The OSU AMPS Database and Antarctic NWP

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Goals for AMPS Database at OSU

❖ To provide an easily accessible subset of AMPS output
   - Focuses on most frequently used variables
   - Approximates observed conditions
❖ Data in NetCDF format
❖ Compute monthly means for selected variables
❖ Will provide support for additional processing as a result of user requests. For example, Antarctic petrel flight patterns are currently being studied in relation to AMPS winds.

AMPS Database at OSU (processing flow)

Download wrf_grb 00Z data from NCAR HPSS server

Extract variables from GRIB files at 00, 06-27 hour forecasts

1. Convert files to NetCDF format
2. Strip down files only keep data and separate coordinate info

1. Archive data into analysis (00) and 3-hour forecasts (06-27)
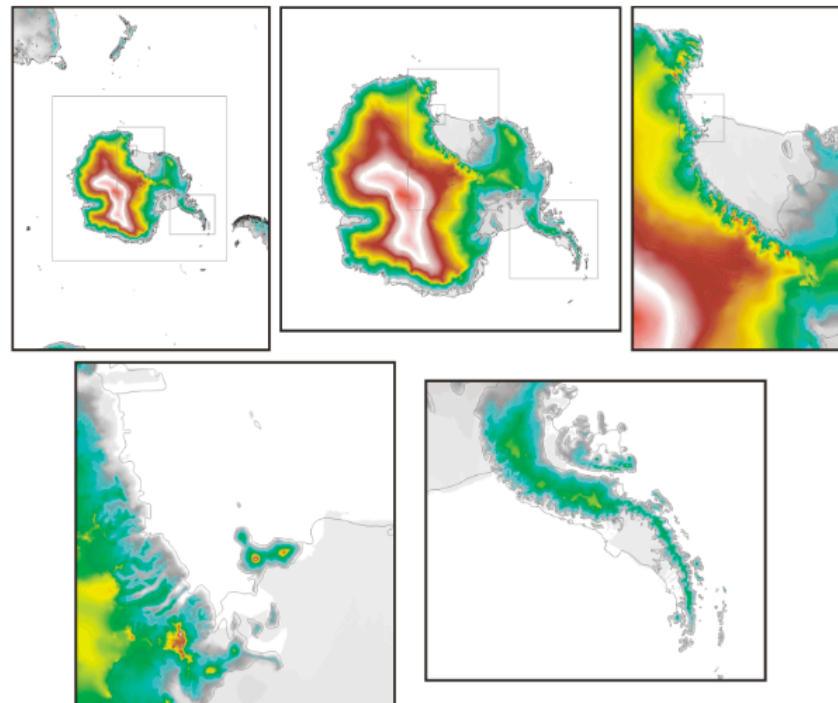2. Compute monthly means and plots

AMPS Database at OSU

❑ As 2015/06, PMG has copied AMPS daily 00 UTC analysis and forecast GRIB outputs for domains 2 to 6 from 2006/03 to 2015/02

❑ Intent is to keep "near-real time" (a few months delay)

PMG AMPS Database Web, http://polarmet.osu.edu/AMPS

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- Data Coverage
  AMPS at OSU covers from 2002 to present

- Model domains and settings vary at different time periods based on changes of AMPS Configuration at NCAR.

  Pre WRF (MM5):
    Data format: ASCII
    2002/01 - 2006/06

  WRF:
    Data format: NetCDF
    2006/03 - 2008/10 (20/6.6/6.6/2.2/6.6 km)
    2008/11 - 2013/01 (15/5/5/1.67/5 km)
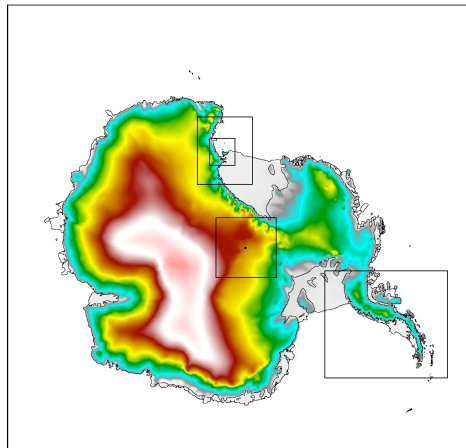   2013/01 - 2013/01 (10/3/3/1/3 km)
    2013/02 - 2013/04 (10/3/3/1/3 km)
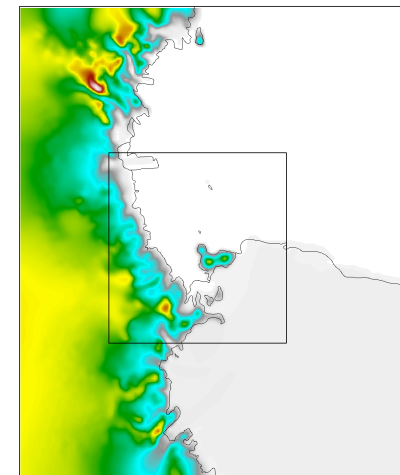   2013/04 - 2013/05 (10/3/x/1/3 km)
    2013/05 - 2015/02 (10/3/x/1/3 km)
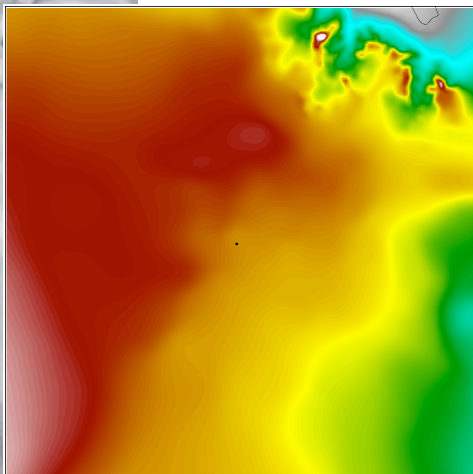   2015/03 - present (N/A, coming soon)

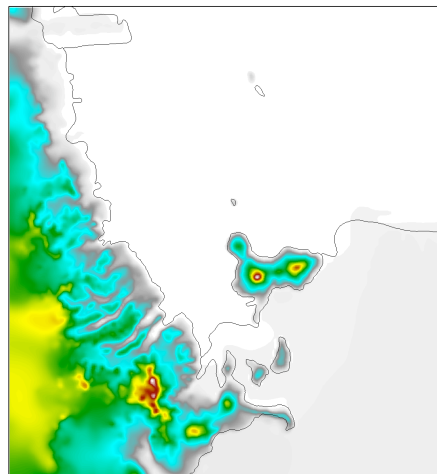# AMPS Domains Model Resolutions and Dimensions (2008/11-2013/01)
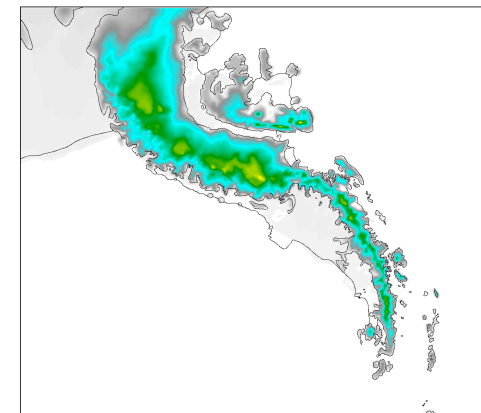

Domain 2, 15-km
442x418

Domain 3, 5-km
157x190

Domain 4, 5-km
169x169

Domain 5, 1.67-km
214x229

Domain 6, 5-km
346x301

http://www.mmm.ucar.edu/rt/amps/information/configuration/maps.html

AMPS Domains Model Resolutions and Dimensions (2013/05/30-present)
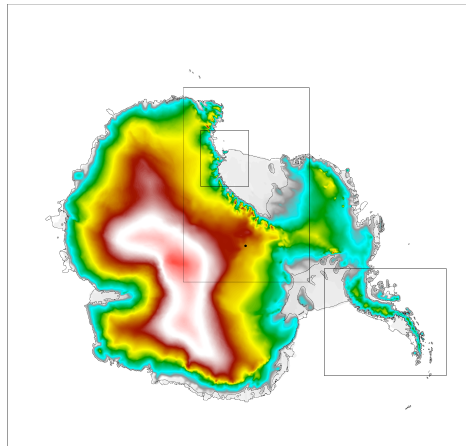
Domain 2, 10-km
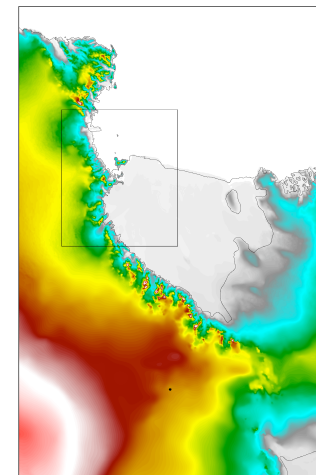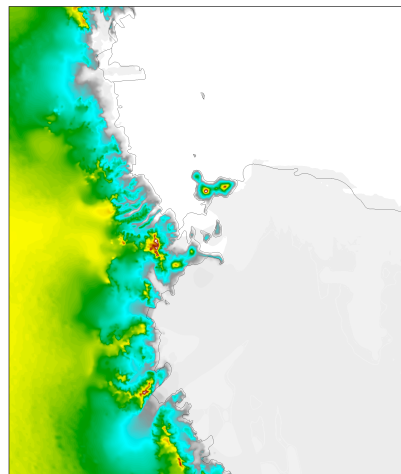667x628

Domain 3, 3-km
538x826

Domain 5, 1-km
613x718

Domain 6, 3-km
520x454

http://www.mmm.ucar.edu/rt/amps/information/configuration/maps.html

PMG AMPS Database Web, http://polarmet.osu.edu/AMPS

DOMAIN 2

Horizontal Resolution:	10-km, 666x627 Grids
Coverage:	2013/05/31-present
Data Format:	NetCDF
Parameter Table:	List of Parameter
Constant Fields:	Constant Variables
File name:	\<yyyymmdd>00_WRF_d2_\<varname>_f\<hhh>.nc \<yyyymm>_WRF_d2_\<varname>_mon.nc \<yyyymmdd>00: model initial time (00Z) \<varname>: variable name f\<hhh>: forecast hour, model vaild hour

("3h" = 3 hourly forecast data; "mm" = monthly mean data)

DATA: 2013

Month	May		Jun		Jul		Aug		Sep		Oct		Nov		Dec	
Parameter	3h	mm	3h	mm	3h	mm	3h	mm	3h	mm	3h	mm	3h	mm	3h	mm
PRES at surface	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
SLP	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
PWAT	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

PMG AMPS Database Web, http://polarmet.osu.edu/AMPS
List of variables

1	Pressure	Pa	PRES
2	Sea-level pressure	Pa	SLP
7	Geopotential height	gpm	HGT
11	Temperature	K	TMP
33	Model Grid U-component of horizontal wind	m/s	UGRD
34	Model Grid V-component of horizontal wind	m/s	VGRD
40	Vertical velocity	0.001*m/s	DZDT
52	Relative humidity (wrt water)	%	RH
53	Water vapor mixing ratio	kg/kg	MIXR
54	Precipitable water (water vapor)	kg/m2	PWAT
61	3 hours accumulated Precipitation	kg/m2	PCP
121	Latent heat flux	W/m2	LHFX
122	Sensible heat flux	W/m2	SHFX
153	Cloud water mixing ratio	kg/kg	CLW
170	Rain water mixing ratio	kg/kg	RWMR
171	Snow mixing ratio	kg/kg	SNMR
178	Ice mixing ratio	kg/kg	ICMR
204	Downward shortwave radiation flux	W/m2	SWDN
205	Downward longwave radiation flux	W/m2	LWDN
248	Cloud Fraction	%	CLDFRC
251	Column integrated snow	kg/m2	INTSNW
252	Column integrated rain water	kg/m2	INTRNW
253	Column integrated cloud ice	kg/m2	INTCLI
254	Column integrated cloud liquid water	kg/m2	INTCLW
176	Latitude	deg N	LAT
177	Longitude	deg E	LON
	Vector rotation angle	radians	ROT
247	Ustar	m/s	USTAR |*

Additional variables

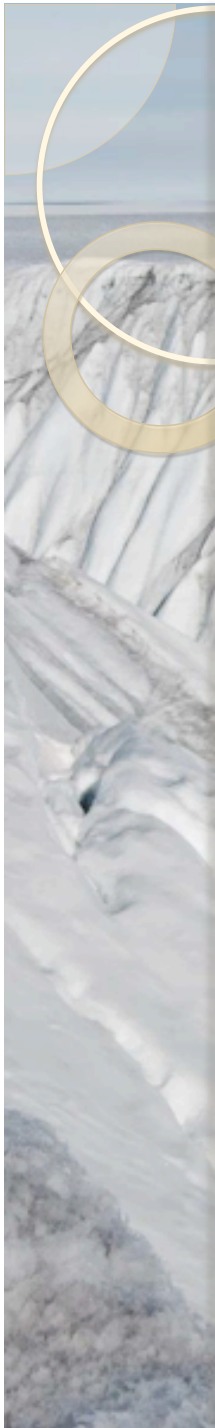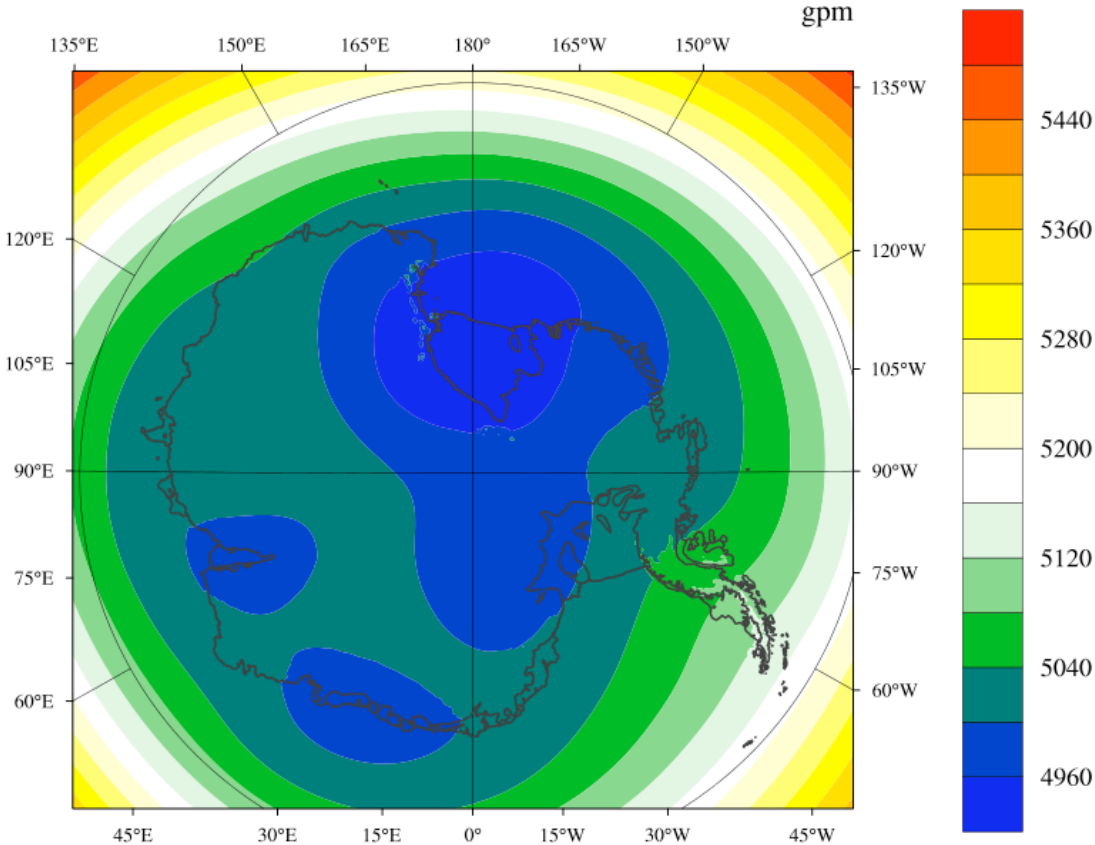| 81	Land/Sea mask	Binary flag	LANDSEA
84	Albedo	%	ALBDO
91	Sea Ice	proportion	SEAICE
249	Inversion height	m	INVHGT
250	Inversion strength	K	INVSTR

* Available after 201401
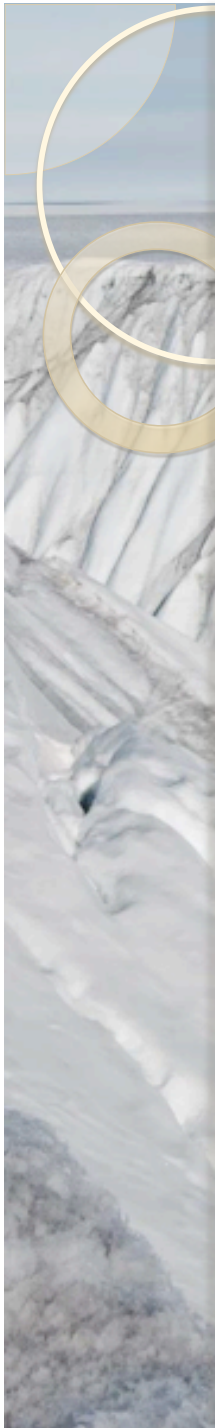
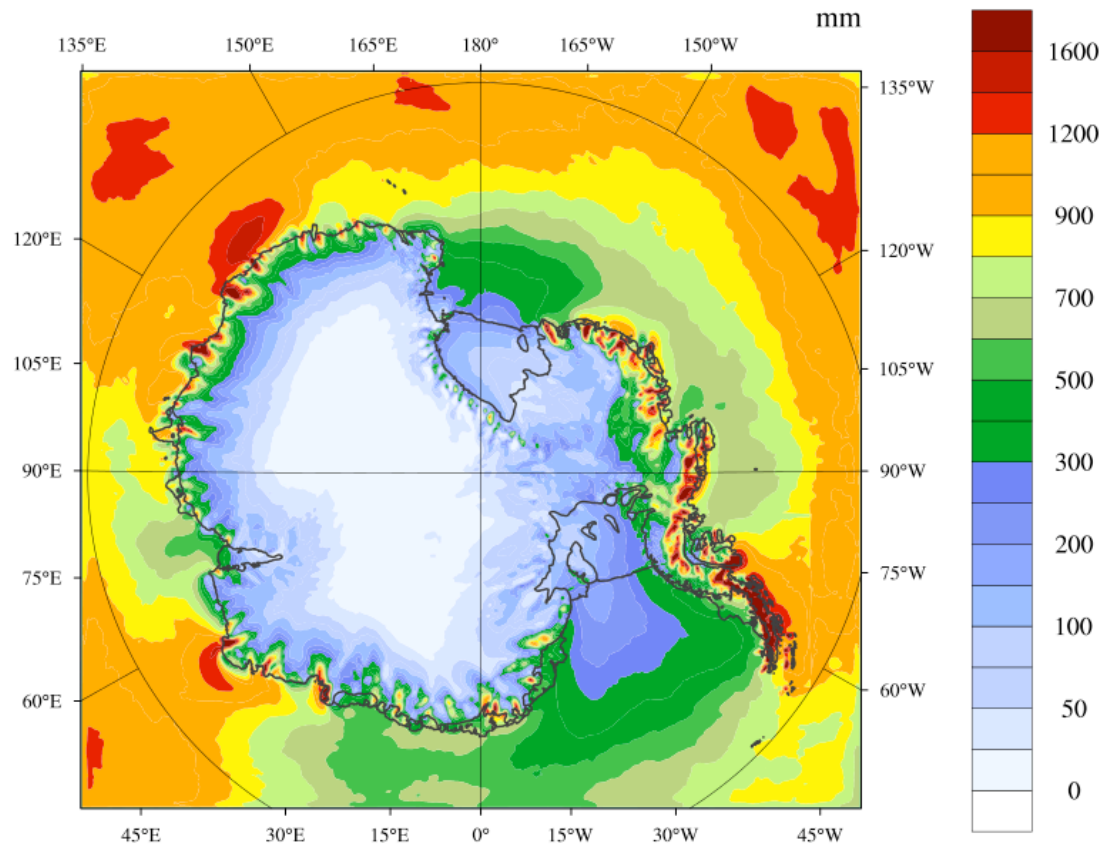# Illustrative uses of the OSU AMPS Database

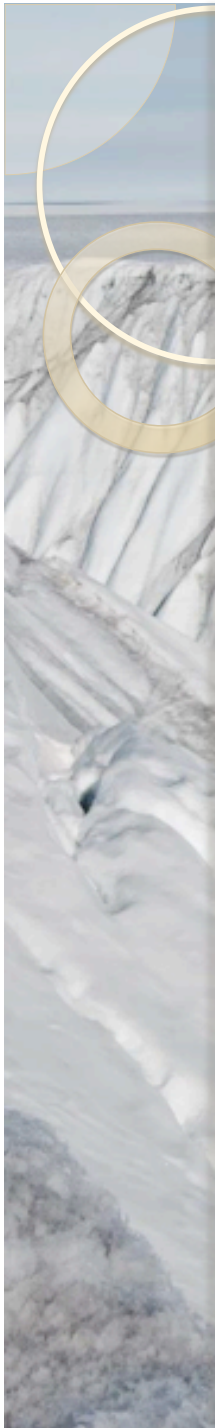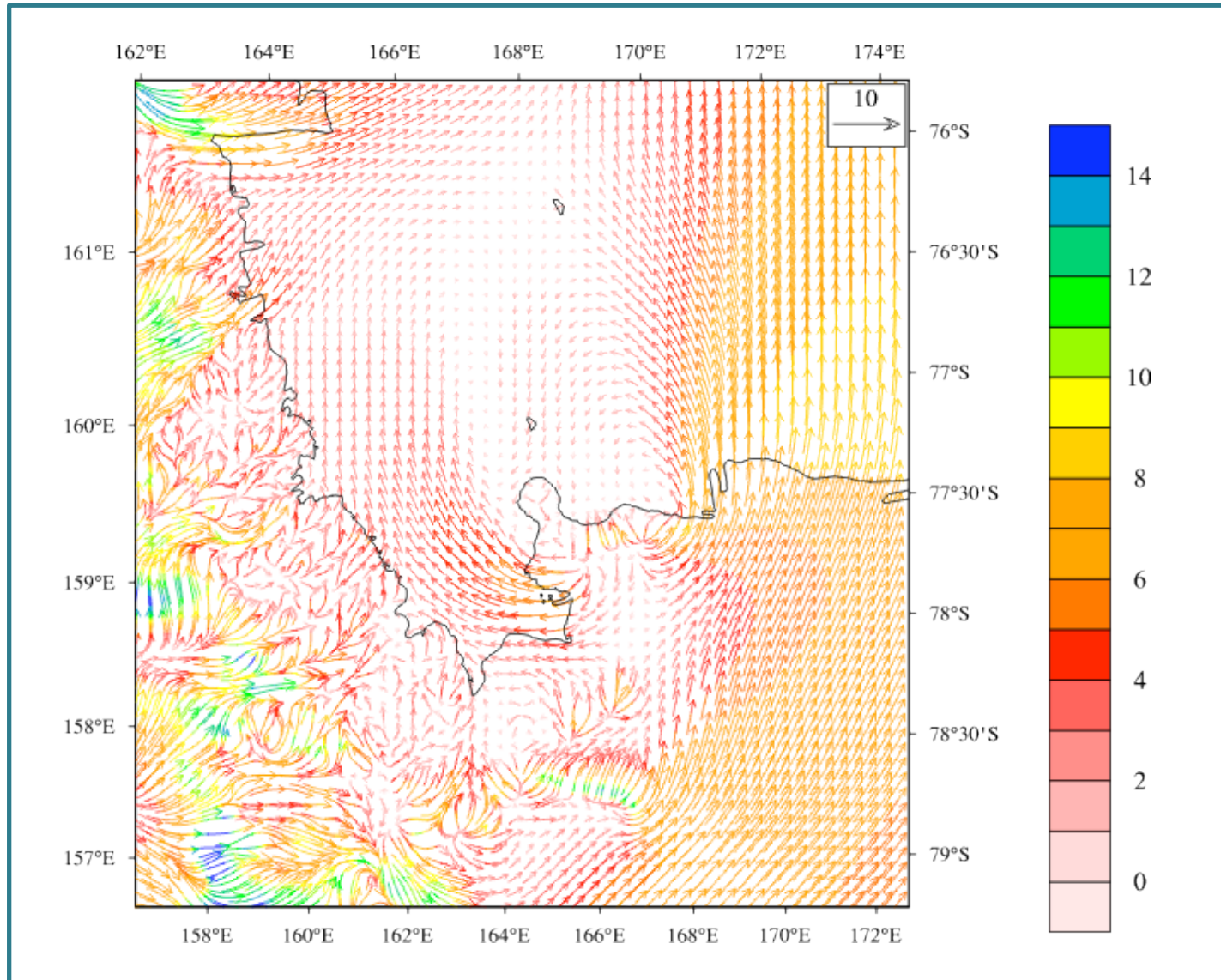# Annual Mean (2009-2012) Sea Level
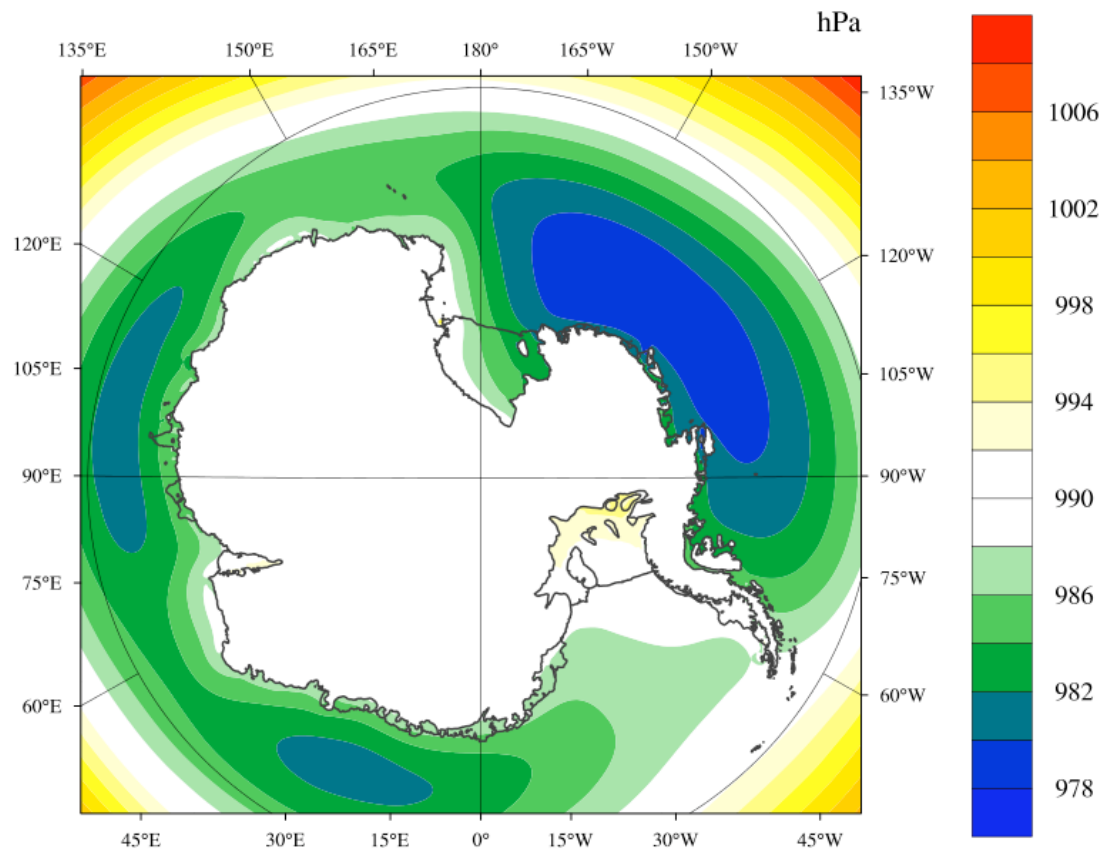
Annual Mean (2009-2012) Geopotential Height at 500 hPa (HGT)

Mean (2009-2012) Annual Total Precipitation (PCP)
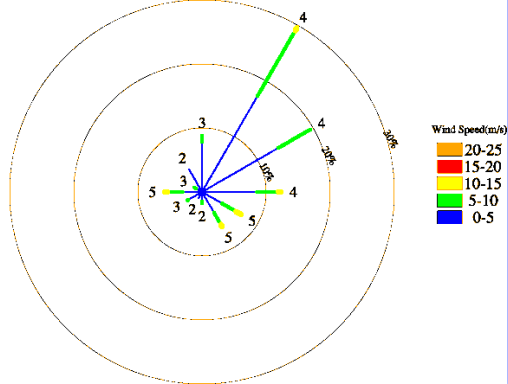
2012 Annual Mean Wind at 10 m

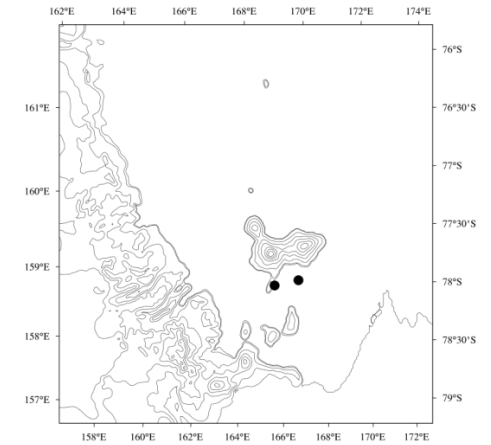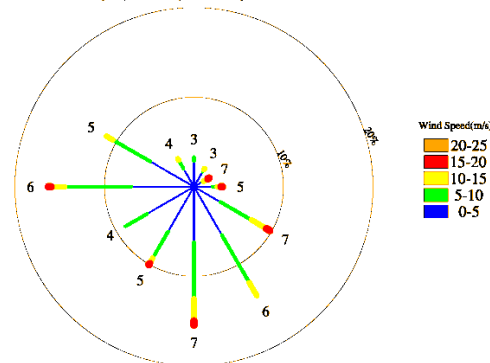# Wind structure around McMurdo for AWARE project

2012 DJF 10m Wind Rose Lat= -77.8 Lon= 167
SpdAve=4 SpdStd=3 DirAve=56 No Calm Reports Nwnd=728
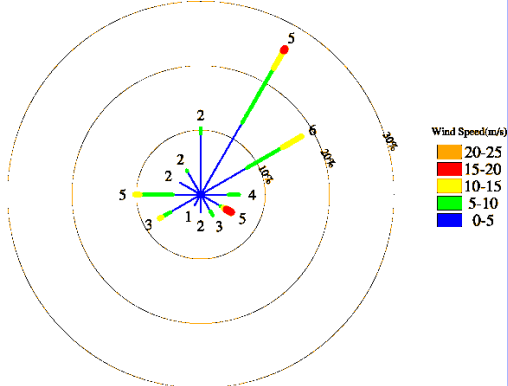Frequency circles every 10%. Mean speed indicated.

2012 DJF 700mb Wind Rose Lat= -77.8 Lon= 167
SpdAve=6 SpdStd=3 DirAve=201 No Calm Reports Nwnd=726
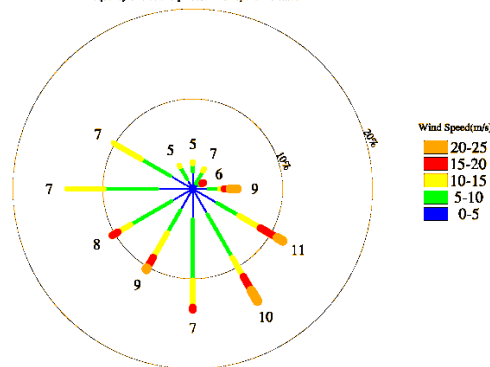Frequency circles every 10%. Mean speed indicated.

2012 JJA 10m Wind Rose Lat= -77.8 Lon= 167
SpdAve=4 SpdStd=4 DirAve=37 No Calm Reports Nwnd=736
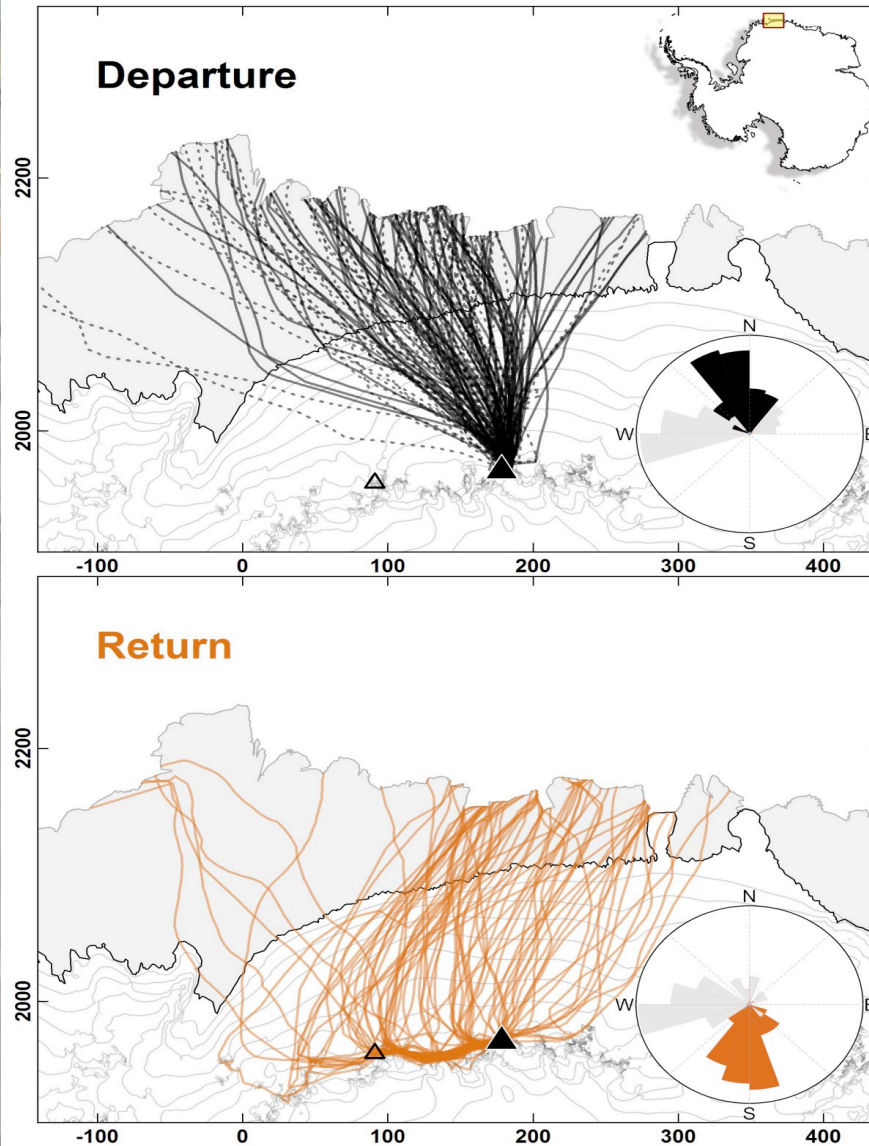Frequency circles every 10%. Mean speed indicated.

2012 JJA 700mb Wind Rose Lat= -77.8 Lon= 167
SpdAve=8 SpdStd=5 DirAve=187 No Calm Reports Nwnd=736
Frequency circles every 10%. Mean speed indicated.

Wind Speed(m/s)
20-25
15-20
10-15
5-10
0-5

Antarctic petrel flight study

Departure (upper panel) and return (lower panel) sections of 79 Antarctic petrel GPS flight tracks recorded during three breeding seasons (2012-2014) in Queen Maud Land, Antarctica. Rose diagrams show the frequency distribution of the wind speed/ direction (to) and bird track directions.

(Tarroux et al, 2015: Flexible flight response to challenging wind conditions in a commuting Antarctic seabird. *Behavioural Ecology*, submitted.)

Antarctic NWP at OSU

❑ Serves as a backup for AMPS run at NCAR
❑ The current model uses the Polar WRF 3.1.1
- The model runs twice a day (00, and 12Z) for 120 forecast hours
- 38 vertical levels, and 45 km horizontal resolution
- The model uses real time GFS (LDM) and near real time SST and sea ice NISE data from NSIDC

❑ This summer (2015)
- New model server, more computer power
- Update the model to PWRF 3.6.1
- Increase model resolution to 25 km with 48 vertical levels

Future AMPS at OSU

As AMPS funding for OSU ends this fall

> ➢ PMG will continue to update the AMPS database to end of 2015 when it will be frozen, but will continue to be available online.

> ➢ PMG will continue work on improving Polar WRF skill for Antarctic NWP.

PMG AMPS Database Web, http://polarmet.osu.edu/AMPS

❑ How to access data

▪ Please click the available time periods and domains in which you are interested from left panel. Your browser will open a new tab for your data.

▪ To download multiple files, please use wget or similar utility programs using

http://polarmet.osu.edu/AMPS/data/nc_fcst/<AMPS version>/<dx>/<varname>/<yyyymm>/

for example,
wget –e robots=off -r -l1 -nH -nd -A "*.nc" --no-parent -i http://polarmet.osu.edu/AMPS/data/nc_fcst/v200811/d2/PRES/200811/)
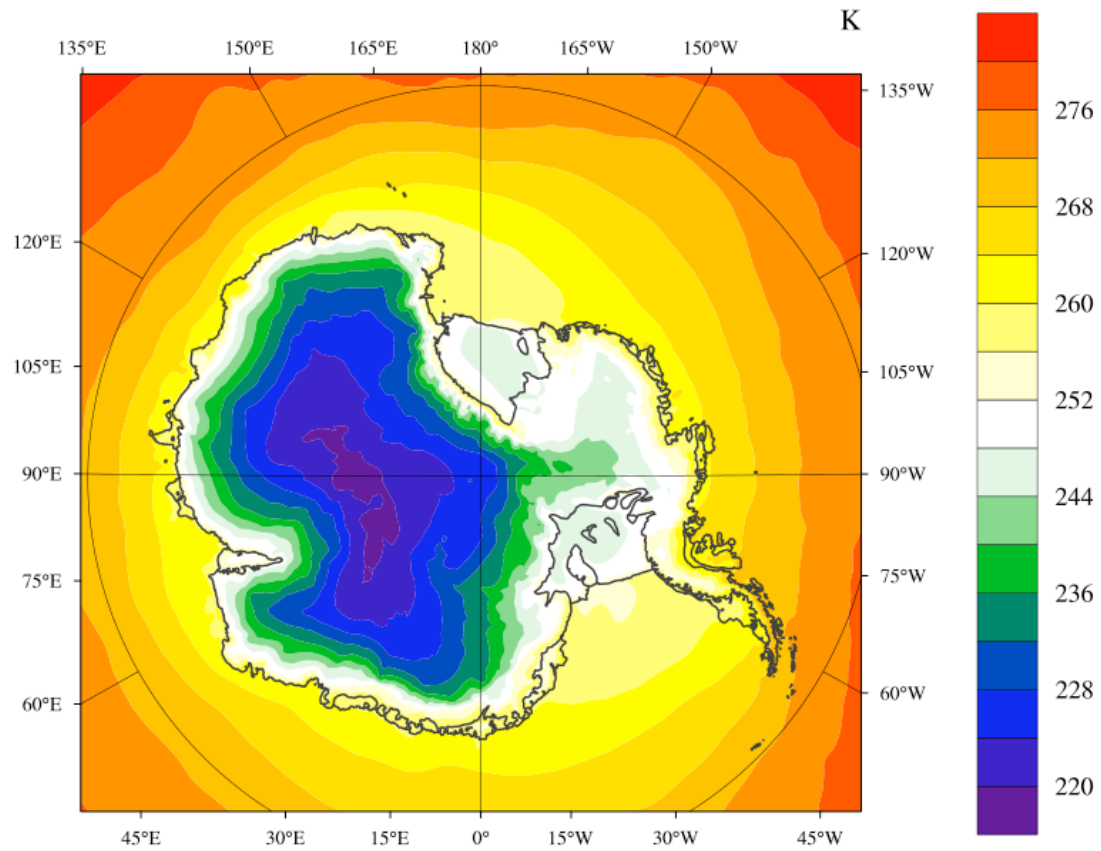("-e robots=off" is required)

or for MM5

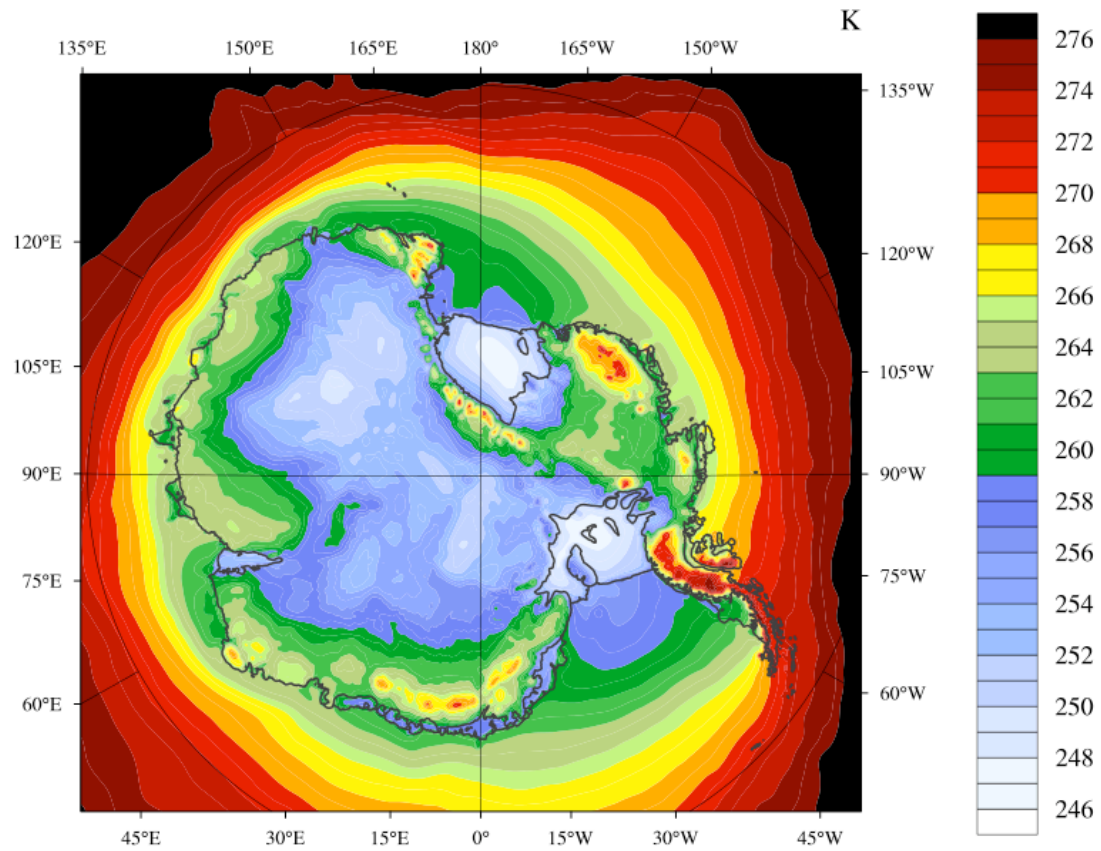http://polarmet.osu.edu/AMPS/data/mm5/<timeseriesdx>/<yyyy>/<yyyyymm>/

for example,
wget –e robots=off -r -l1 -nH -nd -A "*.nc" --no-parent -i http://polarmet.osu.edu/AMPS/data/mm5/timeseriesd2/2003/200301/
("-e robots=off" is required)

Annual Mean (2009-2012) Temperature at 2 m (TMP)

Annual Mean (2009-2012) Potential Temperature

Annual Mean (2009-2012) Cloud Fraction (CLDFRC)