Turning Observations from Multiple Platforms into a Single Modeller-Ready Product

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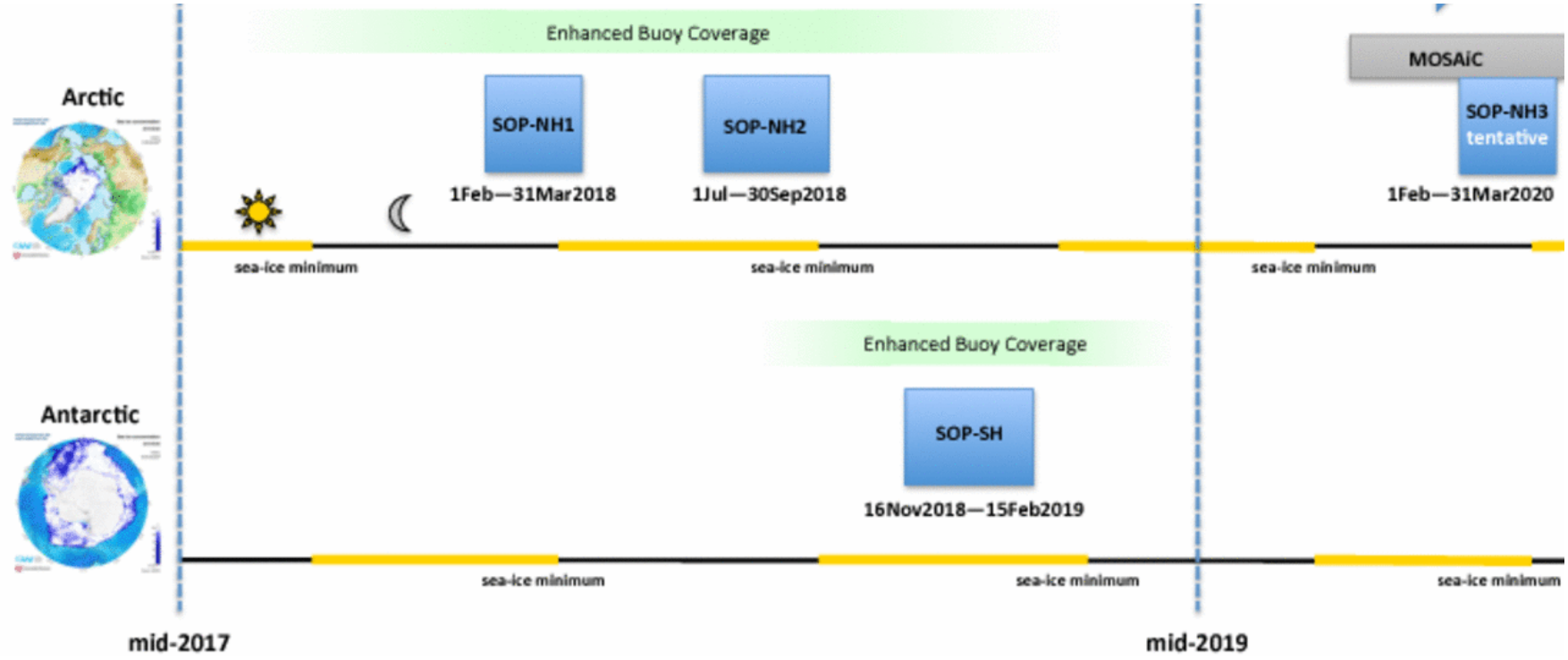
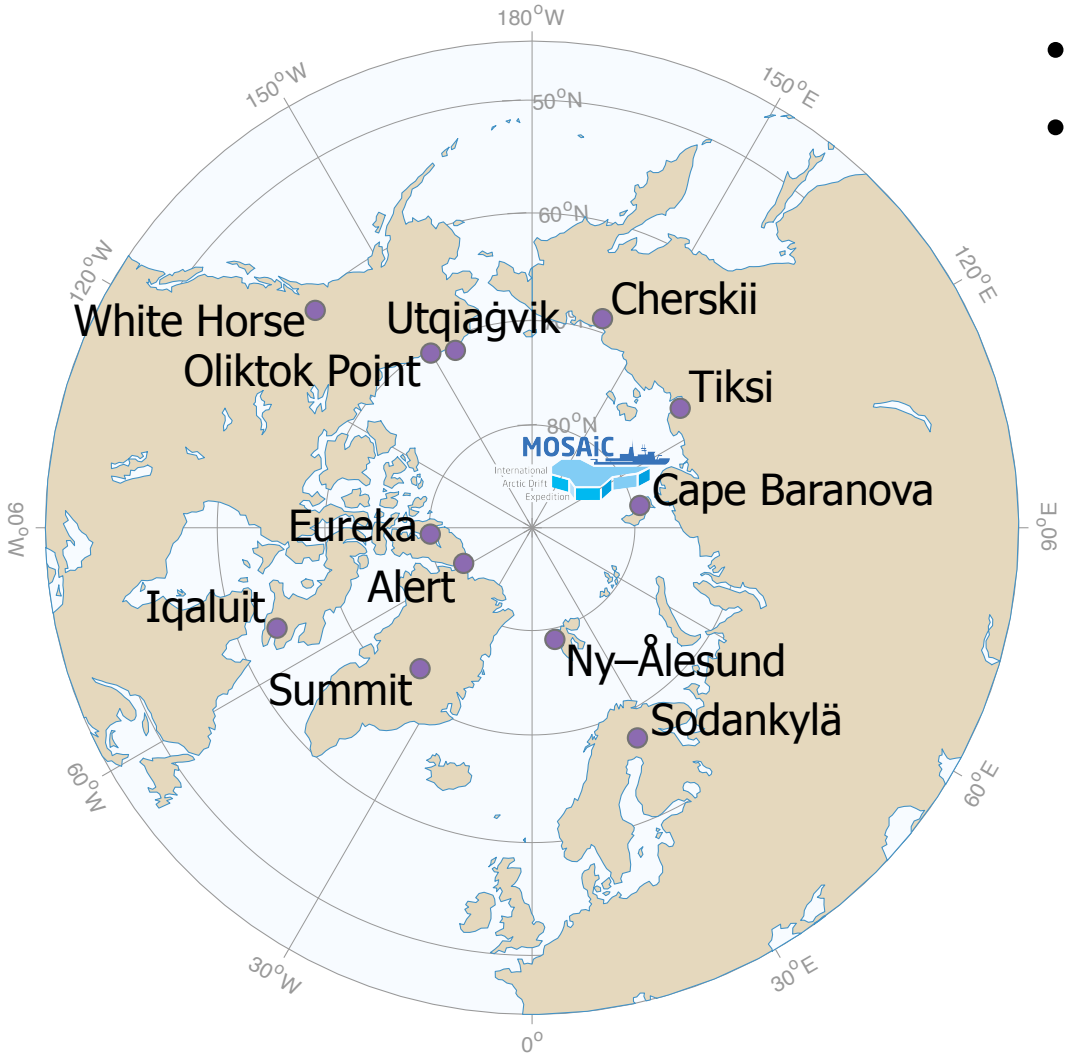
YOPP
YEAR OF POLAR PREDICTION

"enabling a significant improvement in environmental prediction capabilities for the polar regions and beyond"



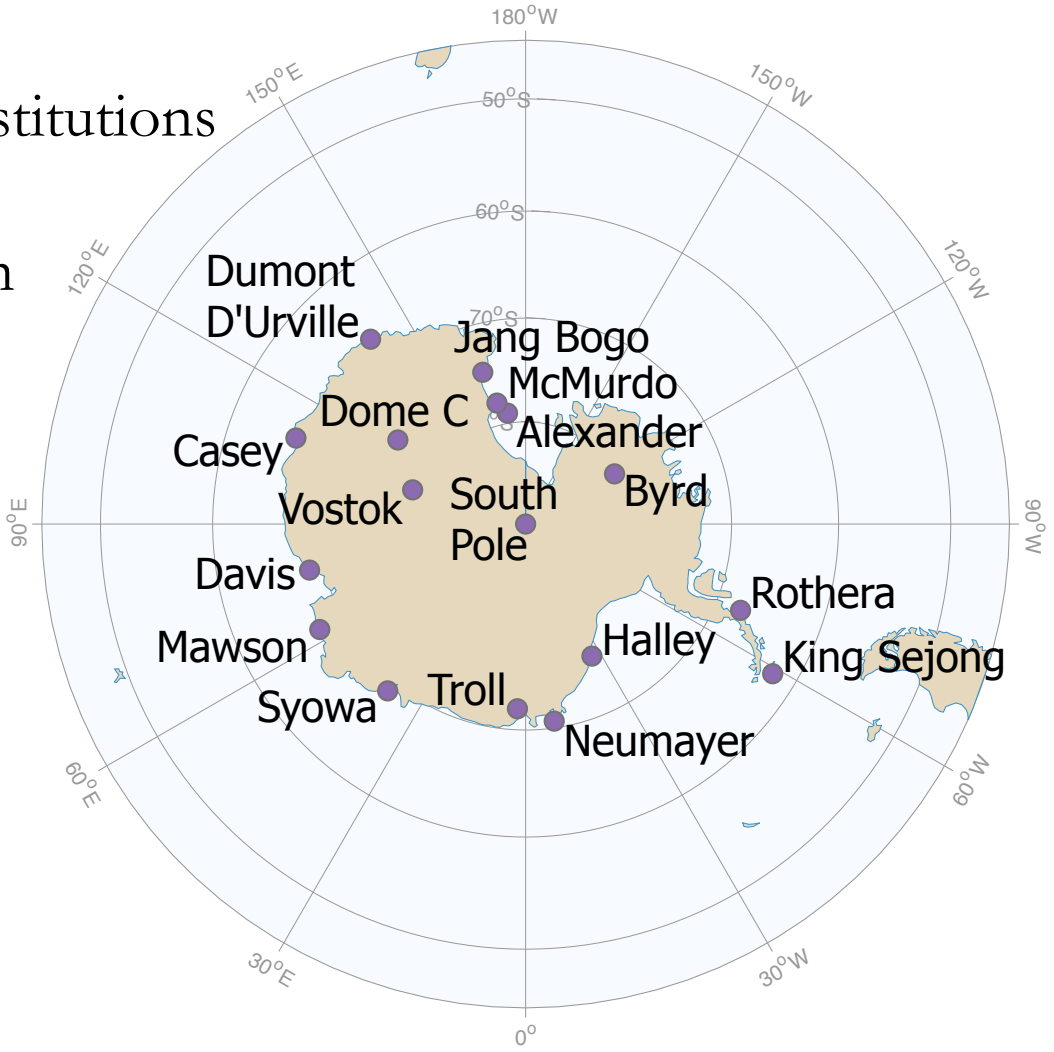
YOPP Supersites: Key Characteristics



- Suites of Instruments
- Standardized [?]
  - measurement practices
  - data processing
  - quality control

YOPP Supersites: Data/Metadata Issues

- Coordinating across institutions
- Making easy to use for
  - satellite verification
  - model validation*
  - process studies*



* YOPPsiteMIP :
the YOPP Supersite Model Intercomparison Project

YOPP Supersites: Data/Metadata Solution

MODFs (Merged Observatory Data Files)

File format and semantics match

the forecast-model output data sets developed

for the numerical weather prediction (NWP)

Model Intercomparison Project (MIP)

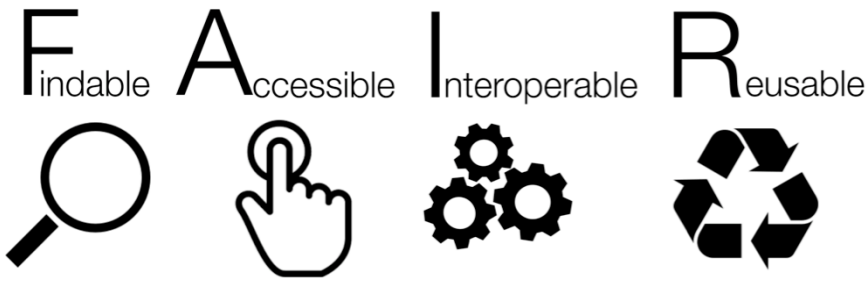
during YOPP Special Observing Periods (SOPs)

YOPPsiteMIP *(https://www.polarprediction.net/key-yopp-activities/yoppsitemip/)*

Open Science & Open Data Practices

Foundational Infrastructure

Providing ***findable***, ***accessible*** data with ***interoperable*** infrastructure enabling long term data ***reuse*** for synthesis



https://www.force11.org/fairprinciples

Source: Jones et al. (2019, Ch. 18; modified by overlaying Arctic Data Center logo on upper-left corner)

MODFs: The Dream (as of Jan 2019)

Observation Center(s)
create MODFs

NWP Centers
create timeseries files
i.e. MMDFs

1 location / circa 1 grid point

Δt = 7.5 minutes

native vertical resolution

surface meteorology

surface radiation

well characterized

thermodynamic soundings

cloud/aerosol profiles

surface energy budget

tendencies (MMDFs only)

less well characterized

as 1 netCDF file per SOP or forecast initialization

MODFs: The Plan (as of Jan 2019)

- **Focus on Utqiaġvik (formerly Barrow), SOP1**
  - Locate & vet [& compare] observations
  - Identify "variable" or "platform" mentors
  - Obtain input from modelers
  - Develop MATLAB code to put data into netCDF
  - Balance "desired" and "possible"
  - Publish w/ DOI
  - Document w/ *Earth System Science Data* article
- **Develop "recipe book" (MATLAB code + instructions)**
- **Second Priority: Sodankylä**
  - Known forecast difficulties
  - Independently test recipe book

MODF Issues & *Solutions*: Gory Data Details

- **Hard to find consistent and/or QC'd surface & sonde**
  - *Use IGRA2 for soundings put onto GTS*
  - *Use what we can get!*
- **Soundings often in "elapsed time" and include lat/lon**
  - *Keep this information, using distinct variable names*
- **Modelers want "uncertainty", defined how?**
  - *?*
- **Some supersites are multiple sites!**
  - *Document! (internal metadata + data journal article)*

MODF Issues & *Solutions*: Creation

- **Naming conventions**
  - CMIP: *comb resources, try to match; other convention or invent*
  - standard_name: *first choice CF*, also ACDD† and others*
  - long_name: *discussions*
  - *Massive Google spreadsheet! Includes mapping to models, sites*
- **File conventions (within netCDF)**
  - *Each MODF = 1 timeseries netCDF + 1 sounding netCDF*
- **Consistency of data & metadata**
  - Metadata: *Discussions → Massive Google spreadsheet!*
  - *Modular Python toolkit under development*

*Climate and forecast (CF) metadata convention, http://cfconventions.org/

†Attribute Convention for Dataset Discovery, http://wiki.esipfed.org/index.php/Attribute_Convention_for_Data_Discovery

MODF Issues & *Solutions*: People

- **Time**
  - Paid vs. squeezing in: *"build-an-MODF" workshop; patience*
  - Across the physical world: *conference call window; patience*
  - Family leave, medical leave, field work: *patience*
- **Mission creep**
  - *Focus on NWP process studies*
  - *Focus on YOPP endorsed activities*

MODFs: The Reality (Utqiaġvik, as of Jan 2020)

Observation Center(s)

create MODFs

✓(2, 10, 20, 40m + T_{soil})

✓

✓(needs QC)

(awaiting personnel)

✓(bulk & eddy fluxes)

✓(snow flux; O_3)

2 nearby locations

Δt = smallest reasonable (1–30 min)

native vertical resolution

surface meteorology

surface radiation

well characterized

thermodynamic soundings

cloud/aerosol profiles

surface energy budget

less well characterized

as 2 netCDF files per SOP

MODFs: The Plan (as of Jan 2020)

- **Focus on Utqiaġvik, SOP1 & SOP2**
  - Lightly QC ARM soundings
  - Cloud/aerosol profiles?
  - Finalize "harmonized metadata"
  - Rewrite netCDF files with Python toolkit
  - Keep writing *Earth System Science Data* article
- **Develop Python toolkit**
- **What to do with MOSAiC data?**
- **MODF Workshop (Boulder, fall 2020)**
  - Observational specialists use toolkit to build MODFs

Data that are

Findable, Accessible, Interoperable, Reusable

require time ($)

but are valuable for science

and deserve credit (DOIs)

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