

AMPS—The Antarctic Mesoscale Prediction System

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The Antarctic Mesoscale Prediction System (AMPS)

- **AMPS**— Real-time WRF Model system run by NCAR to support Antarctic weather forecasting and science

- **History**

- First forecasts: Late 2000
- Original collaborators: NCAR, The Ohio State University, Colorado University

- Purposes

(i) Provide tailored NWP guidance for the forecasters at McMurdo

(ii) Improve model parameterizations for the Antarctic

(iii) Stimulate collaboration among forecasters, modelers, and researchers by sharing the model output and results with the community through web and a workshop



The National Science Foundation Division of Polar Programs funds the USAP and AMPS

The Antarctic Mesoscale Prediction System (AMPS) (cont'd)

• Users

- Key group: SPAWAR— Space and Naval Warfare Systems Center
 - Weather forecasters for the U.S. Antarctic Program (USAP)
- Researchers and students
 - ♦ AMPS archive: Past model output accessible through Earth System Grid
- International community
- Scientific field experiments

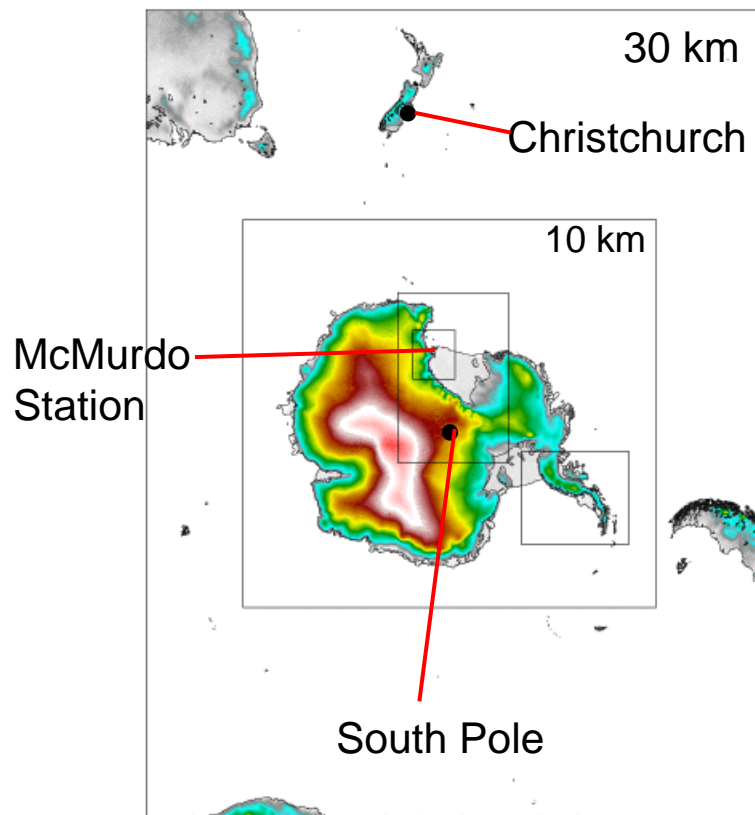
- ♦ Ex: SG-WEX: South Georgia Wave Experiment—
Measurements of waves over South Georgia Is.

- ♦ Univ. of Bath (England)
- ♦ Plots and nest provided

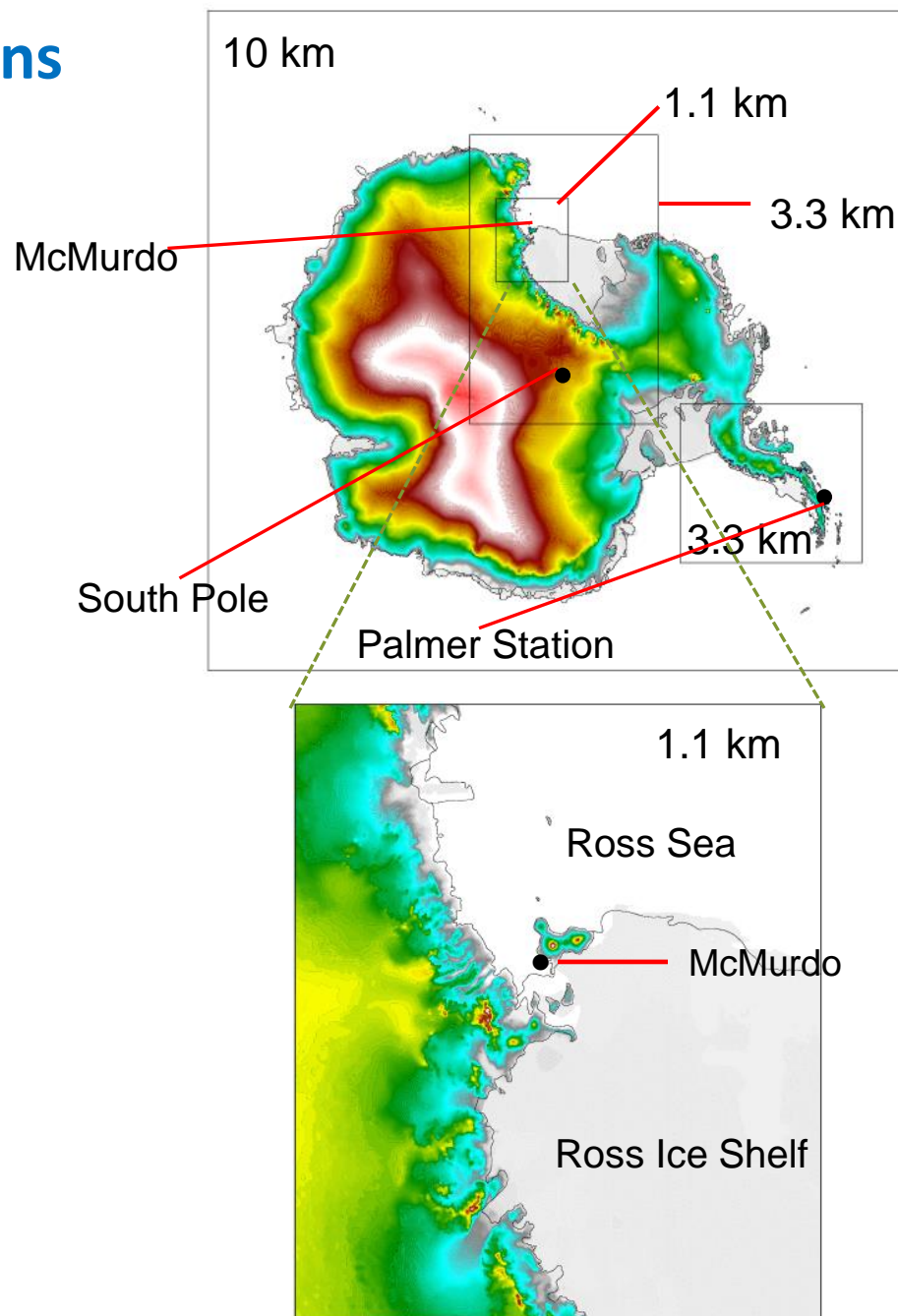


AMPS WRF Forecast Domains

5 grids: Spacings—
30-km, 10-km,
3.3-km (2), 1.1-km

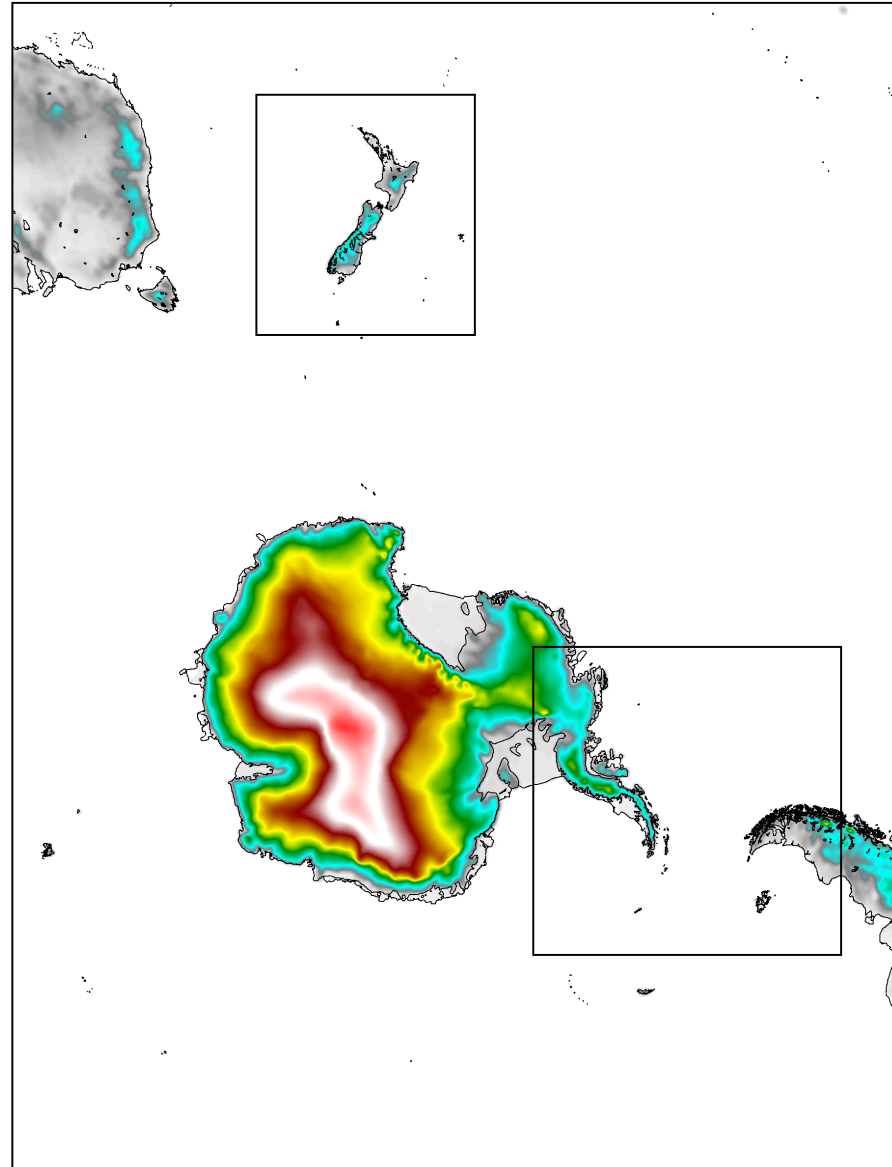


Terrain heights shaded



AMPS WRF Forecast Domains- Extra

Spacings— 27-km + 9-km



Terrain heights shaded

AMPS Forecasts

- **Frequency**

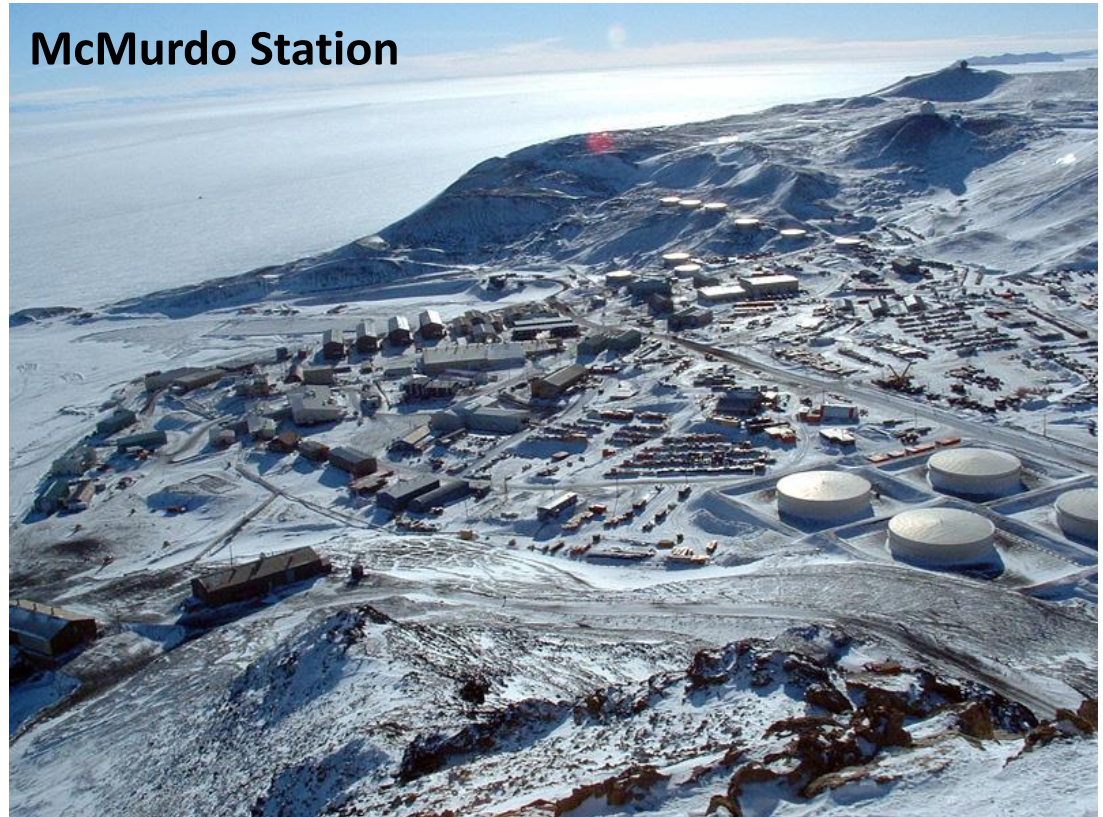
- 2 forecasts / day
- Initialization times:
0000 UTC, 1200 UTC

- **Forecast Lengths**

- 30-km / 10-km grids:
120 hrs
- 3.3-km / 1.1-km grids:
36 hrs

- **Computation**

- Number of CPUs used: **624** (2.6-GHz Intel SandyBridge processors)
- Wallclock time/forecast: **4.5–5 hrs**
- WRF output volumes / fcst: **5.9 GB**



AMPS and USAF Antarctic Airlift Support



New York ANG 109th Airlift Wing
LC-130
Ice Runway, McMurdo

62nd Airlift Wing C-17
Ice Runway, McMurdo
Operation Deep Freeze



- **AMPS provides NWP guidance for forecasting for logistics**
 - ◆ USAF, NY ANG, Royal New Zealand AF, Kenn Borek Air air ops
 - ◆ USAP research vessels (*R/V Palmer*, *R/V Gould*) & USCG vessels

AMPS 10-km WRF
 Fcst. 0 h
 Surface air temperature
 Horizontal wind vectors

Init. 12 UTC Fri 30 Jan 15
 Valid. 12 UTC Fri 30 Jan 15

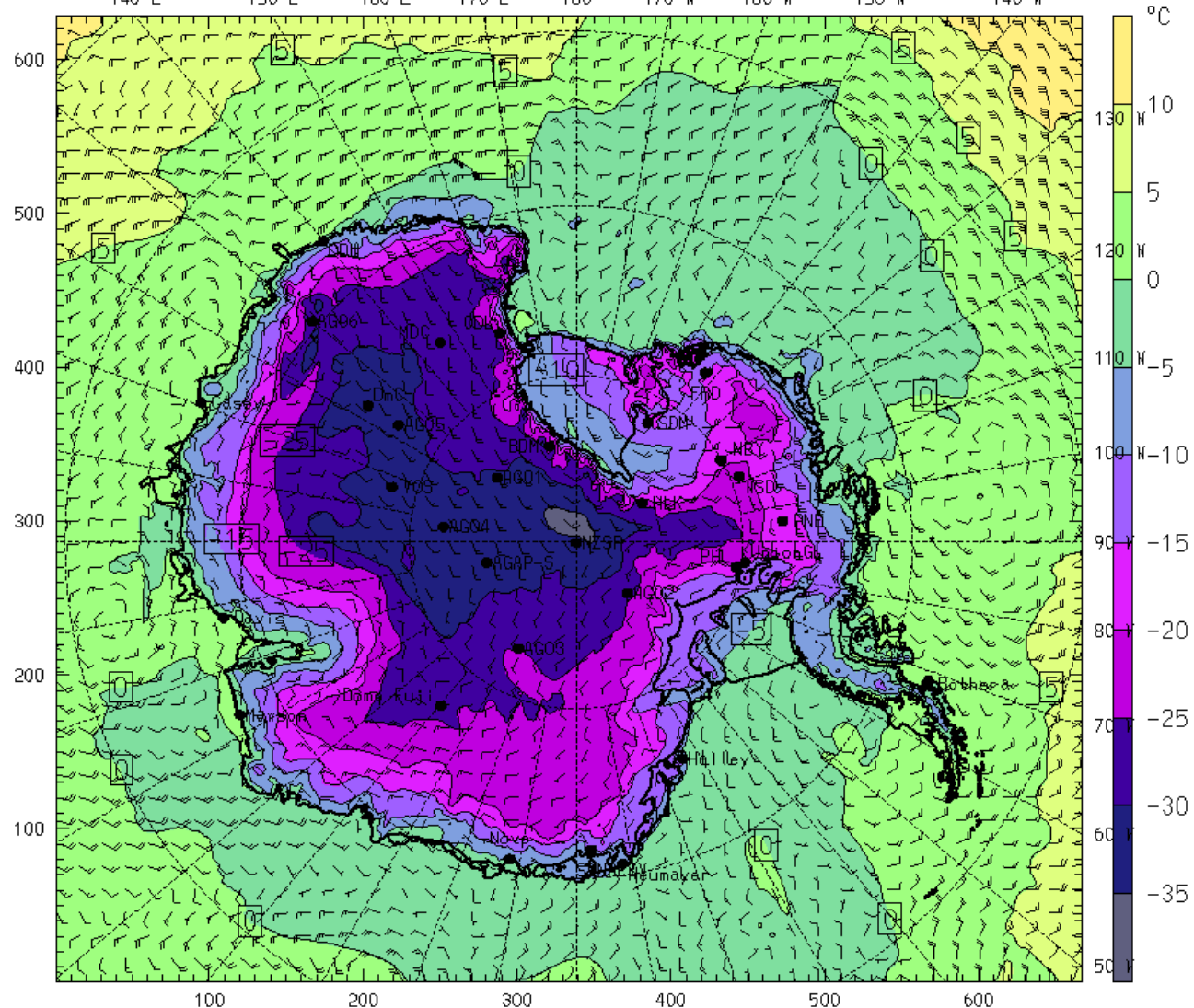
at k-index = 60 sm= 1

AMPS Forecast Products

Sfc Temperature & Winds

30 Jan 2015
1200 UTC init

Fcst period:
12 UTC 30 Jan–
12 UTC 4 Feb

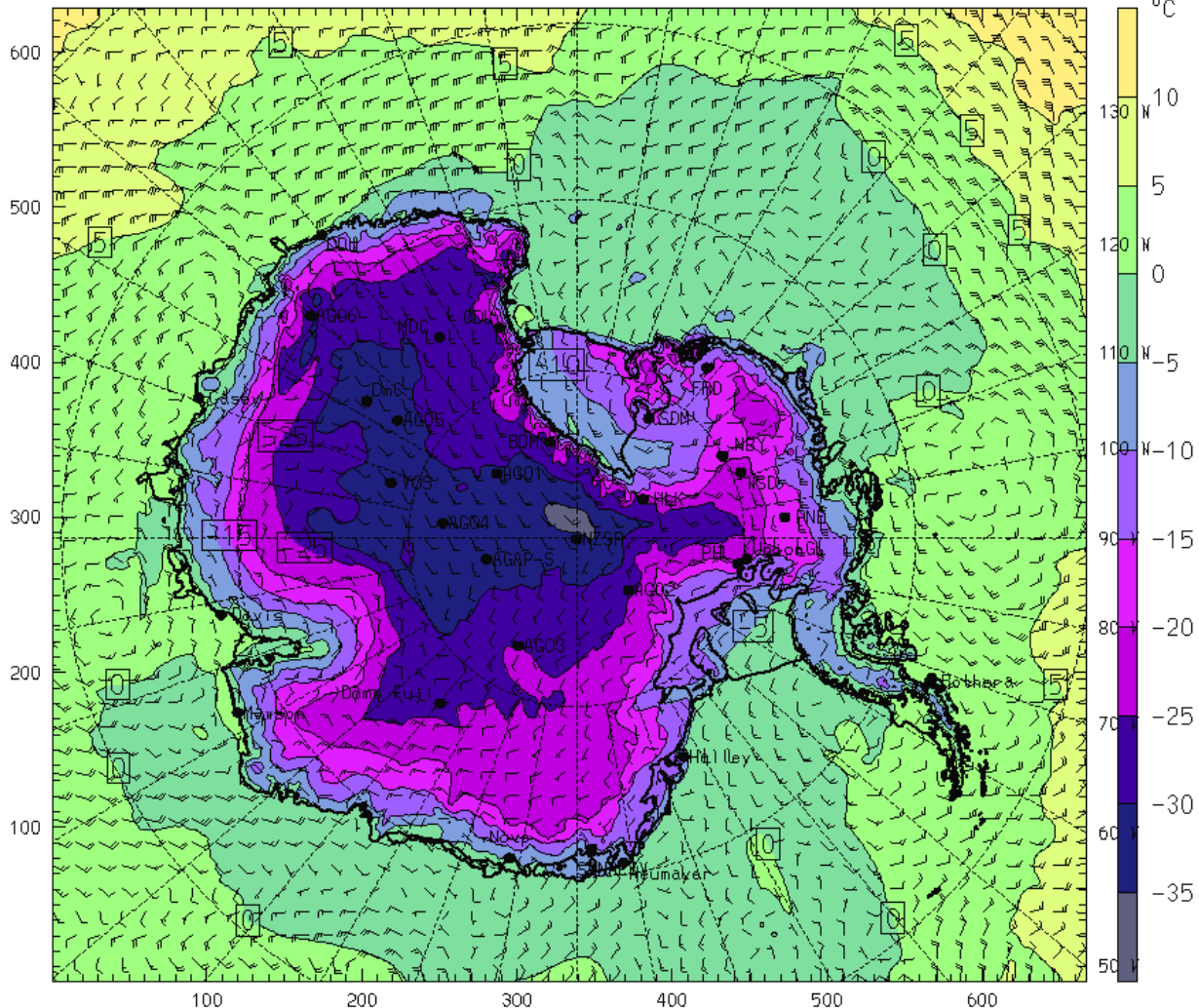


CONTOURS: UNITS=°C LOW=-35.000 HIGH= 10.000 INTERVAL= 5.0000
 Model Info: V3.3.1 KF MYJ PBL WSM 5class Noah LSM 10 km, 60 levels,
 LW: RRTM SW: Goddard DIFF: simple KM: 2D Smagor

AMPS 10-km WRF
 Fcst. 0 h
 Surface air temperature
 Horizontal wind vectors

Init. 12 UTC Fri 30 Jan 15
 Valid. 12 UTC Fri 30 Jan 15
 sm= 1
 sm= 1

AMPS Forecast Products



**Sfc Temperature
& Winds**

3-Hourly Precip

30 Jan 2015
 1200 UTC init

Fcst period:
 12 UTC 30 Jan–
 12 UTC 4 Feb

BARB VECTORS: FULL BARB = 10 kts
 CONTOURS: UNITS=°C LOW= -35.000 HIGH= 10.000 INTERVAL= 5.0000
 Model Info: V3.3.1 KF MYJ PBL WSM 5class Noah LSM 10 km, 60 levels,
 LW: RRTM SW: Goddard DIFF: simple KM: 2D Smagor

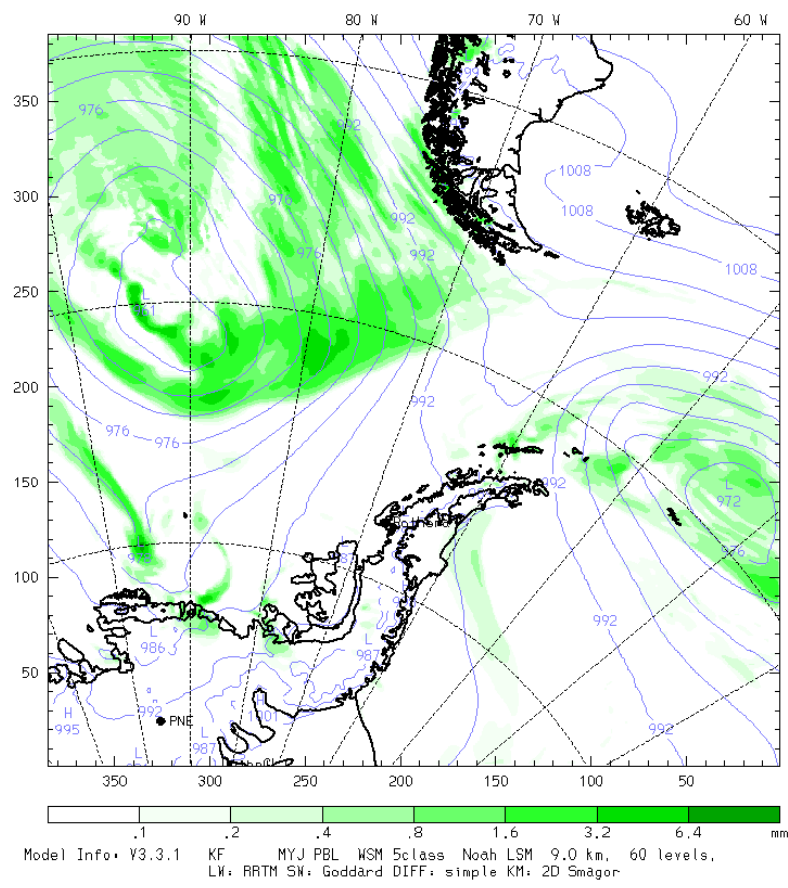
AMPS -- Palmer 9-km nest
 Fcst. 72 h
 Total precip. in past 3 h
 Sea-level pressure

Init. 12 UTC Sun 08 Mar 15
 Valid. 12 UTC Wed 11 Mar 15

AMPS Palmer 9-km Grid

8 Mar 2015 1200 UTC init

72-hr fcst



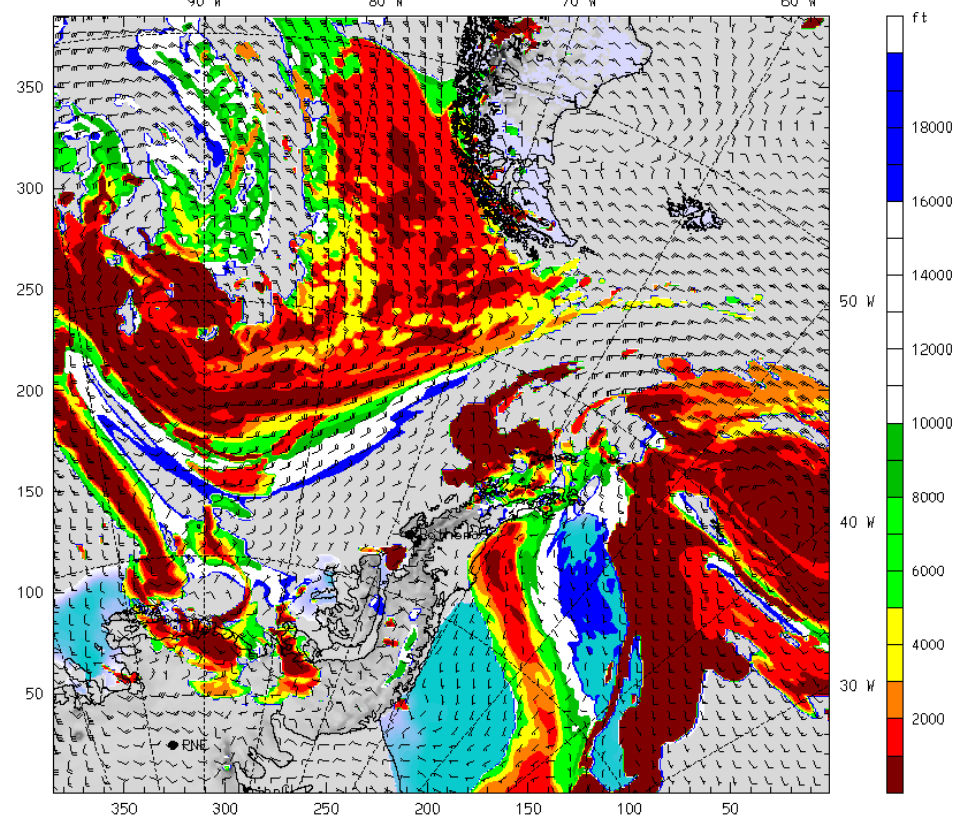
SLP
3-Hourly Precip

Cloud Base (m)

AMPS -- Palmer 9-km nest
 Fcst. 72 h
 Cloud ceiling
 Horizontal wind vectors
 Relative humidity (w.r.t. ice)

Init. 12 UTC Sun 08 Mar 15
 Valid. 12 UTC Wed 11 Mar 15

at k-index = 60
 at k-index = 21



Model Info: V3.3.1 KF MYJ PBL WSM 5class Noah LSM 9.0 km, 60 levels, LW: RRTM SW: Goddard DIFF: simple KM: 2D Smagor
 CONTOURS: UNITS=% LOW= 90.000 HIGH= 90.000 INTERVAL= 90.000

Palmer Station PLM (lat, lon) = (-64.77, -64.05)
 Forecast initialized at 2015030812
 AMPS palmer domain

AMPS Palmer 9-km Grid

Table: Palmer Stn

FCST HR	UTC HR	T (C)	Td (C)	Altim (in Hg)	Spd (kts)	Dir (deg)	Grid (deg)	VV (*)	RH1RH2RH3 (% wrt water)	T1T2T3 (C)	ACCUM (*)
00	12	1.3	-2.9	28.75	12	82	18	-055	074070080	-99-99M00	000
01	13	1.4	-2.3	28.74	17	88	24	194	072059073	-97-98-98	000
02	14	1.9	-2.2	28.73	21	86	21	-013	071057075	-97-97-98	001
03	15	2.4	-1.7	28.68	23	67	3	014	070051072	-95-96-97	001
04	16	2.5	-1.5	28.70	24	62	358	-007	070050072	-95-95-96	001
05	17	2.4	-1.7	28.68	23	57	353	-009	069050074	-95-95-96	000
06	18	2.5	-1.5	28.70	20	55	351	-007	071050074	-95-95-97	000
07	19	2.2	-1.1	28.71	17	55	351	009	074052075	-95-95-97	000
08	20	1.6	-1.3	28.73	15	57	353	023	075055077	-95-96-97	000
09	21	1.4	-2.0	28.73	14	55	351	034	073059079	-95-97-98	000
10	22	1.0	-2.9	28.73	14	53	349	027	071063082	-96-97-99	000
11	23	0.7	-3.7	28.75	13	49	345	025	068065083	-97-98-99	000
12	00	0.5	-4.0	28.77	14	50	346	-001	068065085	-97-98M00	000
13	01	0.7	-3.5	28.77	14	50	346	-020	070064089	-97-98M00	000
14	02	0.7	-3.4	28.79	12	48	344	008	071067091	-97-99M00	000
15	03	0.7	-3.1	28.82	10	46	342	009	072071092	-98-99M01	001
16	04	0.8	-2.9	28.83	7	43	339	006	073075092	-99M00M01	002
17	05	0.7	-3.1	28.84	5	48	344	-006	073078093	-99M00M01	003
18	06	0.4	-3.5	28.86	4	38	334	-013	073078094	-99M00M01	003
19	07	0.1	-4.0	28.88	4	42	337	004	071076095	-99M00M01	001
20	08	0.2	-4.1	28.92	3	39	335	007	072077096	-99M00M02	000
21	09	-0.1	-4.0	28.92	2	21	317	-001	074084095	M00M01M02	000
22	10	-0.4	-4.1	28.94	4	40	336	013	075083095	M00M01M02	000
23	11	-0.3	-4.1	28.96	4	43	339	019	074080096	M00M01M02	000
24	12	0.0	-3.7	28.99	3	59	355	029	075080096	M00M01M03	000

AMPS Forecast Page

Forecast hr

 **THE ANTARCTIC MESOSCALE PREDICTION SYSTEM (AMPS)**
Products Directory GRIB Directory Status View AMPS-Related Links

Forecast Hr	Grid / Window	Initial Time	Product
00 h	30 km <input type="radio"/> Full <input type="radio"/> New <input checked="" type="radio"/> Scaled	2015012812 Go Left Go Right	<input type="radio"/> SFC <input type="radio"/> Sfc RH <input type="radio"/> Sfc RH (H2O) <input type="radio"/> SLP/Precip <input type="radio"/> Cloud base <input type="radio"/> Sea ice Upper air Soundings Tables Cross sections <input type="radio"/> PseudoSat <input type="radio"/> Sfc wind Meteograms

Product chooser

Forecast grid

Model run

Welcome to AMPS

The Antarctic Mesoscale Prediction System—AMPS—is an experimental, real-time numerical weather prediction capability that provides support for the United States Antarctic Program, Antarctic science, and international Antarctic efforts. AMPS produces numerical guidance from the Weather Research and Forecasting (WRF) model with twice-daily forecasts covering Antarctica. The effort is sponsored by the National Science Foundation (NSF) Office of Polar Programs and the NSF UCAR and Lower Atmospheric Facilities Oversight Section. It is a collaboration of the National Center for Atmospheric Research and the Byrd Polar Research Center of The Ohio State University.

Instructions

- Select a forecast hour— "Forecast Hr"
- Select a model grid or plotting window— "Grid / Window"
- Select a forecast initial time— "Initial Time"
- Select a plot view
Scaled plot— "Scaled" (Scaled to fit your browser window)
Full-size plot— "Full" (Requires scrolling to view in its entirety)
New window for the plot— "New"
- Select a product to view— "Product"
- Select "Go Left" or "Go Right" to view the product in either the left or right panel in lower half of page (if "full" or "scaled" selected)

WRF for 2015-01-28 / 12 UTC has finished.

Images have been posted through hour 120.

Refresh completed hour

For AMPS questions, e-mail kmanning@ucar.edu.
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<http://www2.mmm.ucar.edu/rt/amps>

Summary— Antarctic Mesoscale Prediction System

- **MMM effort to provide NWP guidance to USAP**
 - Model: WRF
 - Areas covered: Varying-resolution grids across Antarctica and the Southern Ocean
 - Products: Wide variety of surface and upper-level model output plots available
- **Support of ORCAS with products from existing grids**
 - Forecasting a separate effort