US Contribution to YOPP-SH

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With contributions from:
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YOPP-SH Planning Meeting
Columbus - June 6, 2016
Year of Polar Prediction (YOPP) - Southern Hemisphere

Latest News on YOPP-SH:

- Year of Polar Prediction in the Southern Hemisphere (YOPP-SH) Planning Meeting, Columbus, Ohio (June 6, 2016)
- Special Observing Period for YOPP-SH: Austral Spring 2018 - Austral Fall 2019

Description

- Coordination Committee for YOPP-SH (Last updated: Oct. 08, 2015)

YOPP MISSION:

Enable a significant improvement in environmental prediction capabilities for the polar regions and beyond, by coordinating a period of intensive observing, modelling, verification, user-engagement and education activities.

The Year of Polar Prediction (YOPP) is one of the key elements of the Polar Prediction Project. YOPP is scheduled to take place from mid-2017 to mid-2019.

http://polarmet.osu.edu/YOPP-SH/
Projects endorsed by YOPP-SH

- Upper air soundings from Neumayer and RV Polarstern
- Italian Antarctic Meteo-Climatological Observatories (IAMCO)
- Southern Ocean Aerosol Clouds And ice Processes Experiment (SEASCAPE)
- GEO Cold Regions Initiative (GEO CRI): Information Services for Cold Regions
- ARM West Antarctic Radiation Experiment (AWARE)
- WGNE activities for support of YOPP
- Southern Ocean Clouds Radiation Aerosol Transport Experimental Study (SOCRATES)
- Influence of small-scale processes on the dynamics of the coupled atmosphere-cryosphere ocean system on daily to seasonal timescales in the region of Adélie Land, Antarctica
- Lower tropospheric Ozone Profiles over Antarctic Plateau (LOPOP)
- RADiative Impact of ANtarctic Clouds Experiment (RADIANCE)
- Precipitation Impact on the Regional ANtarctic Accumulation (PIRANhA)
- TRaceability and Improvement of Meteorological Measurements during YOPP intEnsive peRiods, to better investigate ABL characteristics and coupling processes in coastal Antarctica (TRIMMER)
- Surface-Atmosphere Mass and Energy Exchanges at a Coastal Antarctic site (SAMEECA)
- Antarctic Meteorology and Snow Research: from Process Understanding to Improved Predictions (ASPIRE)
Antarctic Mesoscale Prediction System (AMPS)

- Provides customized NWP support for US Antarctic Program forecasters
  - Forecast model is the Weather Research and Forecasting Model (WRF-ARW), optimized for the Antarctic environment (Polar WRF)
- Funded by the National Science Foundation
  - Run by NCAR/Mesoscale and Microscale Meteorology Laboratory
  - Primary goals are to support USAP forecasters and their needs, with secondary aims to support research and education efforts in Antarctic meteorology
- AMPS products/model output
  - Real-time forecasts running since October 2000, through many updates
  - Real-time products disseminated primarily through the AMPS web page ([http://www2.mmm.ucar.edu/rt/amps/](http://www2.mmm.ucar.edu/rt/amps/)) and the Antarctic-IDD network
  - Forecast archive: recent years available through Earth System Grid
- Limited support for special projects
  - South Georgia Island Wave Experiment (SG-WEX), Antarctic Cloud Microphysics Campaign, 2ODIAC, ORCAS, AVOCET
AMPS Domains

30-km

3.3-km

10-km

3.3-km

1.1-km

3.3-km
Example of AMPS high-resolution climatology

2015 annual mean
10m wind field over the
Ross Island area from
AMPS 1.1km domain
AMPS downscaling: 1.1km $\rightarrow$ 330m

AMPS 1.1km @ 1200 UTC 20 Aug 2014

AMPS-NDOWN 330m @ 1200 UTC 20 Aug 2014
**ARM West Antarctic Radiation Experiment**

*A Joint NSF-DOE ARM Mobile Facility Campaign*

**Objectives**

1. Improve understanding of mechanisms governing West Antarctic energy balance and climate change
   - Influence of subtropical and tropical teleconnections
   - Influence of local cloud radiative forcing and feedbacks

2. Assessment and improvement of cloud physical parameterization in climate model simulations for the coldest climate regime
   - What factors govern cloud physics in a very cold and very pristine environment year around?

**Deployment Plan**


**AMF2 at McMurdo Station (“Central Facility”)**

Detailed cloud and aerosol observations with the most advanced atmospheric science equipment available today.

Dec. 2015 (*initially Oct. but bad weather got in the way!*) – 15 Jan. 2015 (Summer)

**West Antarctic Ice Sheet (WAIS) Divide (“Extended Facility”)**

Observations of cloud, upper air and surface energy budget

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*Figure adapted from Nicolas and Bromwich (2011)*
2015-16 AWARE Field Campaign

The AWARE field party arrives at WAIS Divide Ice Camp on Dec 2, 2015 (Photo: AWARE)

AMF equipment at WAIS Divide on Dec 6, 2015 (Photo: AWARE)

More on this field campaign on Wednesday afternoon!
Measurements:

- **30m**: Temp, RH, Wind Speed, Wind Direction, Net Longwave and Shortwave Radiation
- **15m**: Temp, Wind Speed, Wind Direction
- **7.5m**: Temp, RH, Wind Speed, Wind Direction
- **4m**: Temp, Wind Speed
- **2m**: Temp, Wind Speed
- **1m**: Temp, Wind Speed

Photo: UW-AMRC
Positive Histogram

• AMPS overestimates the strength of the inversion for stronger wind speeds

![Histogram](image)

- Critical transition range is 4-8 m s⁻¹

**AMPS Inv > Tower Inv**
AMPS underestimates the strength of the inversion for weaker wind speeds.

Critical transition range is 4-8 m s$^{-1}$
Contributions to YOPP-SH

• From AMPS:
  - Assimilation of extra YOPP observations (obs put on GTS)
  - AMPS analyses and forecasts archived at NCAR and available for scientific investigations via web
  - Forecast plots for YOPP field campaigns as resources allow

• From AWARE:
  - Improved observation/prediction of Antarctic clouds

• From OSU/PMG:
  - Continued support for the Coordination Committee through webpage maintenance/development

• Other:
  - Alexander Tall Tower! capturing PBL characteristics in the Antarctic