



**ARM**



<https://www.arm.gov/capabilities/observatories/nsa/locations/c1>

# Aerosol priorities for the North Slope of Alaska (NSA)

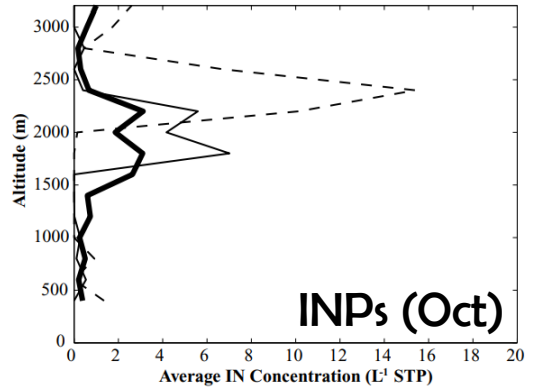
Jessie Creamean, Kerri Pratt, Allison McComiskey, Jim Mather



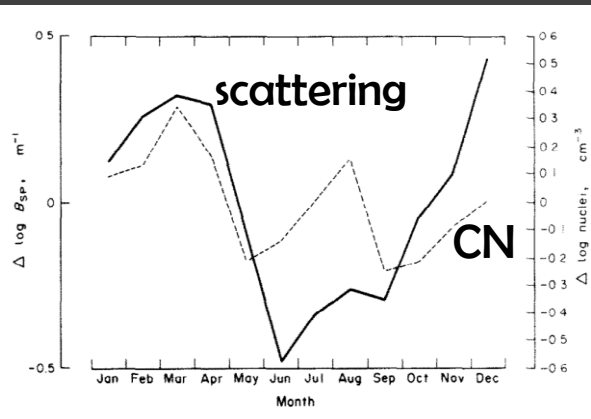
<https://gml.noaa.gov/dv/site/index.php?stacode=brw>

# Background on NSA aerosol studies

- Combo of routine & IOP obs, on the ground and in the air
  - Number & size, radiative, CCN/INPs, chemistry, trace gases (TGs)
- Benchmark findings of seasonal cycles of aerosol quantities, radiative properties, and composition
- Process-level studies of sources & ACI (e.g., AGASP, ABLE 3A, FIRE-ACE, MPACE, ISDAC, ARCPAC, ARCTAS, ACME-V...)
  - Very few TBS



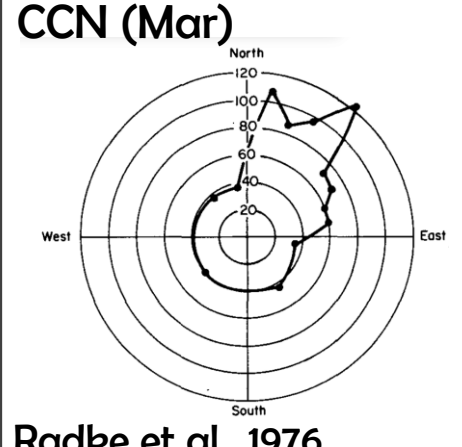
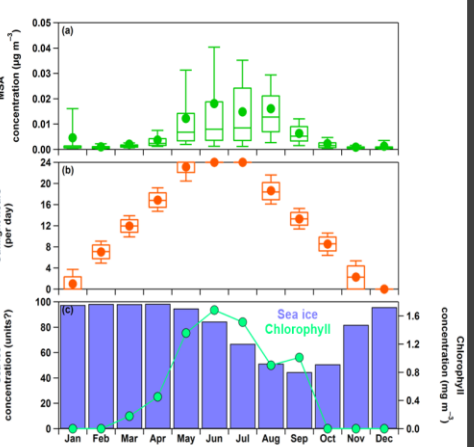
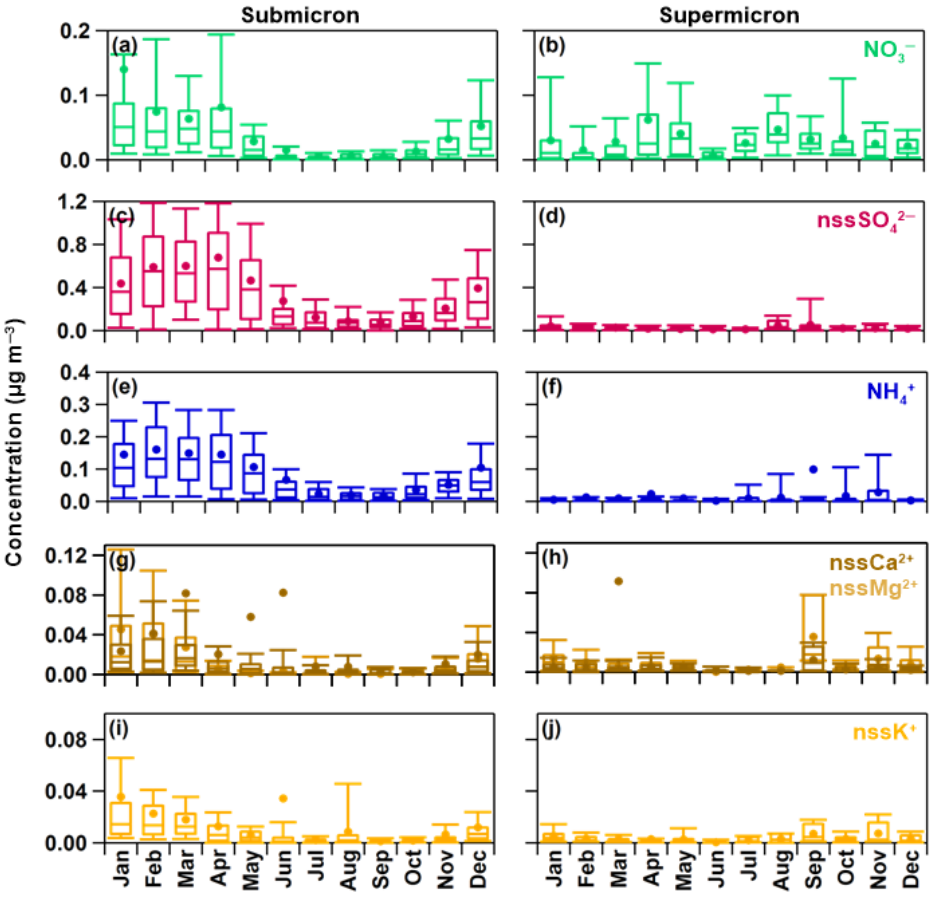
Prenni et al. 2009



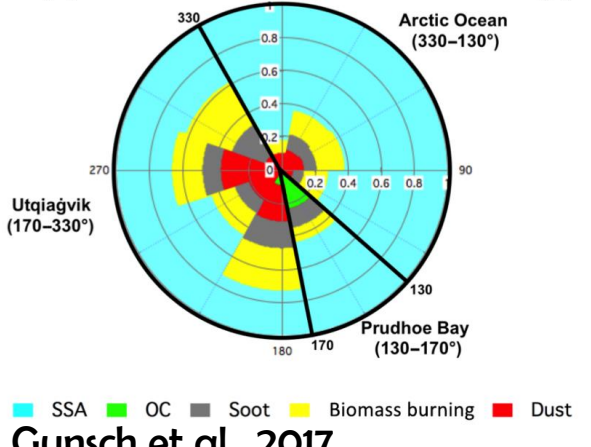
Bodhaine et al., 1981

Many previous measurement efforts are intermittent, intensive, or have limited aerosol measurements.

A routine, comprehensive suite of aerosol observations is needed!



Radke et al., 1976



Gunsch et al., 2017



## New opportunities

- NOAA since 1973
- DOE since 1997
- New NOAA facility (Vasel et al. 2020) + interest in DOE contributions = opens doors to improving routine NSA aerosol measurements
- Need for aerosol and gas measurements emphasized by IGAC CATCH.

# Needs, wants, and feasibility – at the ground

Ground-based			
Currently operational	Doable	Consider / need advice on	Likely not doable
CPCf (number)	CPCu (number)	PSAP (absorption)	ACSM (chem)
Dry nephelometer (scattering)	SMPS (size)	Wet nephelometer (scattering)	NO <sub>x</sub> (TGs)
CLAP (absorption)	UHSAS (size)	CAPS (extinction)	
Aethalometer (BC)	APS (size)	CCN (ACI; MOSAiC?)	
PMEL filter collection (chem)*	INPs (ACI)	CO <sub>2</sub> /CH <sub>4</sub> (TGs)	
Ozone (TGs)	PMEL filter analysis (chem)*	CO/N <sub>2</sub> O/H <sub>2</sub> O (TGs)	
		HTDMA (MOSAIC?)	

\* = filters are collected but need additional resources for offline analysis of inorganic ions, elemental composition

Green = currently ongoing measurement

Yellow = retired; no longer operational

Red = never been operational

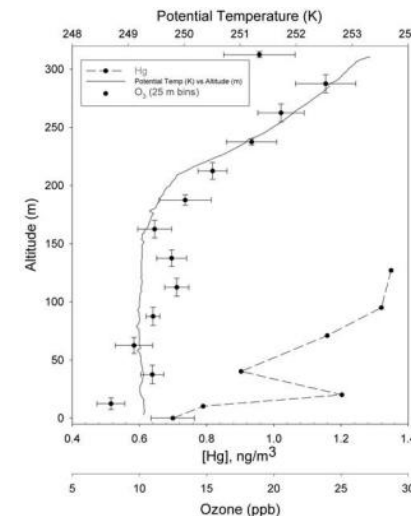
# Needs, wants, and feasibility – in the air

## Vertical profiling – TBS (does not include PI IOPs)

Currently operational	Doable	Consider / need advice on
None ☹️	TBS CPCf (number)	TBS CCN (ACI)
	TBS POPS (size)	
	TBS filter collection (INPs)	
	TBS STAC collection (chem)	
	Ozone (TGs)	



Creamean et al. 2021

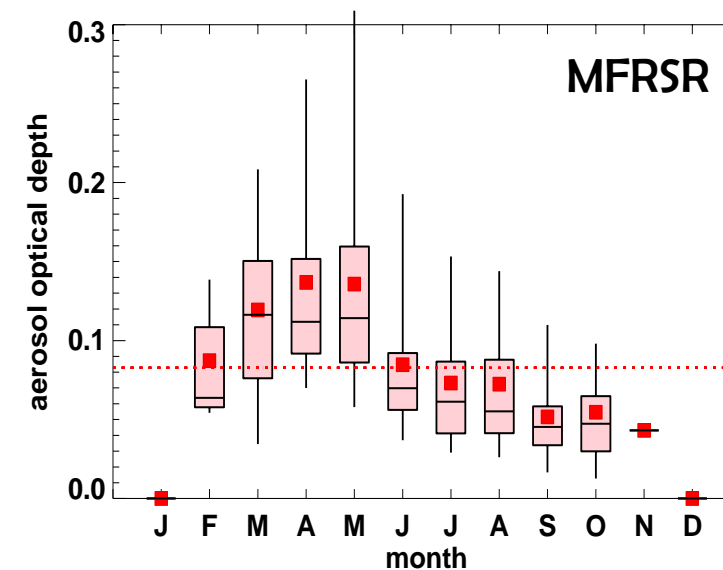


Tackett et al. 2007

## Vertical profiling – remote sensing (does not include PI IOPs)

Currently operational	Doable	Consider / need advice on
None ☹️	lidar (extinction)	?
	MPL (extinction, AOD)	
	Sun photometer (AOD)*	
	MFRSR (AOD)*	

\* = operational, but issues with data



Green = currently ongoing measurement

Yellow = retired; no longer operational

Red = never been operational

# Idealized priorities: adding observations to capturing aerosol processes

## Ground-based:

### 1. Full aerosol size distribution & number

= CPCu + CPCf + SMPS + UHSAS + APS

### 2. Aerosol microphysics / ACI

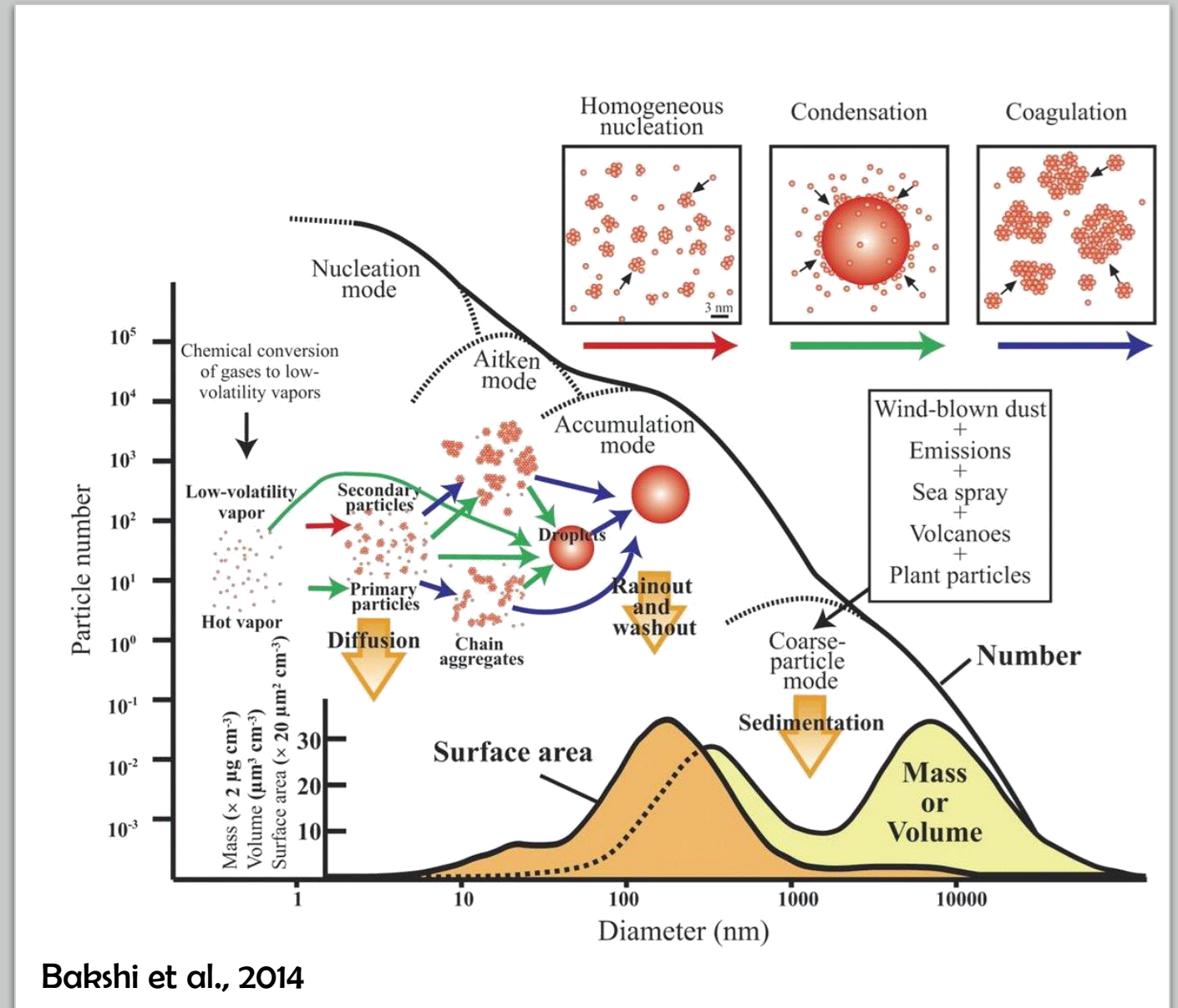
= CCN + INPs

### 3. Aerosol composition

= Support offline PMEL filter analysis for sub-1 and sub-10  $\mu\text{m}$ ?

## Vertical profiling:

1. More routine in situ data from TBS
2. AOD
3. Lidar (will be one up there in next few years)





# We'd like input from YOU!

- What measurements does the community want? Greatest needs? Science gaps?
- What we would like to see and what is feasible (i.e., based on AMF3 and MOSAiC)?
- Look at measurements at other stations. Aim to be player on international scale.