

## AMPS Update – June 2015

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### 1. Introduction

The Antarctic Mesoscale Prediction System (AMPS) is an experimental real-time numerical weather prediction (NWP) system providing high-resolution NWP products in support of Antarctic weather forecast efforts. Sponsored by the National Science Foundation, AMPS is run at the National Center for Atmospheric Research, using the Weather Research and Forecasting model (WRF). This presentation relates recent developments in AMPS

### 2. New features in AMPS

Assimilation of Atmospheric Infrared Sounder (AIRS) retrieved profiles has been implemented this year. Further details of the AIRS profiles and their testing and assimilation into AMPS may be found in Powers et al. (2015).

Following suggestions from forecasters, a new feature has been added to our set of web-page tools. This is the AMPS 4-panel display tool, allowing users to view up to four different AMPS graphical products in one display window. Users may select different fields, different levels, different plotting windows, and different forecast initializations. Advancing through a forecast step by step, or animating through the forecast, will keep all selected products synchronized to the same forecast valid time. Using this tool, forecasters can easily compare different levels of a forecast, or different scales; or by selecting different forecast initializations, easily compare successive forecast cycles.

We continue our experimentation and developing of AMPS ensemble forecast capabilities. We have increased the number of ensemble members, and are producing a modest set of graphical ensemble products. Examples of our ensemble products include ensemble mean and spread of various fields, ensemble frequency of surface winds exceeding specified thresholds, ensemble maximum surface wind speed, and ensemble meteograms for selected sites.

### 3. Field Project Support

As in previous years, the AMPS team received requests to support forecasting efforts of various field campaigns and specific operations. In field campaign support, AMPS provided site-specific time-series and zoomed-in views of AMPS prod-

ucts for the 2-season Ozone Depletion and Interaction with Aerosols Campaign (2ODIAC). A one-way nest with 6-km grid spacing was set up for the South Georgia Wave Experiment (SGWEX). Additionally, for the Microphysics of Antarctic Clouds (MAC) experiment (since delayed), a one-way nest with 2-km grid spacing was set up over Halley Station.

In preparation for the O<sub>2</sub>/N<sub>2</sub> Ration and CO<sub>2</sub> Airborne Southern Ocean (ORCAS) experiment, we have been testing an expanded 27-km grid to drive our New Zealand and Palmer grids. This larger grid will be used for forecasting purposes, as well as for computing trajectories to diagnose the source and history of atmospheric constituents.

### 4. Future Directions

Before the next Austral summer season, we will likely upgrade the version of WRF used in AMPS from version 3.3.1 to 3.6.1. WRFv3.6.1, however, uses significantly more memory than version 3.3.1, which could reduce the number of ensemble members we are able to run. We may try to accelerate the transition to WRF version 3.7, which version alleviates much of the excessive memory usage of version 3.6.1

We plan to continue the development and analysis of the AMPS ensemble capability, expanding the set of ensemble forecast products, and evaluating the ensemble with respect to spread and reliability.

We will continue testing of data assimilation strategies. For example, we can make use of the AMPS ensemble forecast to perform a hybrid ensemble data assimilation. This hybrid technique allows us to make use of flow-dependent error covariance statistics that vary from case to case, rather than depend entirely upon seasonal statistics which may be unrepresentative of any given case. Early tests of this hybrid ensemble DA show some promise. Other data assimilation strategies in testing include full cycling data assimilation.

### 5. References

Powers, J.G., P. Mooney, and K. W. Manning, 2015. Assimilation of AIRS Version 6 Data in AMPS. 10<sup>th</sup> Antarctic Meteorological Observations, Modeling, and Forecasting Workshop, Cambridge, UK.