Comparison of Continuous Surface Ozone Measurements from Two Arctic Observatories

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Barrow, AK	**Tiksi, Russia**
71.32, -156.61 Alt:8.0 mASL	71.6 ,-128.9 Alt: 249.3 mASL
NOAA Observatory	NSF, NOAA, Roshydromet
Surface O_3 1973-present	Surface O_3: 2010-present

Motivations for Arctic surface ozone measurement

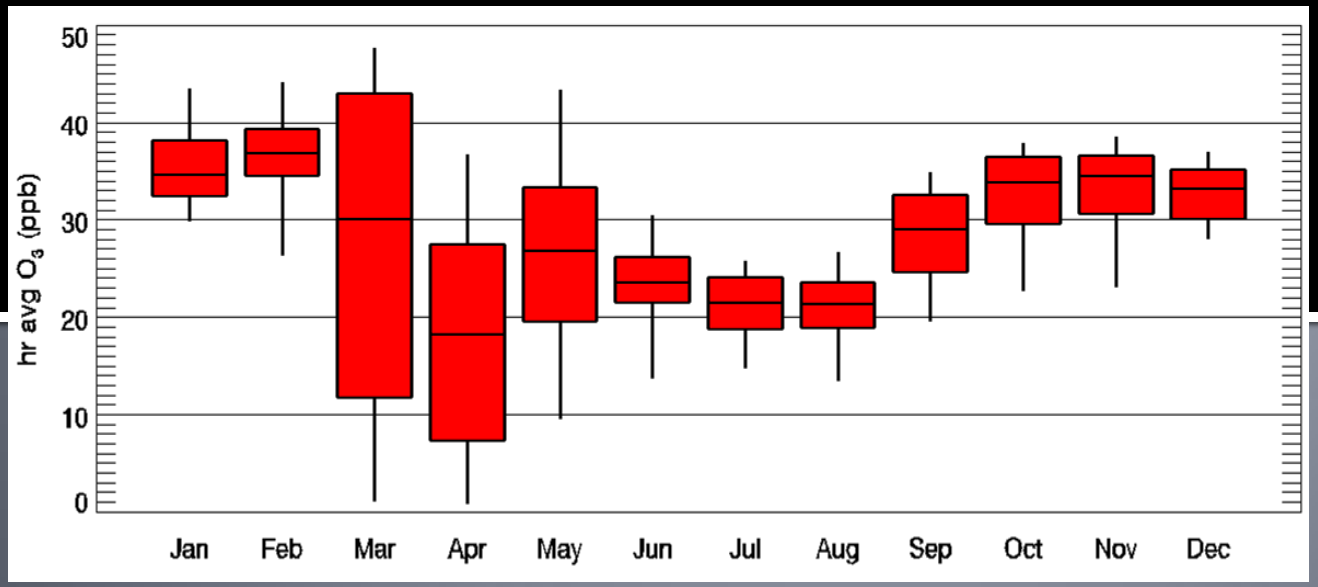
- long-term observation for baseline ozone
  - Are remote levels of ozone (non-polluted) changing over time?
- Pollution events
- ozone depletion events (ODEs)
- chemistry is rapidly changing

Instrumentation: Thermo Scientific 49 Series

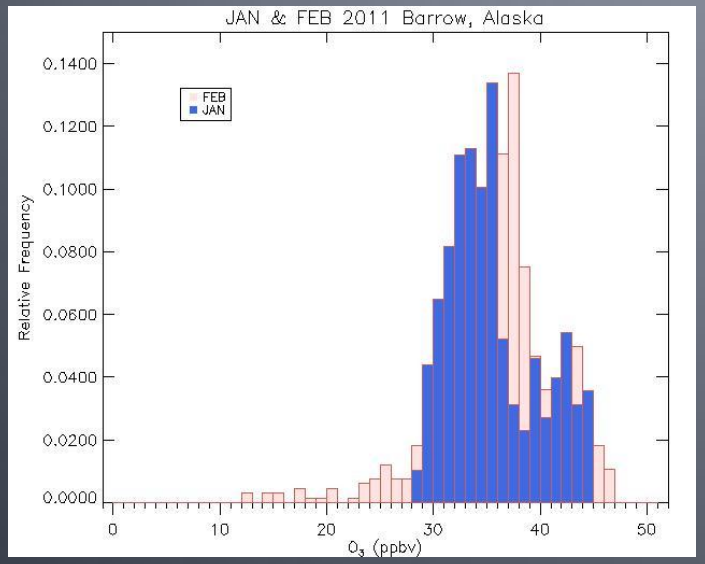
- utilizes UV dual-cell photometry
- has precision of 1 ppb
- has very little drift

- Inlets: ozone conditioned Teflon PFE
  - Inverted funnel to avoid rain and snow in line

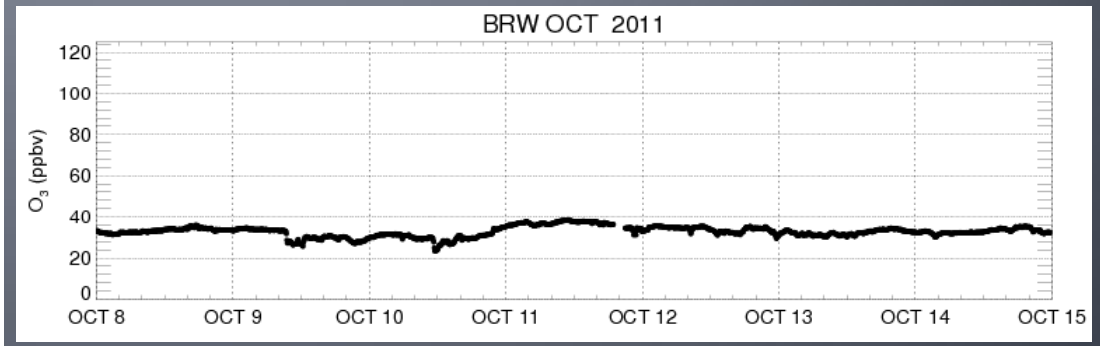
Typical surface ozone behavior - Barrow



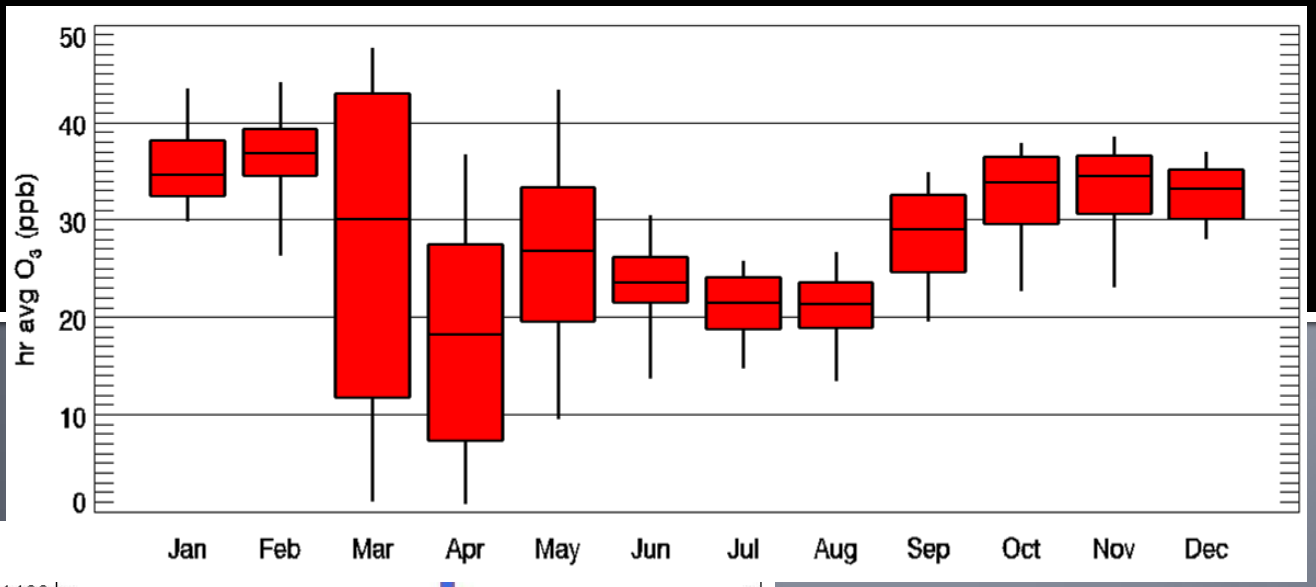
- Narrow range of values, except for M, A, M

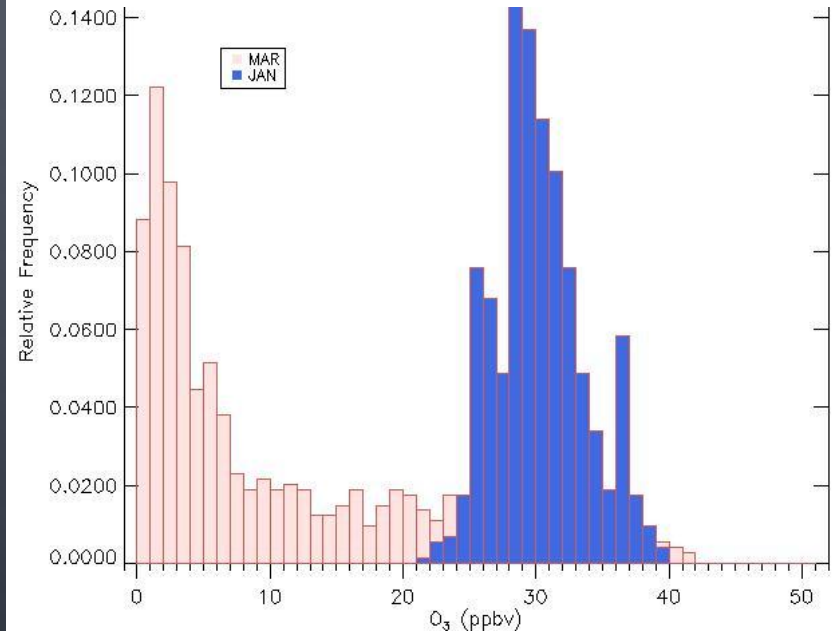


←Jan/Feb

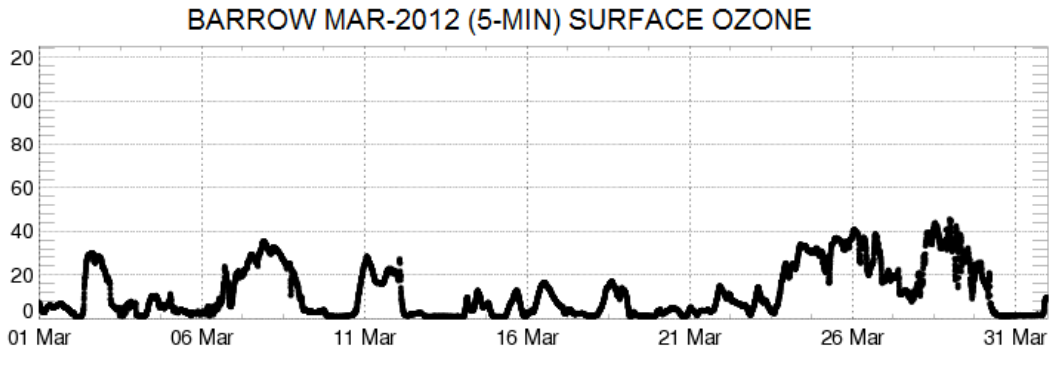


ODEs occur yearly at Barrow

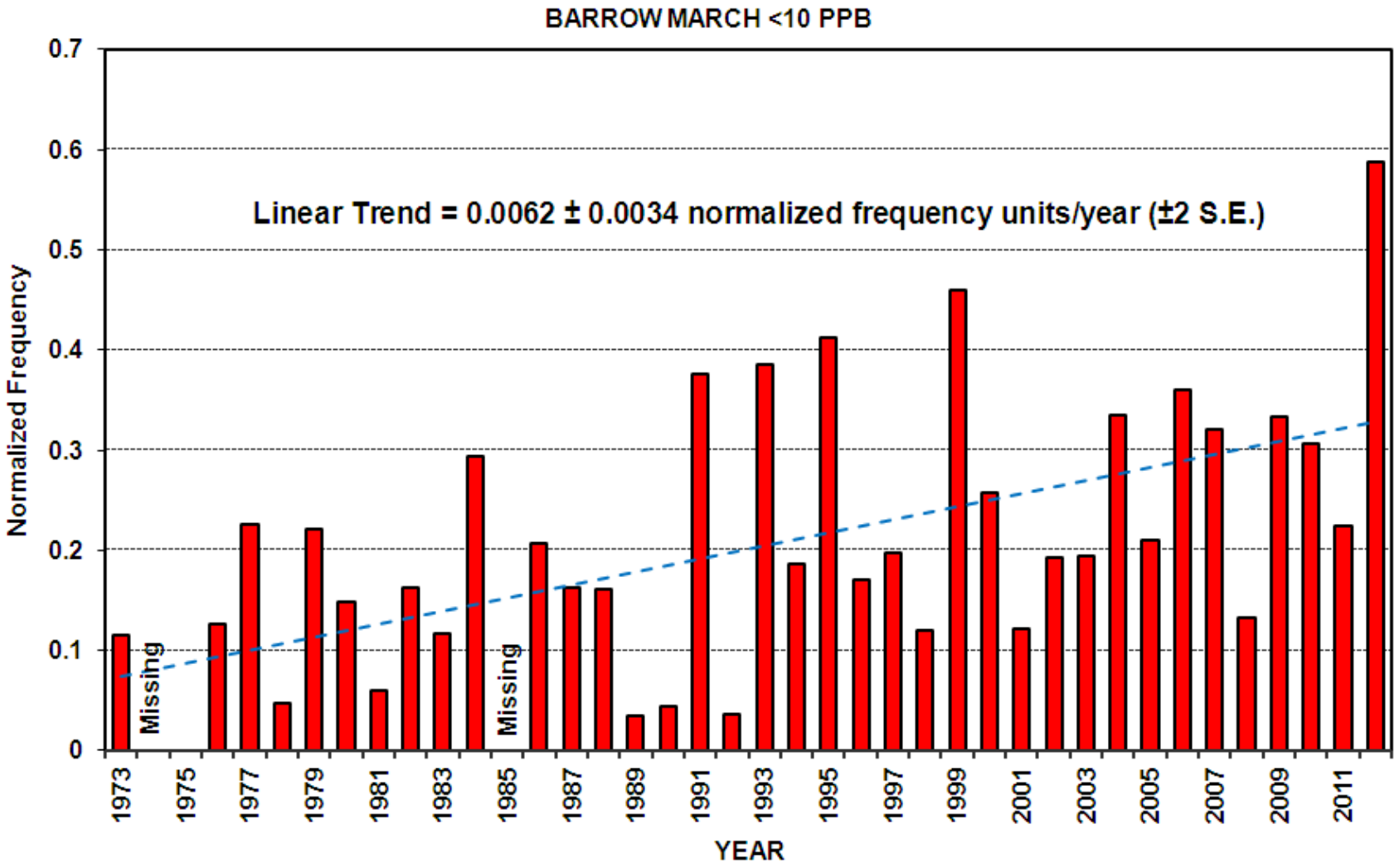




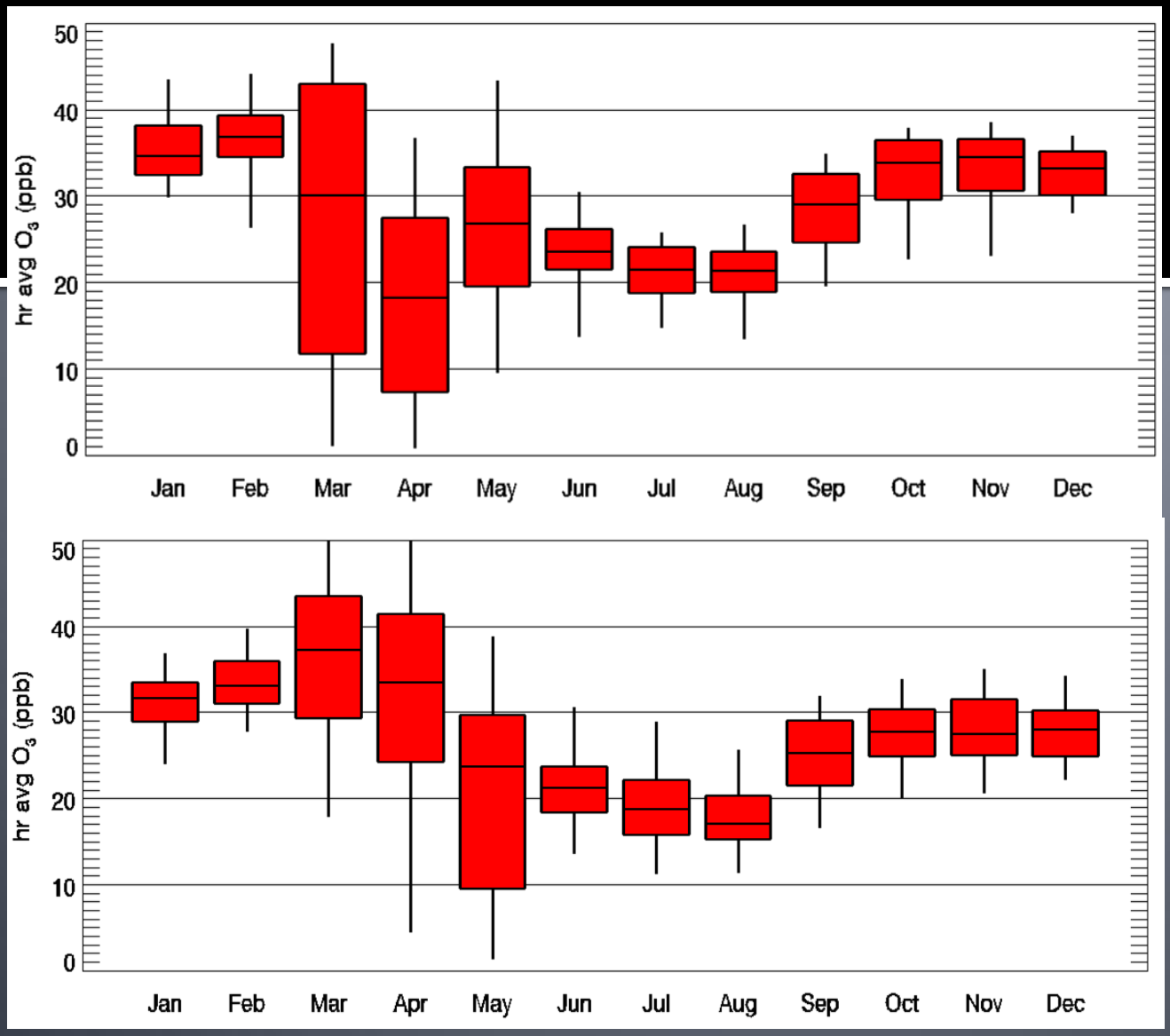
←Jan/Mar



Ozone Depletion events increasing in Barrow



Typical surface ozone behavior



←Barrow

←Tiksi

Narrow range of values, except for M, A, M

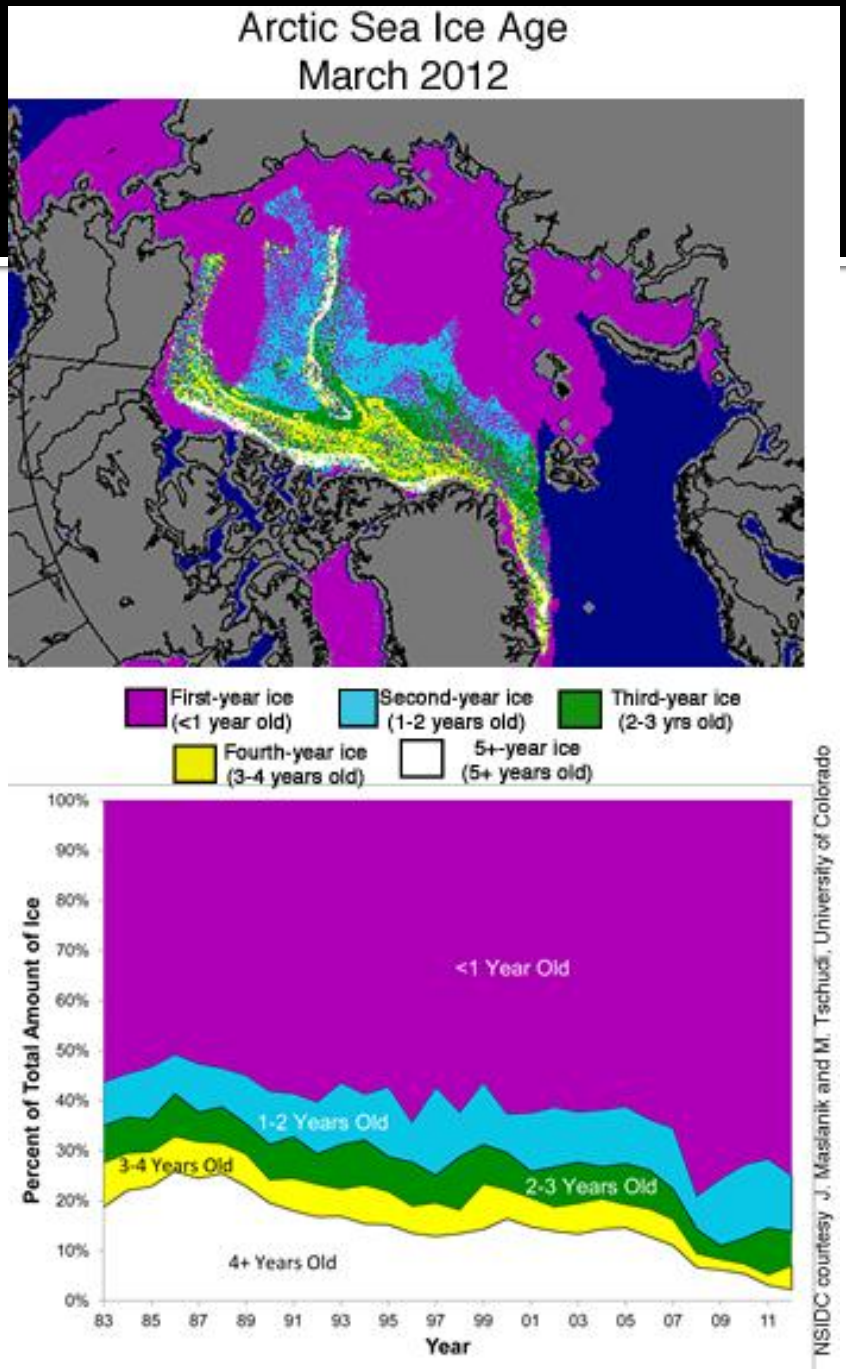
Polar Ozone Depletion Events

- Exceptionally low ozone in spring
- First reported in the Arctic in the 1980s [*Oltmans*, 1981; *Bottenheim et al.*, 1986]
- Br- ↑ released from open water when sea-ice melts
- O_3 ↓ decreases "ozone depletion events"
- Younger ice – saltier – intensifies release of halides → more ODEs

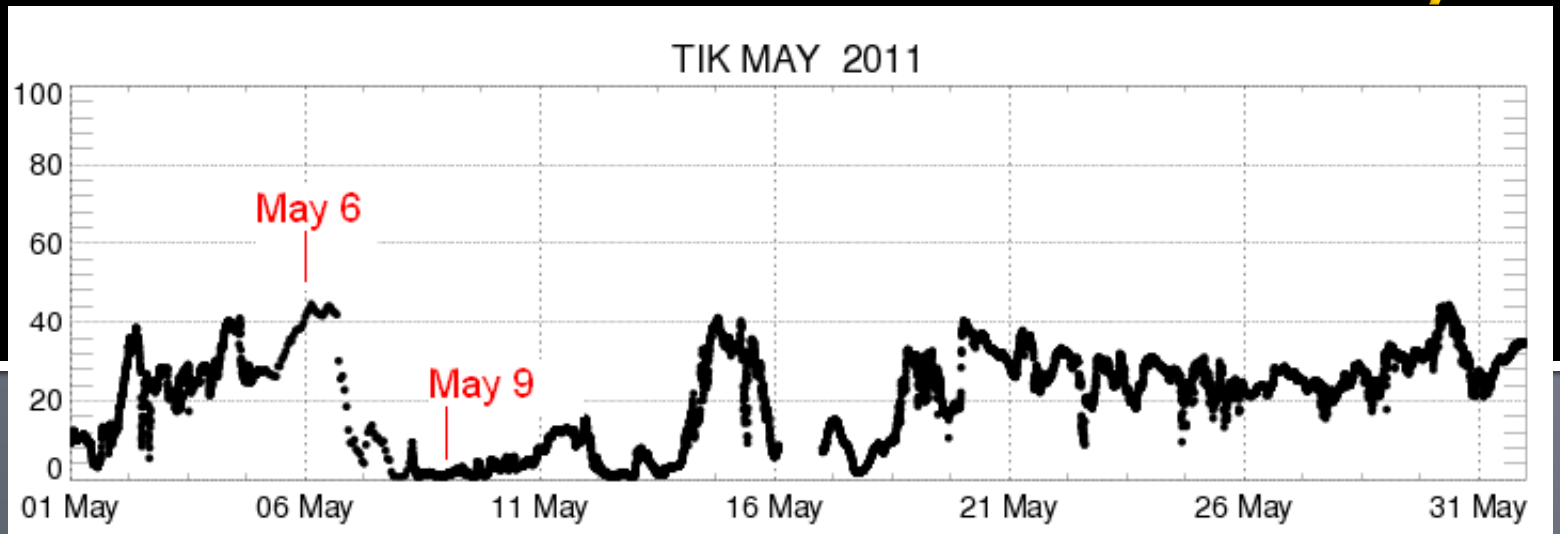
Shifting to a new ice regime

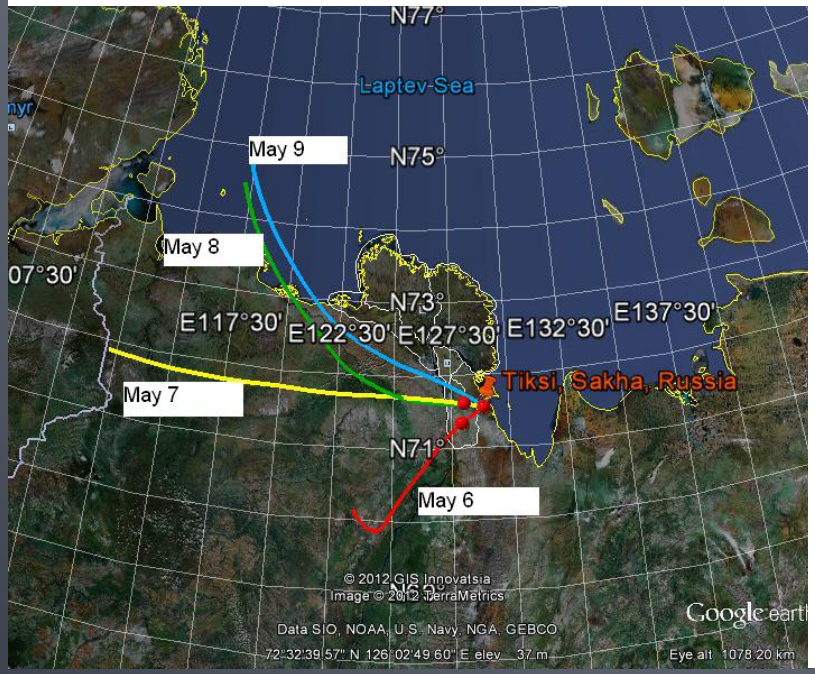
- first-year ice made up 75% of the Arctic sea ice cover March, 2012
- Multiyear ice now only constitutes only 2%.

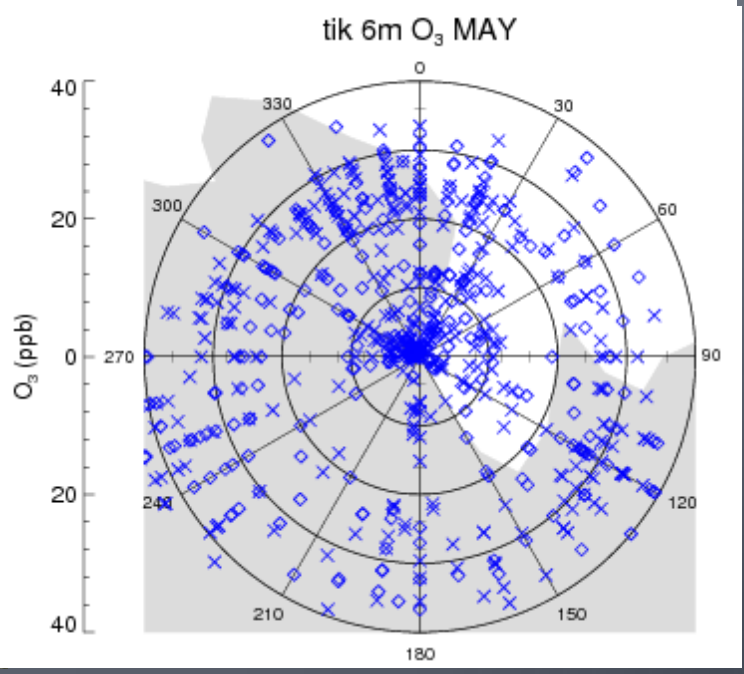
Credit: NSIDC courtesy J. Maslanik and M. Tschudi, University of Colorado



ODEs occur at Tiksi in 2011…but in May







Conclusions

- Wind directions play a part in how much depletion is seen
- Tiksi observes ODEs similar to those at Barrow since 1973
- Events are increasing as portion of new ice (higher bromine) increases
- Tiksi is a land station but it still will give information about sea-ice conditions off the coast