NOAA Barrow Observatory

Bryan D. Thomas
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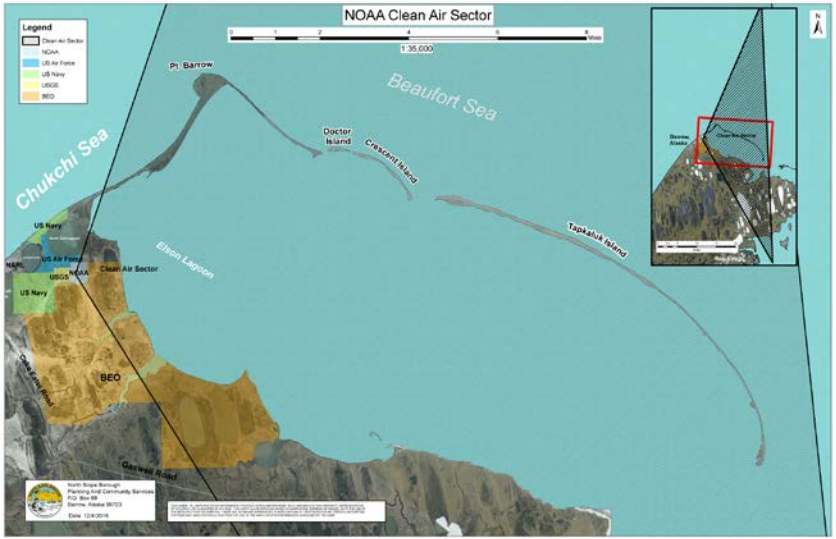
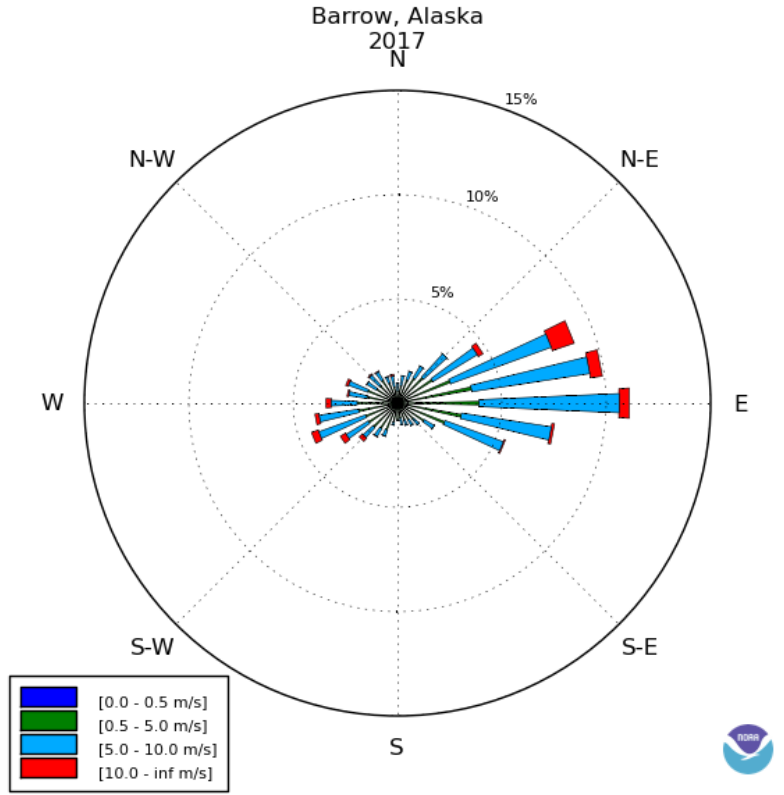
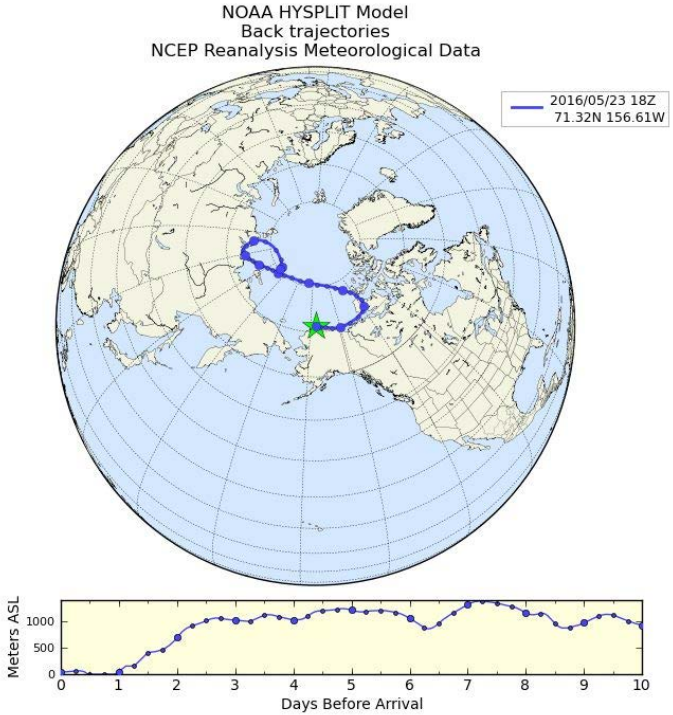
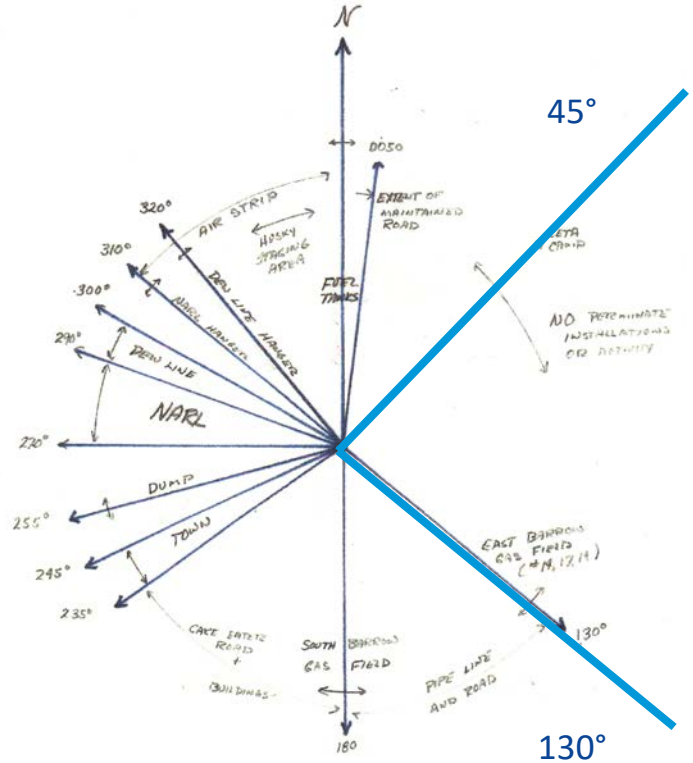
Imikpuk Lake
UIC Science
New Beginnings Church of God
Utqiaġvik Whale Bone Arch
Iñupiat Heritage Center
Wiley Post-Will Rogers Memorial
Utqiaġvik


NOAA Clean Air Sector
Legend
Clean Air Sector
NOAA
US Air Force
US Navy
USGS
BEO
Pt Barrow
Beaufort Sea
Chukchi Sea
Doctor Island
Crescent Island
Tapkaluk Island
Elson Lagoon
US Navy
US Air Force
NOAA
Clean Air Sector
USGS
US Navy
BEO
Gas well Road
Gas well Road

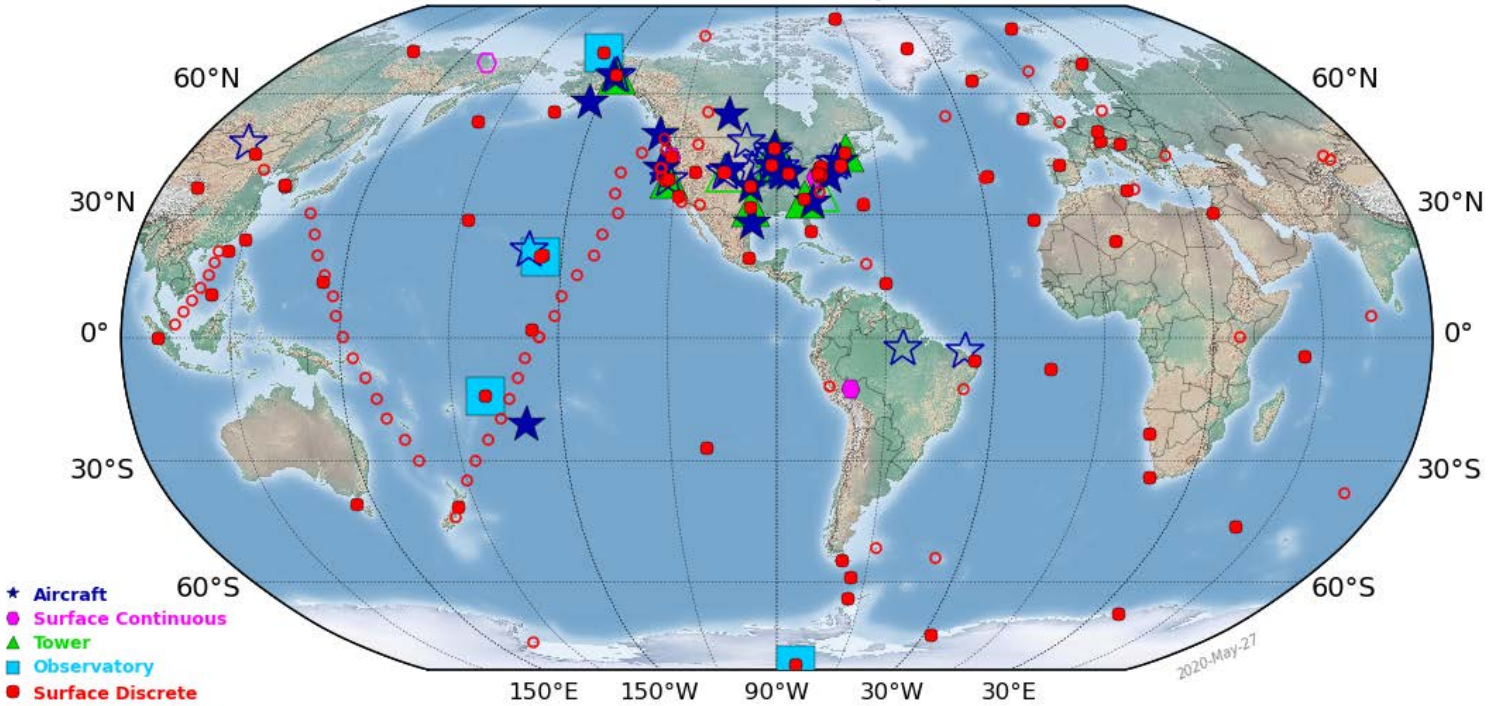

Barrow, Alaska
2017
N
N-E
E
S-E
S
S-W
W
N-W
15%
10%
5%
[0.0 - 0.5 m/s]
[0.5 - 5.0 m/s]
[5.0 - 10.0 m/s]
[10.0 - inf m/s]


NOAA HYSPLIT Model
Back trajectories
NCEP Reanalysis Meteorological Data
2016/05/23 18Z
71.32N 156.61W
Meters ASL
1000
500
0
0 1 2 3 4 5 6 7 8 9 10
Days Before Arrival

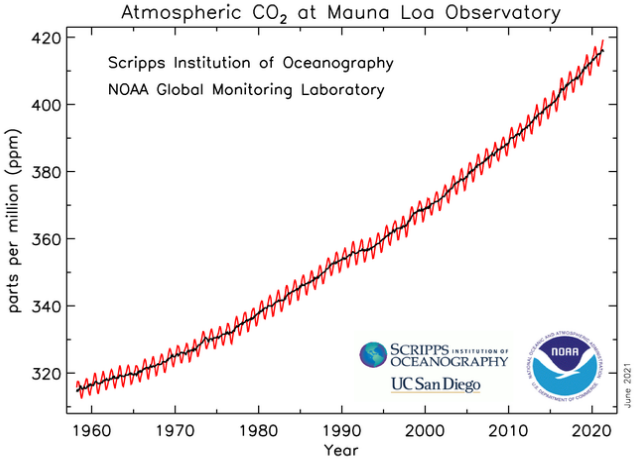

N
45°
130°
320°
310°
300°
290°
270°
255°
245°
235°
180
NARL
DUMP
TOWN
PERU LINE
AIR STRIP
EAST BARROW GAS FIELD
SOUTH BARROW GAS FIELD
PIPE LINE AND ROAD

“Taking the Pulse of the Planet”

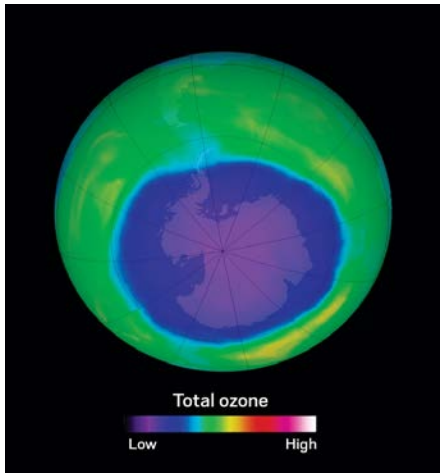
Measurement sites distributed globally



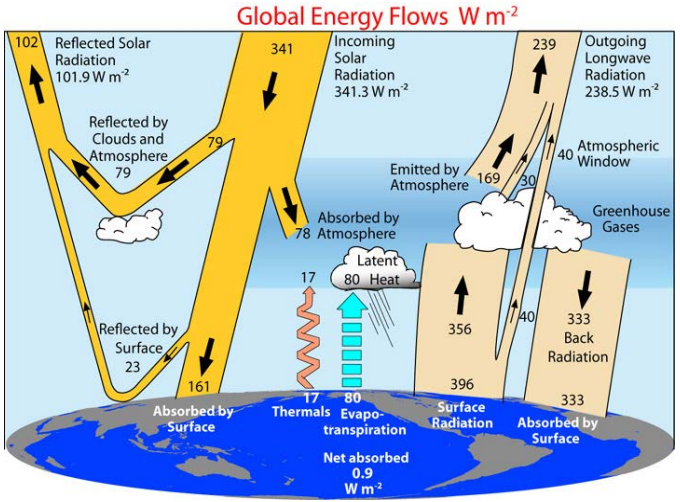
Observe, assimilate, and understand …



Tracking Greenhouse Gases and Understanding Carbon Cycle Feedbacks



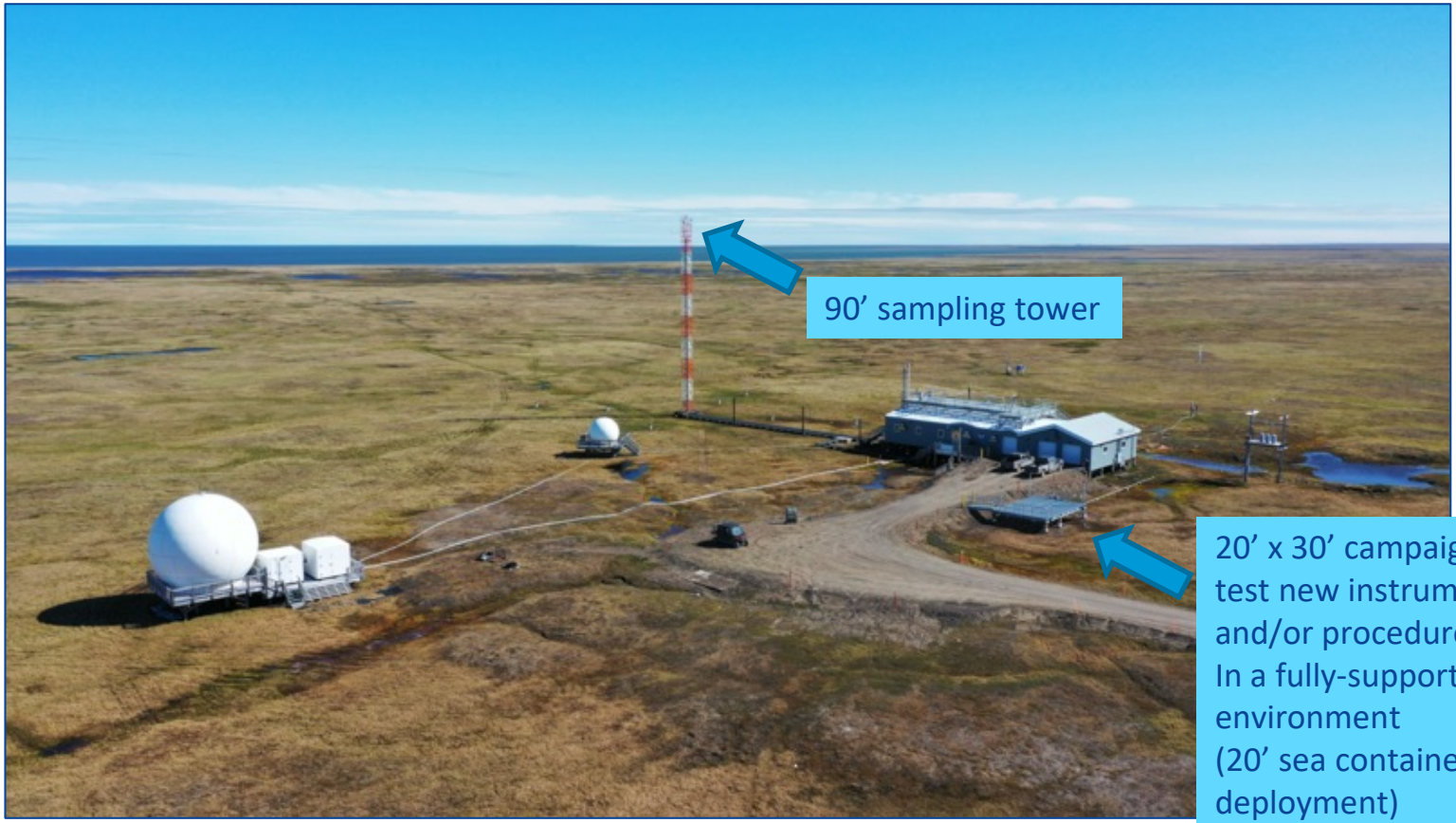
Guiding the Recovery of Stratospheric Ozone



Monitoring and Understanding Surface Radiation, Clouds and Aerosol Distribution

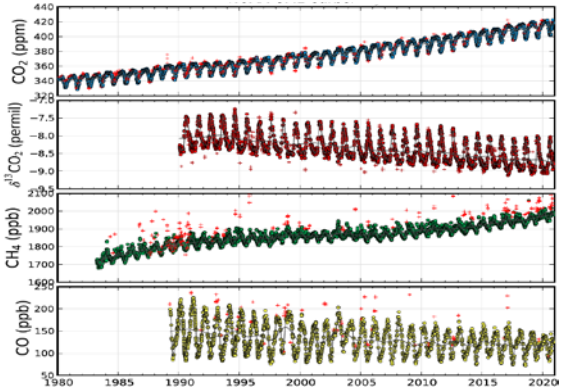
Provide a baseline of core atmospheric measurements to the research community

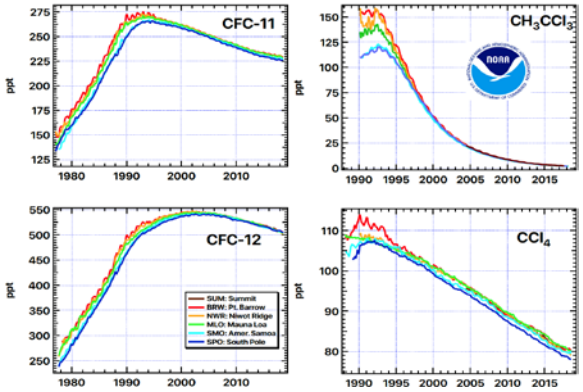
- Global pollutants (CFC-11)
- Surface and stratospheric ozone (O3)
- Greenhouse gases: Carbon dioxide (CO2), Methane (CH4), N2O, SF6
- Aerosols, Solar energy, soil temperature
- Magnetic field
- Meteorology (US Climate Reference Network)
- Co-located Seismometer and Global Positioning System (GPS)
- Satellite antennas (Sea surface height)

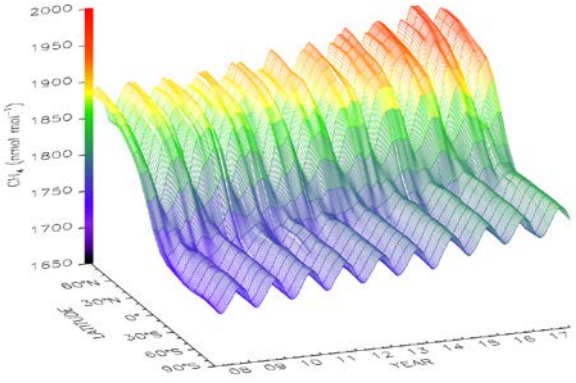

90’ sampling tower
20’ x 30’ campaign science deck
test new instrumentation and/or procedures
In a fully-supported Arctic environment
(20’ sea container, pre-deployment)

What does the Barrow Observatory offer to Arctic science?

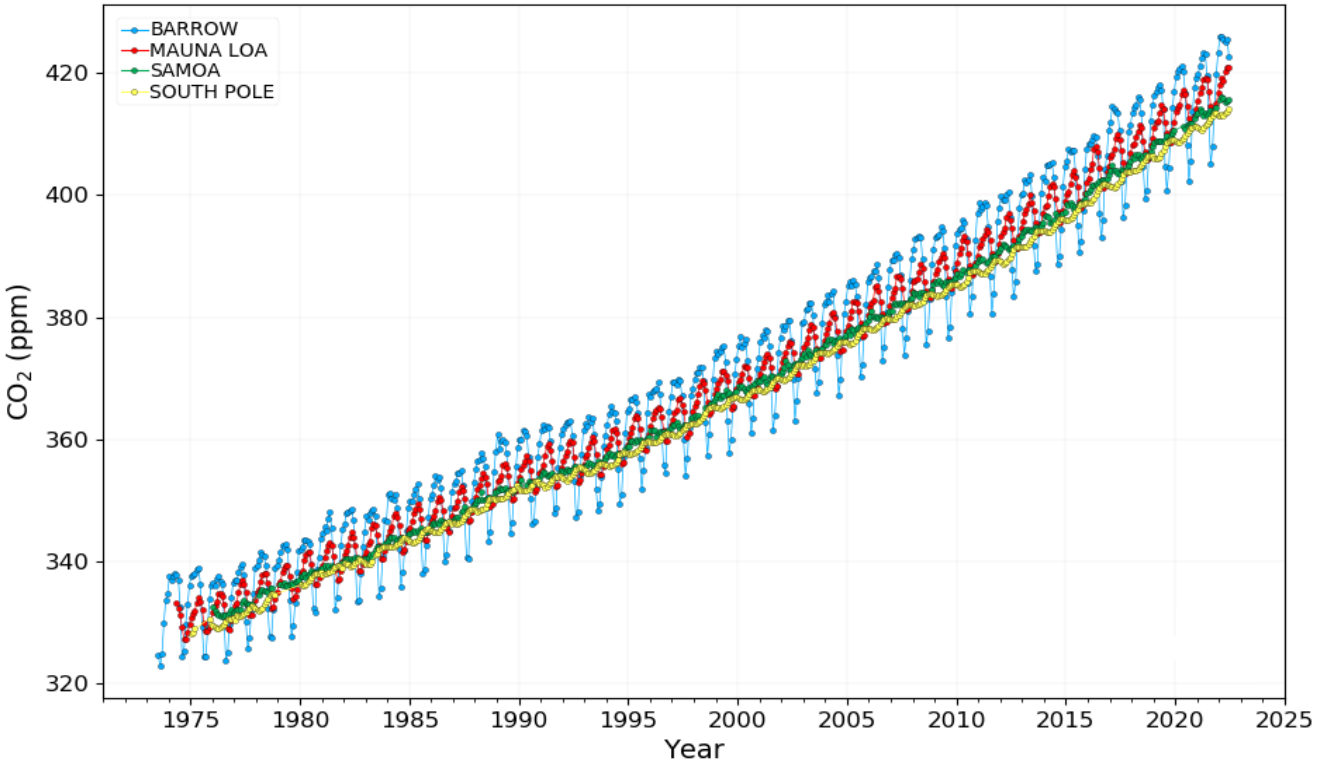
- WMO GAW Global station & WMO GCW Surface Network CryoNet station.
- 45+ years of operational scientific data acquisition experience in the Arctic.
- Co-location with the DOE ARM North Slope Alaska and USGS Geomagnetic Observatory; NOAA NESDIS polar satellite antennas; NOAA Global Climate Reference Network, adjacent BEO science.
- 225+ long-term atmospheric core measurements available at the site, including meteorology.



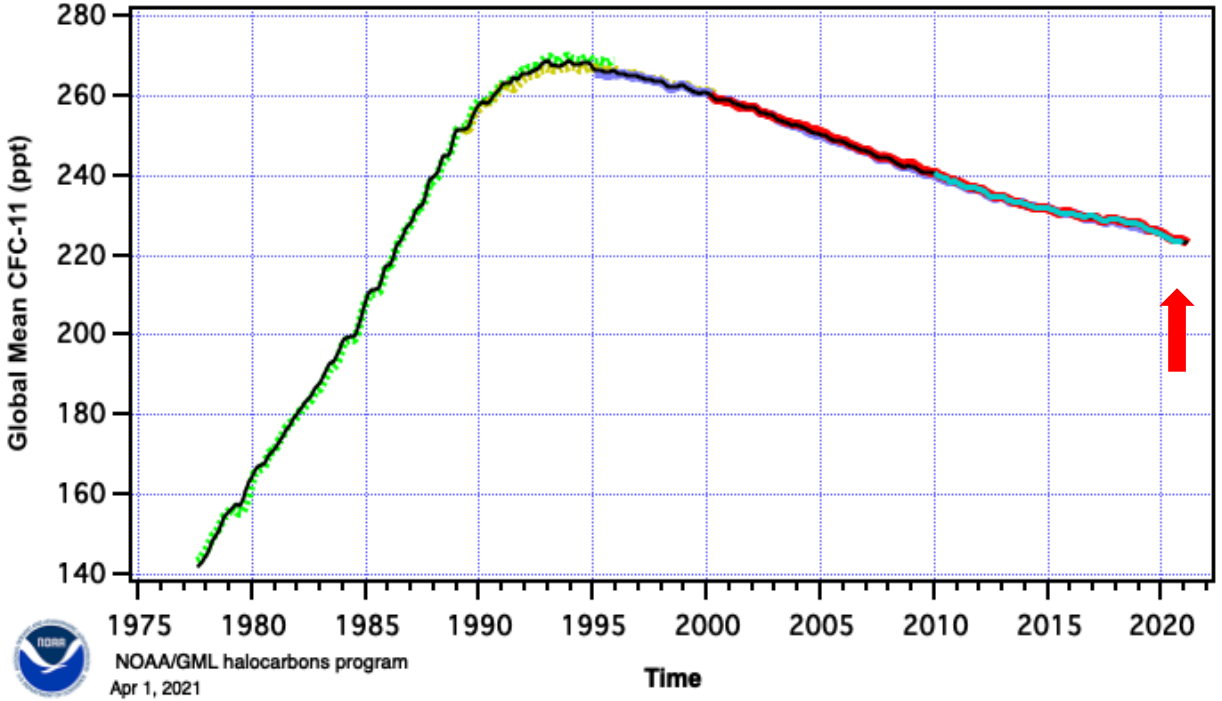




Carbon Dioxide (CO_2) monthly mean



a) Monitoring concentrations of ozone in the stratosphere.
b) Monitoring concentrations of ozone depleting gases controlled by the Montreal Protocol.

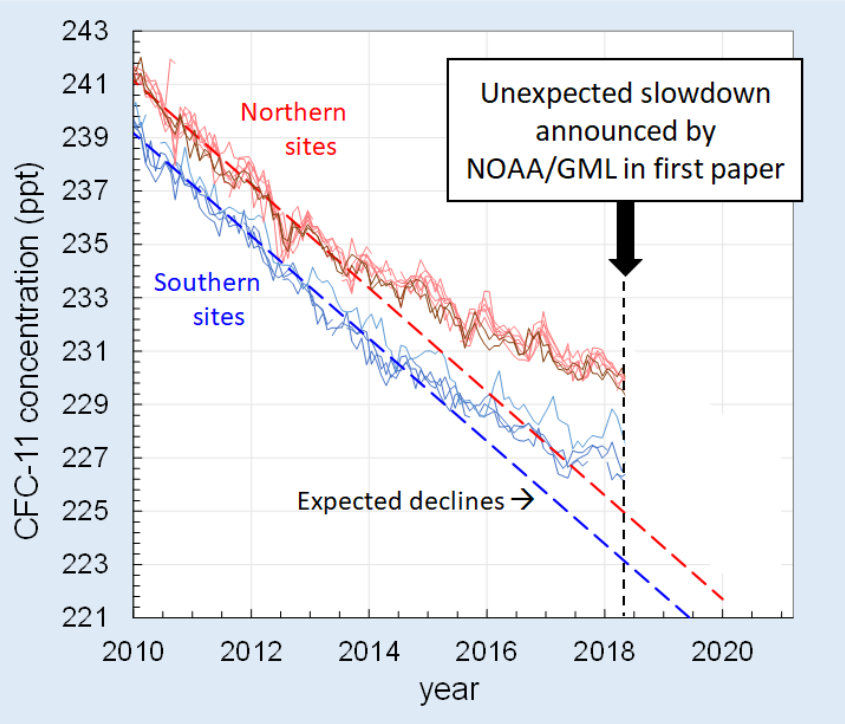


← **The NOAA-GML global concentration record for CFC-11**, the second most abundant ozone-depleting gas in the atmosphere

- Concentrations peaked in the early 1990s and have since declined because of the Montreal Protocol.
- Production was fully banned globally in 2010.

Production of CFC-11 was reportedly banned globally in 2010 by the Montreal Protocol

The concentration decline was expected to accelerate thereafter...

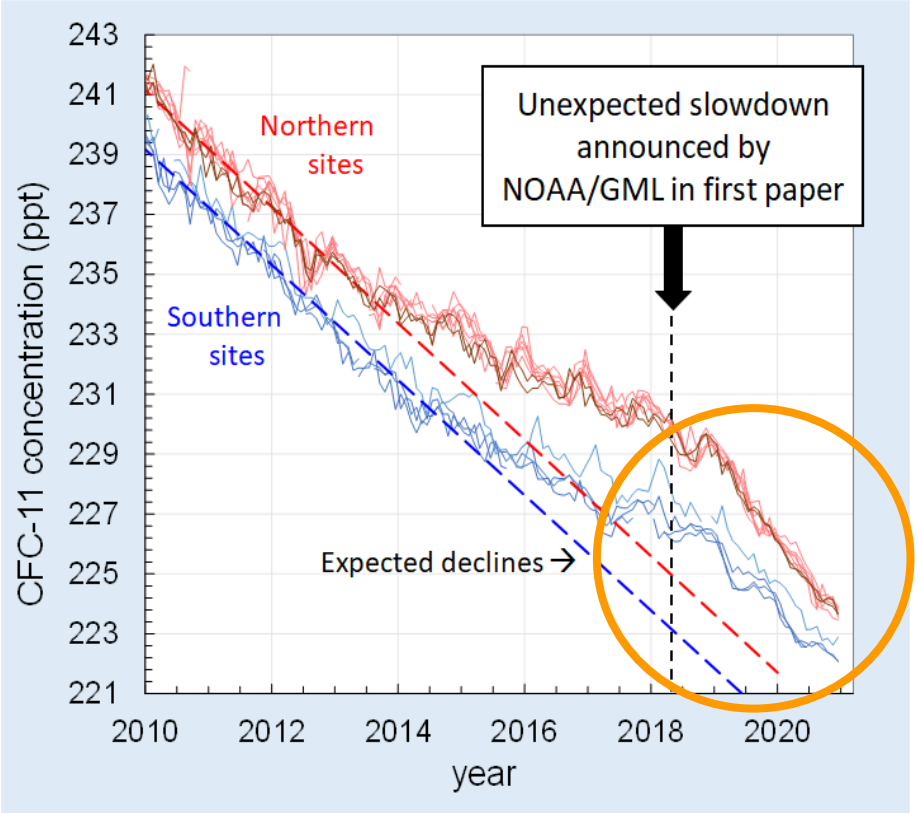


The results point to a violation of the Montreal Protocol and threatened its integrity; timely recovery of the ozone layer put in doubt. (May 2018)

Data from the ABO sites were key.

Only about half of the emission increase was subsequently linked to China.

- *but GML's network indicated the problem did **NOT** originate in the US*



Updated results reveal a rapid turnaround in ***some*** of the problem, in part from **emission decreases in China.**

Second paper by NOAA/GML in 2021.

***Impacts*:**

- **Ozone depletion minimized** &
- **Loopholes in the Montreal Protocol are being assessed** to avoid future violations.

Take-home messages:

*** Atmospheric monitoring was key**

* Could have significantly delayed recovery of the Antarctic ozone hole

D-ICE 2017-2018:
Inform MOSAiC instrumentation

As the Arctic atmosphere becomes warmer and wetter, what changes are seen in other parts of the Earth System?

How are aerosols changing with declining sea ice?

What is the change in (atmospheric constituent) in the context of Barrow Atmospheric Baseline Observatory data?

How can observing platforms and networks be connected and harmonized?

Quyanaq for your attention!

Hope to see you on the tour Thursday.

Link to NOAA Story Map about BRW:

https://storymaps.arcgis.com/stories/0f338f215aea4122b70746d68991cf6b

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