2004 Update on AMPS Operations

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1. Introduction

Antarctic Mesoscale Prediction System (AMPS) real-time activities in support of the United States Antarctic Program (USAP) operations have continued this past year at the National Center for Atmospheric Research (NCAR). This abstract discusses a few of the more significant recent enhancements to AMPS, including improvements to the forecast model, to model pre- and post-processing procedures, and to AMPS products available on the Internet. We continue to adapt and extend AMPS in response to suggestions and inquiries from AMPS workshop participants, USAP weather forecasters, Byrd Polar Research Center (BPRC) collaborators, and a variety of users from the international Antarctic research and forecasting communities.

2. Earlier model start

We have revised our MM5 preprocessing procedures for AMPS, changing the flow of data from one program to the next, to allow us to start the model earlier. In order to create lateral boundary conditions for our regional model, the AMPS system uses the National Centers for Environmental Prediction (NCEP) Global Forecast System (GFS) forecast products out to 72 hours. Because of server load at NCEP and other communications difficulties, downloads can be quite slow, occasionally taking several hours. Previously, AMPS waited for all the necessary GFS files, from GFS forecast hour 00 through hour 72, to be downloaded. Now, once we have a few GFS files (hours 00 through 18), we can create boundary conditions for AMPS forecast hours 00 through 18, and start the model. As the model integrates, we watch for later GFS files to arrive. As the later GFS forecast hours arrive, we create lateral boundary conditions for later AMPS forecast periods. This allows us to start the model about an hour and a half earlier than we had before, and sometimes two hours or more earlier.

3. Earlier posting of products

AMPS forecast products are disseminated to users through the AMPS web page. In the past, products were posted to the AMPS web page when the full suite of products was available sometime after the model integration finished. As reported last year (Manning, 2003), offloading graphical postprocessing to a separate machine allowed us to post products within a few minutes of the completion of model integration. This past year, we have begun posting products as soon as they are made, while the forecast is still integrating. This allows users much earlier access, by several hours, to products from the early forecast hours. The downside is that partial forecasts get posted, which may confuse users who have to wait to see the whole suite of products.

4. 10-km Antarctic Peninsula grid

The above two modifications to the data processing of AMPS have given us the computer time to add a third 10-km grid to the system. Significant research operations are carried out on or around the Antarctic Peninsula by the USAP and by research programs of several other nations. The Antarctic Peninsula is a challenging geographical feature for mesoscale models. It is a significant feature of the continent, yet it is narrow. Though narrow, it has much high, steep terrain with complex topography. Because of its narrow, elevated, complex topography, the Antarctic Peninsula was not well represented on the AMPS 30-km grid. So the idea had been floating about, for a couple of years (at least since the International Workshop on Antarctic NWP, October 2002), of adding a 10-km grid over the peninsula as we have opportunity.

At the 2003 AMPS workshop, a peninsular grid was discussed with some enthusiasm. So last summer we prepared and tested a large 10-km grid. A medical evacuation flight through Rothera in

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September 2003 provided the impetus for us to put the grid into the real-time system. We had the grid prepared and tested, and were ready to implement it in hopes that it would prove useful for medevac planning.

The Antarctic Peninsula domain (Fig. 1) is a large grid, covering the entire peninsula, active for forecast hours 06 through 36. It adds an hour to the model wallclock time, and takes roughly a quarter of the entire CPU time of the model integration.

5. Nudging top boundary

A top boundary nudging scheme, devised by BPRC researchers, was in testing as reported at the 2003 AMPS workshop (Manning, 2003). This scheme has now been implemented in the real-time system. Evaluations of the new model configuration by BPRC investigators indicate considerable improvement of upper-level model fields.

6. New products

Inquires and suggestions regarding AMPS products continue to arrive from SPAWAR forecasters and from forecasters and researchers from the international community. As a result, many new products are available. Many new locations for soundings and time series are provided. There is a new plotting window of the 30-km grid, covering in greater detail the area of major flight operations based out of McMurdo. Additional AMPS model products include horizontal fields of altimeter setting (Fig. 2), cloud base (Fig. 3), and flight-level winds and temperature (not shown); and tabular representation of time series (Fig. 4).

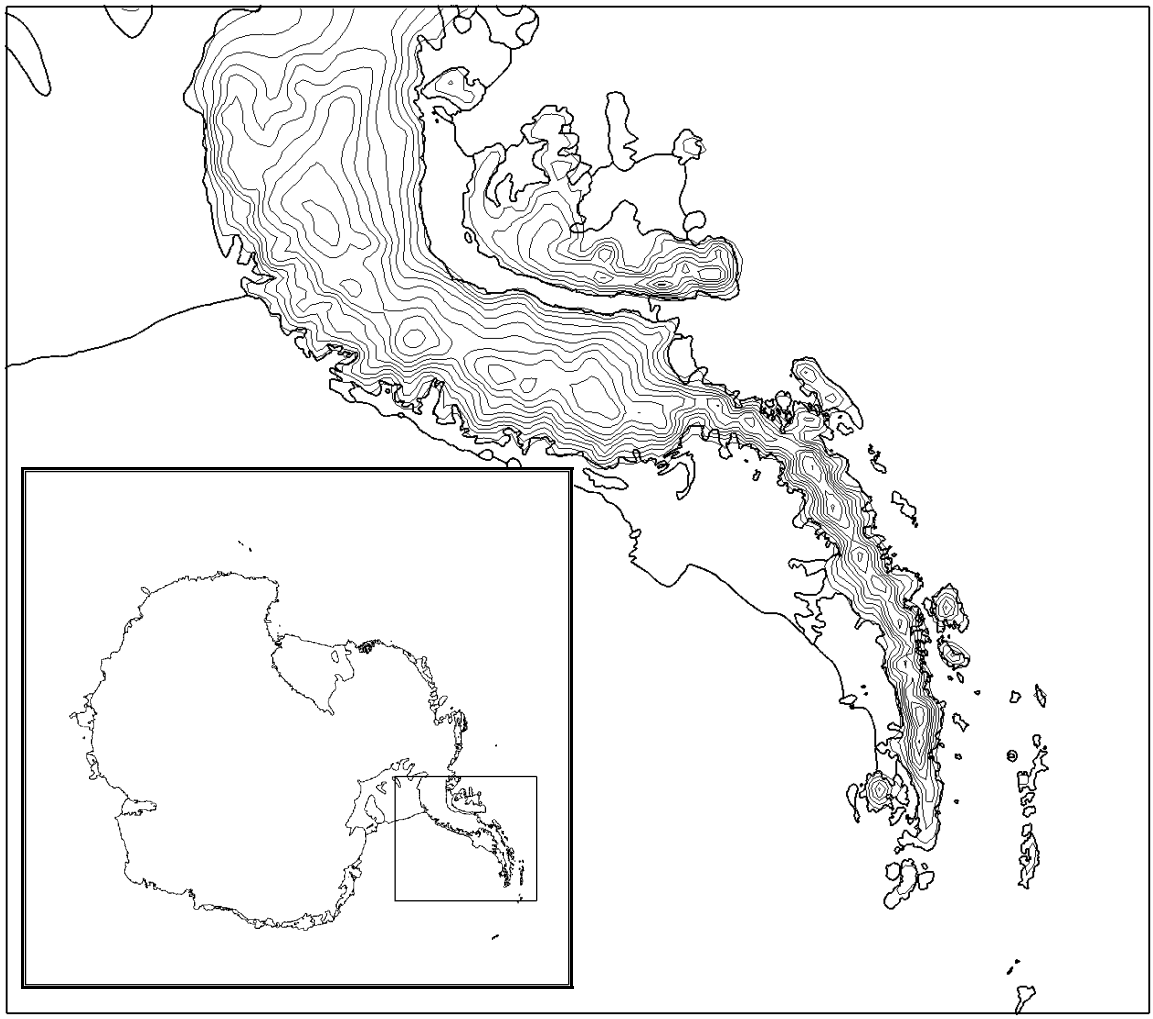

FIG. 1. Antarctic Peninsula 10-km grid. Terrain contoured with 200-m contour interval. Inset shows 30-km continental grid with location of 10-km Antarctic Peninsula grid indicated by box.

7. Web page enhancements

The AMPS real-time pages have seen some improvements. Image sizes have been increased from 700x700 pixels to 900x900 pixels, to allow users to better see details of the products. To the animations page, heavily used by McMurdo forecasters, has been added additional controls for activating or deactivating specific images of an animation, and for sweeping forward and backward through an animation by moving the mouse. Animations menus have been cleaned up to reflect only the fields available for animation on a particular grid.

8. New hardware

A new Linux cluster has been purchased through an agreement between SPAWAR and NCAR, with SPAWAR providing most of the funding. This machine is specifically intended for 3DVAR development work, but will also serve as a backup platform in the event that our production machine has significant failure. As a backup platform, it will allow us to run the 90/30/10km-Ross Island grids (three grids) in about the same time that the current six grids run on our production machine.

9. References

Manning, K. W., 2003. An update on AMPS operations and recent system developments. Preprints, AAWS-AMRC-AMPS Joint Annual Meetings. 23-26 June 2003, Madison, WI.

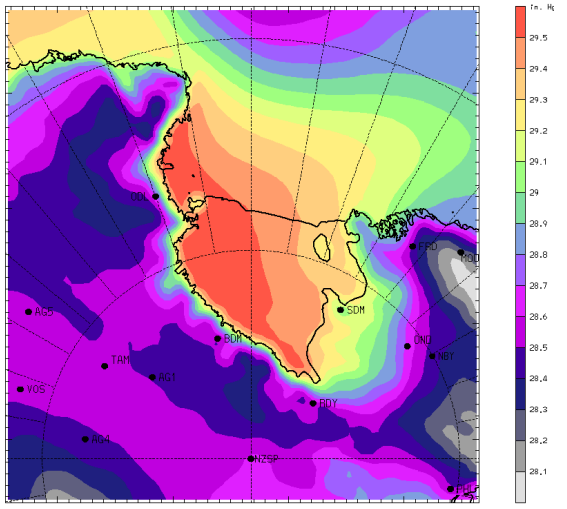

FIG. 2. Sample of AMPS Altimeter Setting product

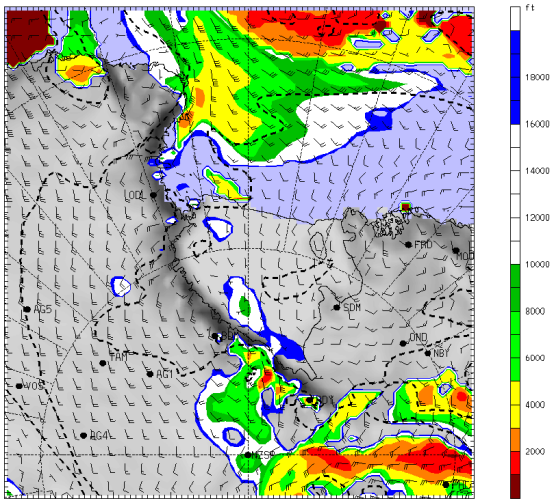

FIG. 3. Sample of AMPS Cloud Base product

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NZPG Pegasus North      (lat, lon) = (-77.95, 166.50)
Forecast initialized at 2004050700
AMPS 30km domain

FCST  UTC     T     Td    Altim  Spd  Dir Grid   VVV    RH1RH2RH3      T1T2T3 ACCUM
 HR    HR     (C)   (C)  (in Hg)(m/s)(deg)(deg)  (*)  (% wrt water)    (C)    (*)

 00    00  -28.4  -33.7   28.96    2  317  123   008   068023038  M23M22M22  000
 03    03  -25.9  -30.5   29.03    4  286   92   043   068026034  M21M21M22  000
 06    06  -27.9  -34.7   29.10    7  199    5  -003   054035031  M24M25M24  000
 09    09  -26.1  -33.9   29.23    3  133  299   018   049033034  M23M23M23  000
 12    12  -26.9  -33.7   29.31    2   94  261  -001   054035039  M24M23M24  000
 15    15  -26.5  -34.1   29.37    2  142  309   011   050035041  M24M24M24  000
 18    18  -27.1  -34.1   29.42    3   95  261  -000   053041047  M25M25M25  000
 21    21  -29.2  -34.3   29.45    3   75  242  -011   063043051  M26M26M26  000
 24    00  -29.9  -35.1   29.46    3  105  271   003   063043053  M26M26M26  000
 27    03  -30.2  -36.0   29.49    3  103  269   006   059035056  M27M27M27  000
 30    06  -29.3  -36.4   29.52    3  102  269   002   052036058  M28M27M27  000
 33    09  -29.6  -36.5   29.53    3  110  277  -003   053038053  M28M28M27  000
 36    12  -29.8  -36.3   29.54    3   96  263   002   055039063  M29M28M28  000
 39    15  -30.1  -37.2   29.47    2  135  302   008   051047074  M30M30M30  000
 42    18  -30.1  -37.8   29.46    4  205   11   007   049027071  M28M29M30  000
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FIG. 4. Sample AMPS Time Series textual output. RH1, RH2, and RH3 are at surface, 1000 ft, and 3000 ft. T1, T2, and T3 are at 500, 1000, and 1500 ft.