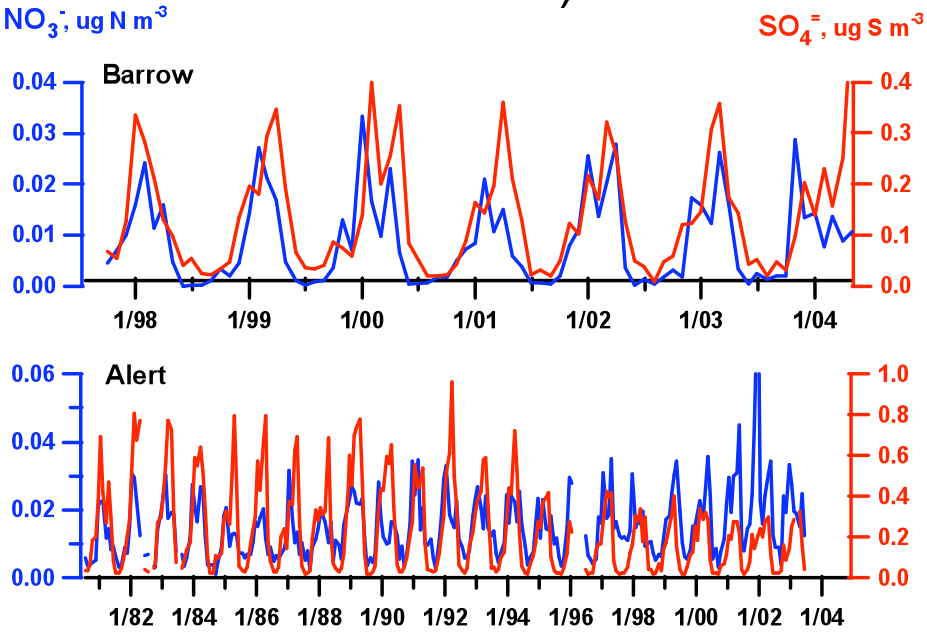
Monitor and observe: We conduct long-term measurements of aerosol chemical composition to reveal information about the sources of pollutants and how sources and concentrations are changing over time.

Understand and describe: We led an intensive field campaign onboard the RV Knorr – ICEALOT (joint with ESRL) to study the processes controlling the aerosol chemical composition in the Arctic.

Assess and predict: With international colleagues we have led workshops and written state of knowledge papers on the impacts of Short Lived Pollutants on Arctic Climate. In addition, we contributed to the 2006 AMAP (Arctic Monitoring and Assessment Programme) assessment of Acidifying Pollutants, Arctic Haze, and Acidification in the Arctic,

Monitor and observe: We conduct long-term measurements of aerosol chemical composition to reveal information about the sources of pollutants and how sources and concentrations are changing over time (joint with NOAA/ESRL/GMD and the Univ. Alaska)

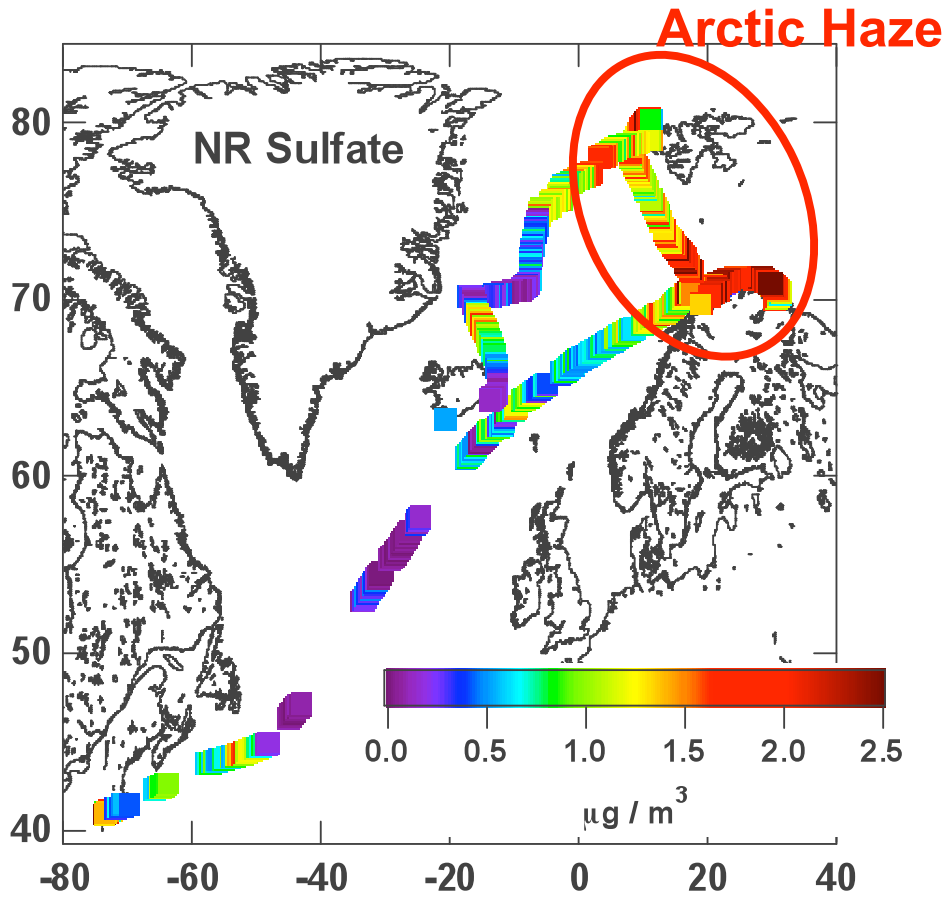




Seasonality in particulate concentrations of nitrate and sulfate at Barrow, AK and Alert, Canada.
Concentrations are at a maximum each winter/spring when pollutant transport to the Arctic is most efficient.

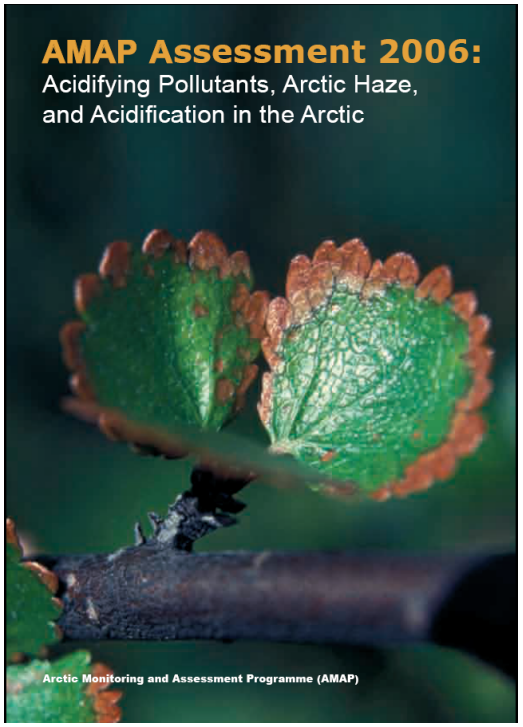
Understand and describe:

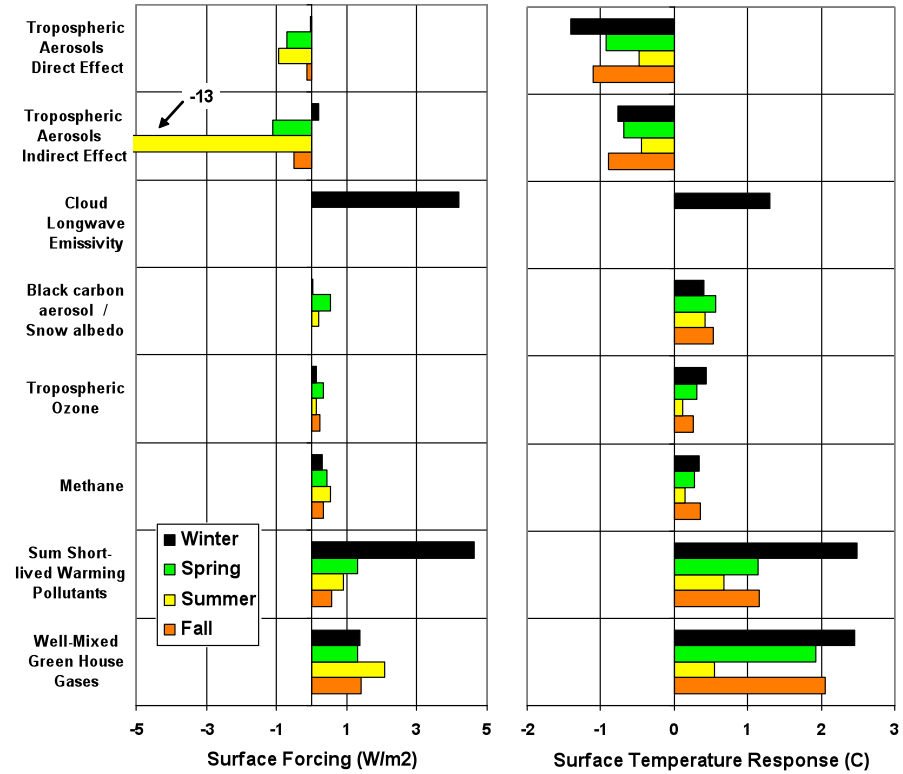
We led an intensive field campaign onboard the RV Knorr – ICEALOT (joint with ESRL) to study the processes controlling the aerosol chemical composition in the Arctic.



ICEALOT cruise track colored by measured concentrations of particulate sulfate.

Assess and predict: With international colleagues we have led workshops and written state of knowledge papers on the impacts of SLP on Arctic Climate. In addition, we contributed to the 2006 AMAP (Arctic Monitoring and Assessment Programme) assessment of Acidifying Pollutants, Arctic Haze, and Acidification in the Arctic.





Comparison of seasonally averaged surface forcing and temperature response for the SLPs and well-mixed greenhouse gases (Quinn et al., 2008).

Future direction:

- Continue long-term measurements at all Alaska sites to document changes in sources and concentrations of SLPs in the Arctic.
- Continue working with our customers (climate modelers, AMAP, the Arctic Council, policy makers) to provide a solid science foundation for climate predictions and SLP mitigation strategies.