

Comparison of AMDEs between Villum and Zeppelin Mtn.

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Group 1

Assistants

Lance and Lisa

Motivations

Mercury is a long-lived neurotoxin whose oxidation and deposition is expected to change with a changing climate

Goal

Compare AMDEs between the two High Arctic sites

Research Question

What are the differences in depletion events with regards to occurrence, sea ice, insolation, RH in the period 2011-2014



Methods

Data Sets from Ny Ålesund (NYA) and Villum Research Station (VRS) for 2011-2014

- Atmospheric Mercury (EBAS and AU Database)
 - Depletion event defined as:
Hg > 0.5 ng m⁻³ and three consecutive decreasing measurements
- Meteorological data (EBAS and AU Database)
 - Temperature
 - Relative Humidity
 - Shortwave Down-welling Radiation (CESM2 Model)
- Sea Ice Area Fraction (NICAM 16-7S Model)

Model data was masked for $\pm 4^\circ$ Lat/Lon of NYA and VRS

- HYSPLIT Back Trajectory Model with GDAS 1° Met Data

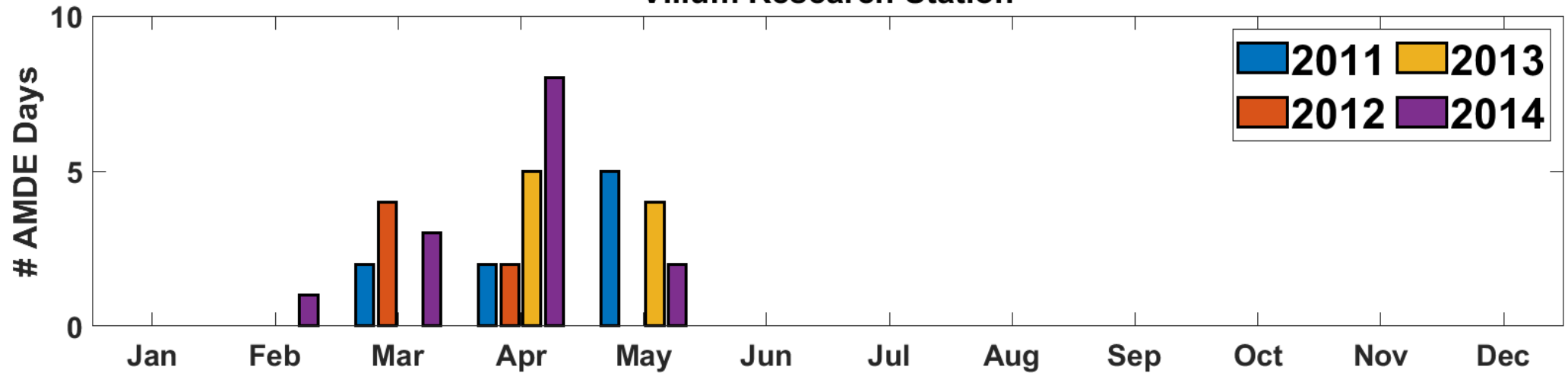
IT Tools Used

- Anne, Sara, Lance, Johannes

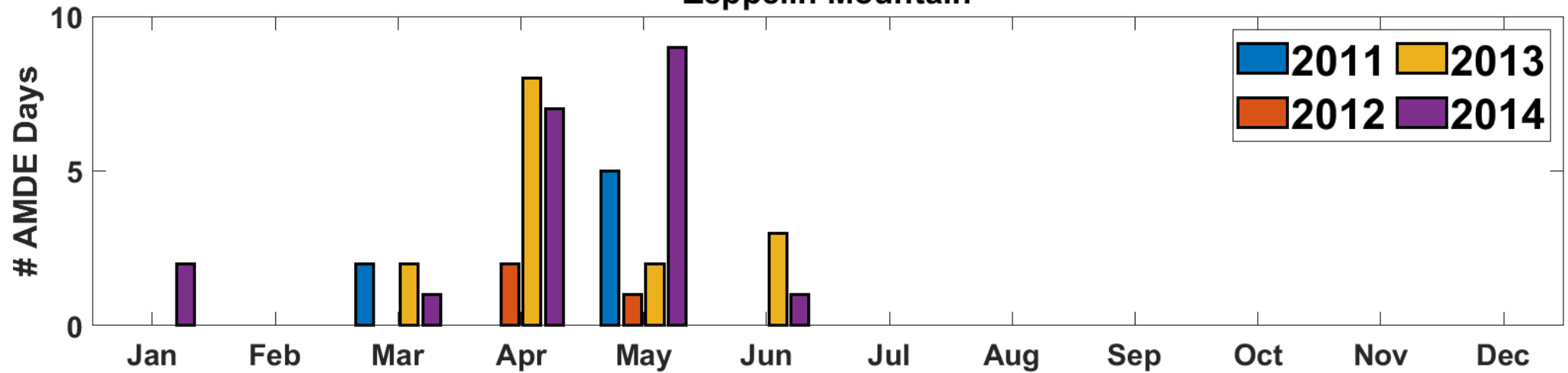


Overview of AMDEs at NYA & VRS

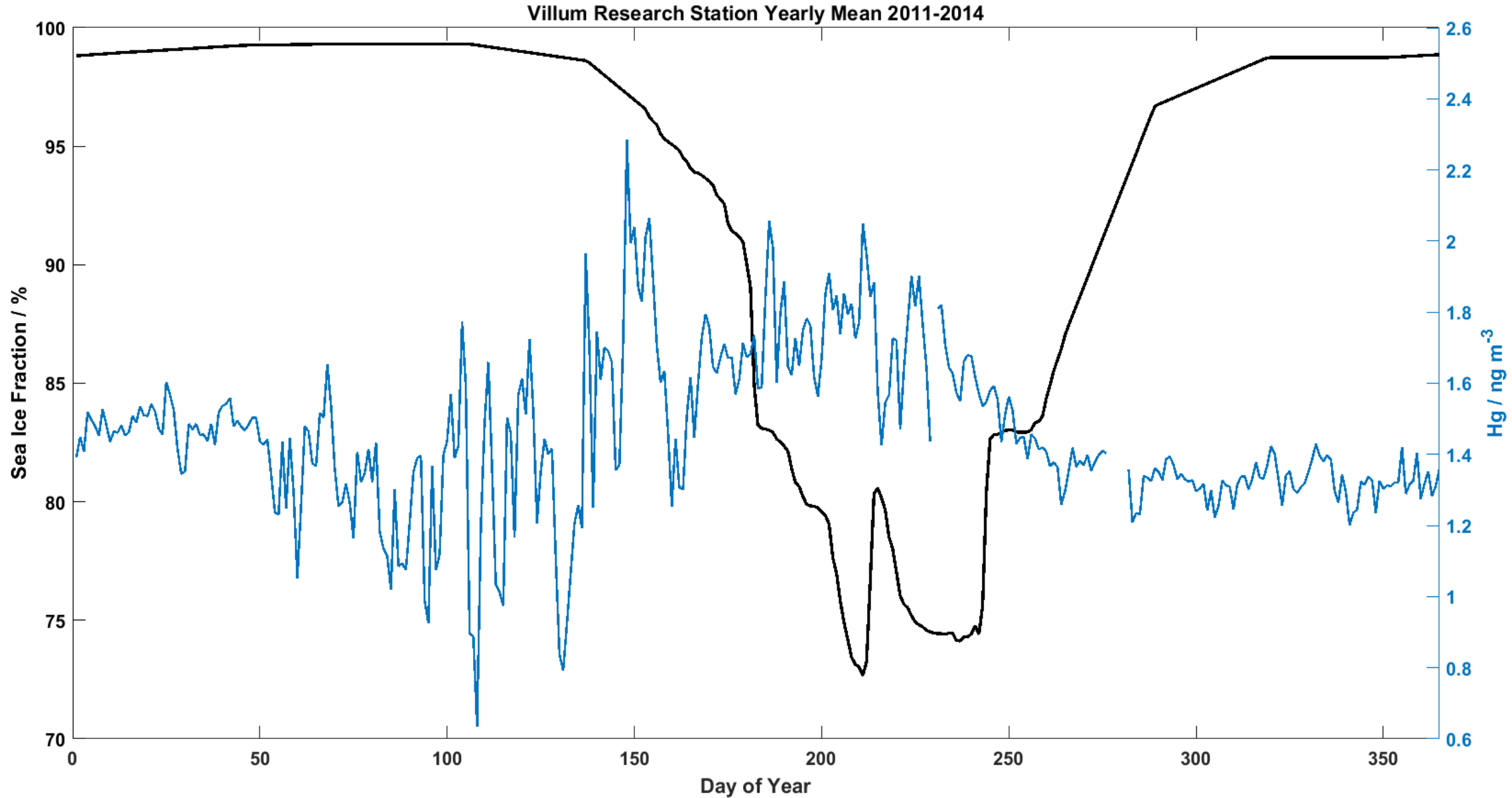
Villum Research Station



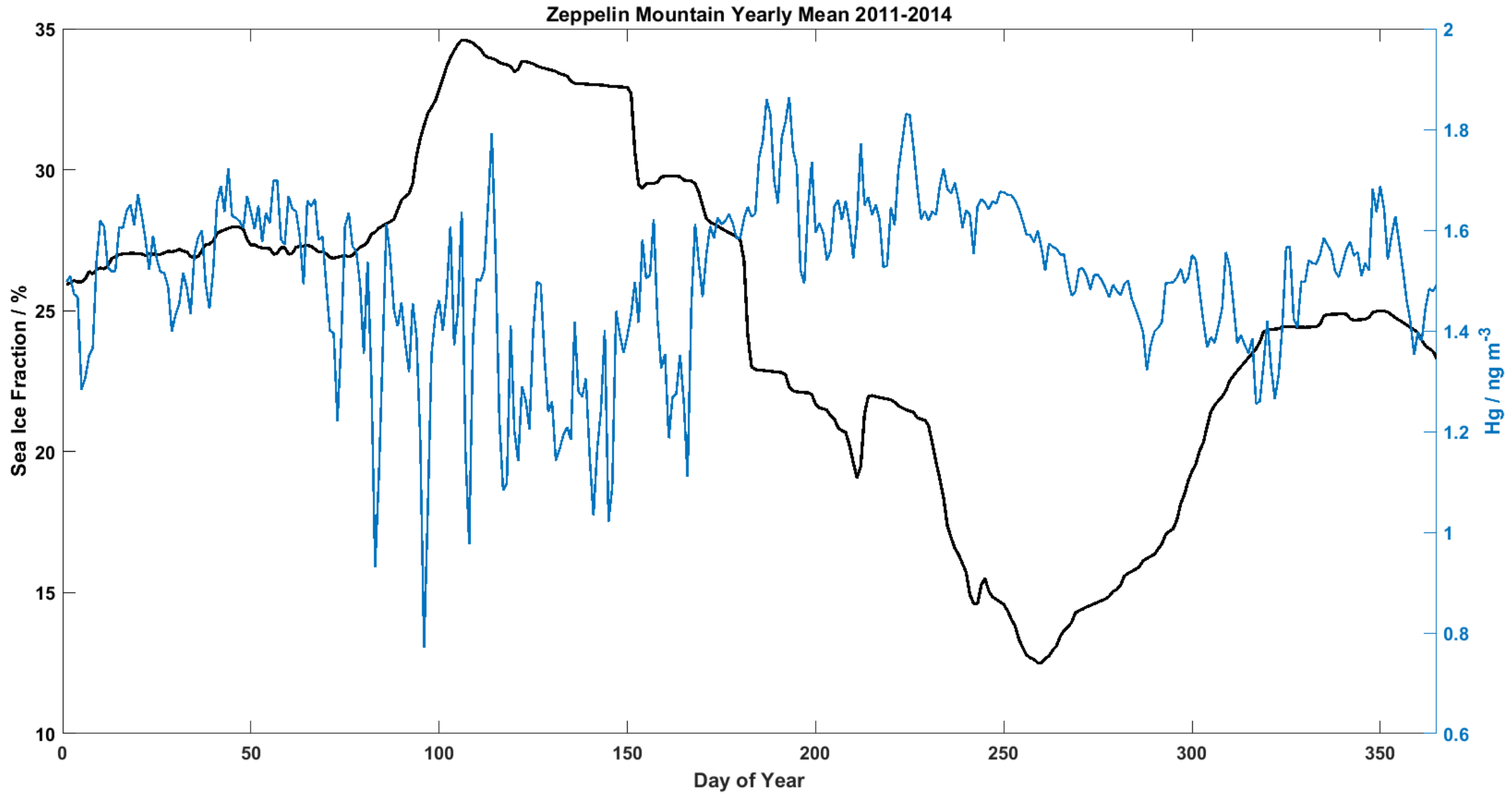
Zeppelin Mountain



Relationship between Hg and Sea Ice at VRS

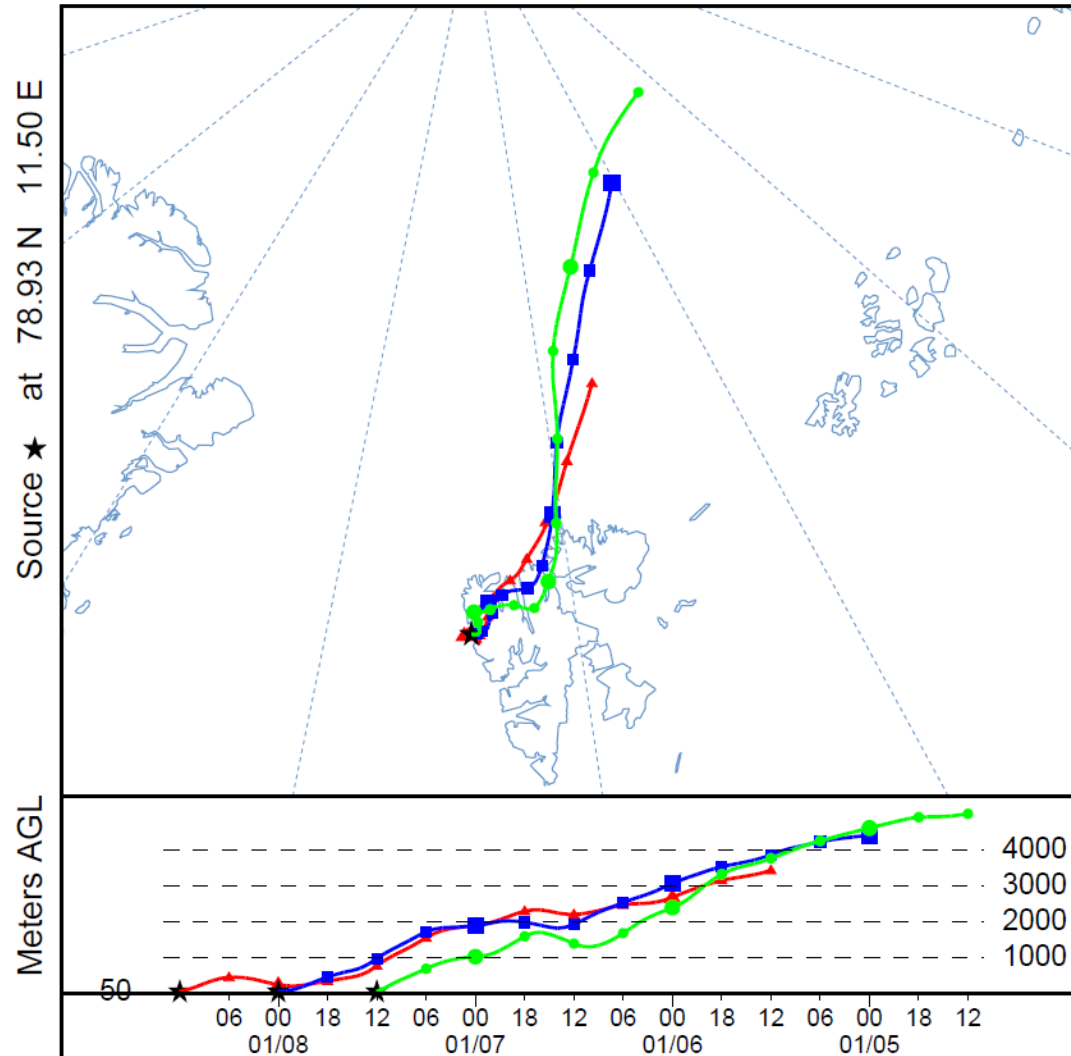


Relationship between Hg and Sea Ice at Zeppelin Mtn.



Upper Tropospheric Intrusion induced AMDE

NOAA HYSPLIT MODEL
Backward trajectories ending at 1200 UTC 08 Jan 14
GDAS Meteorological Data



- AMDE observed at Zeppelin Mtn. on January 7th and 8th, 2014
- Polar Night → No Insolation → No Reactive Halogen Source
- Back Trajectories confirm intrusion from upper troposphere as cause of AMDE

Conclusions & Future Work

Conclusions

- Differences in Sea Ice fraction surrounding VRS and Zeppelin drive differences in Hg concentration as well as magnitude and frequency of AMDEs
- VRS is mainly ice-locked throughout the year preventing ocean evasion and providing a surface for oxidized Hg deposition and reactive halogen cycling
 - This is observed in lower yearly mean and higher magnitude of reemission in summer
- NYA is largely open water thus allowing for ocean evasion and a pathway for oxidized Hg removal
 - This is evident in the higher yearly mean and less magnitude of reemission in summer

Future Work

- Investigate differences in Insolation, Temperature, and Relative Humidity

