AMPS Update – June 2013

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Kevin W. Manning
Jordan G. Powers

Mesoscale and Microscale Meteorology Division
NCAR Earth System Laboratory
National Center for Atmospheric Research
Boulder, CO

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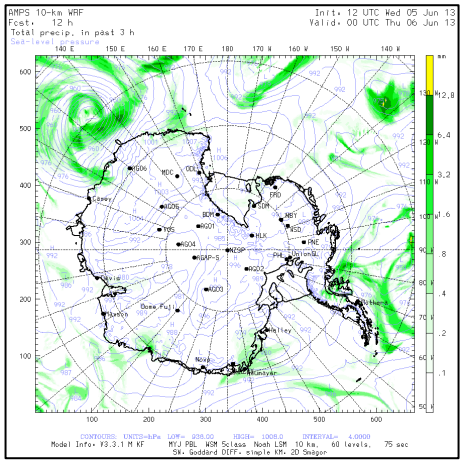
Antarctic Mesoscale Prediction System (AMPS)



- AMPS is a real-time, experimental NWP system for Antarctica, running since about Oct 2000
- Funded by the NSF, a collaboration between NCAR and the Byrd Polar Research Center (BPRC) of the Ohio State University
- Primary purpose is to provide NWP support for forecasters of the United States Antarctic Program (USAP)
  - USAP forecasters based at McMurdo Station and Charleston, SC
- AMPS uses the Weather Research and Forecasting model (WRF-ARW) with polar adaptations
- Real-time forecast products available through the AMPS web site:
  - http://www.mmm.ucar.edu/rt/amps

New in AMPS this year

- New Computing Platform
  - Higher vertical resolution
  - Higher horizontal resolution
  - Expanded grids
  - Reorganized some nests
  - Extended high-resolution forecast times

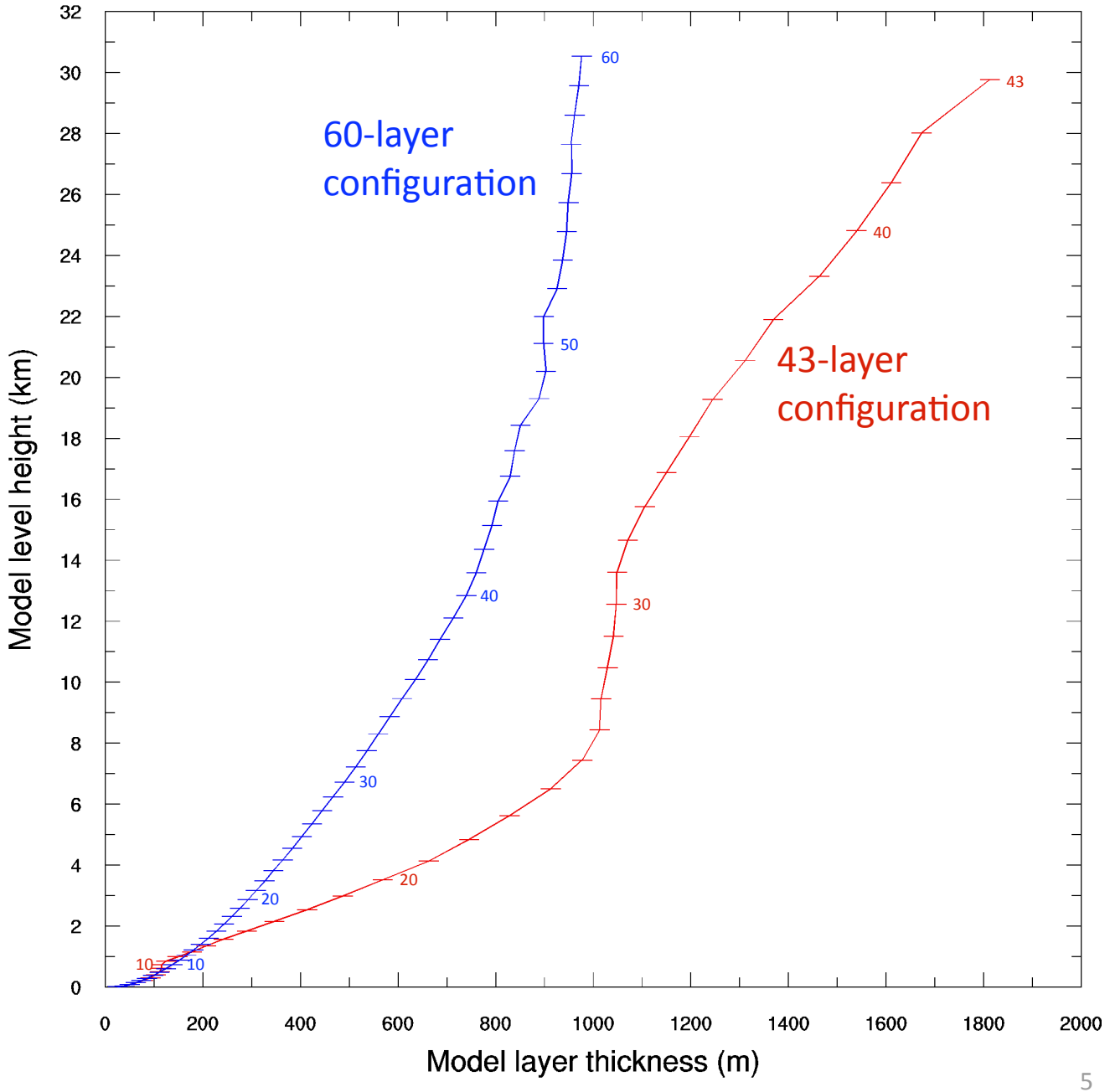
- Model update to WRF version 3.3.1
- NetCDF4-compressed WRF output files
- WRF Bug fix – adaptive timestep logic

Erebus

- IBM iDataPlex Compute Cluster
  - 84 Nodes, 16 cores per node (2.6 GHz Intel Sandy Bridge EP processors) 1344 cores total – 28 TFLOPs theoretical peak
  - Roughly 15-fold to 25-fold increase in computing capacity for AMPS

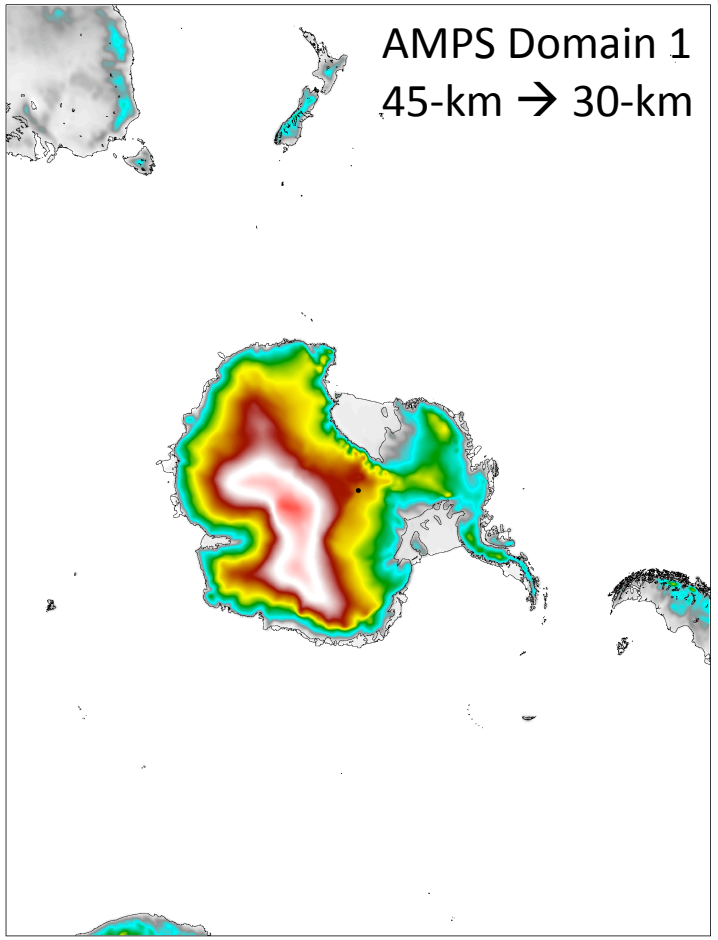
- AMPS ported to Erebus: Sep – Dec 2012
- AMPS off its former computing platform on 14 Jan 2013

Increased vertical resolution, changing number of layers from from 43 to 60 (model top at 10 mb)

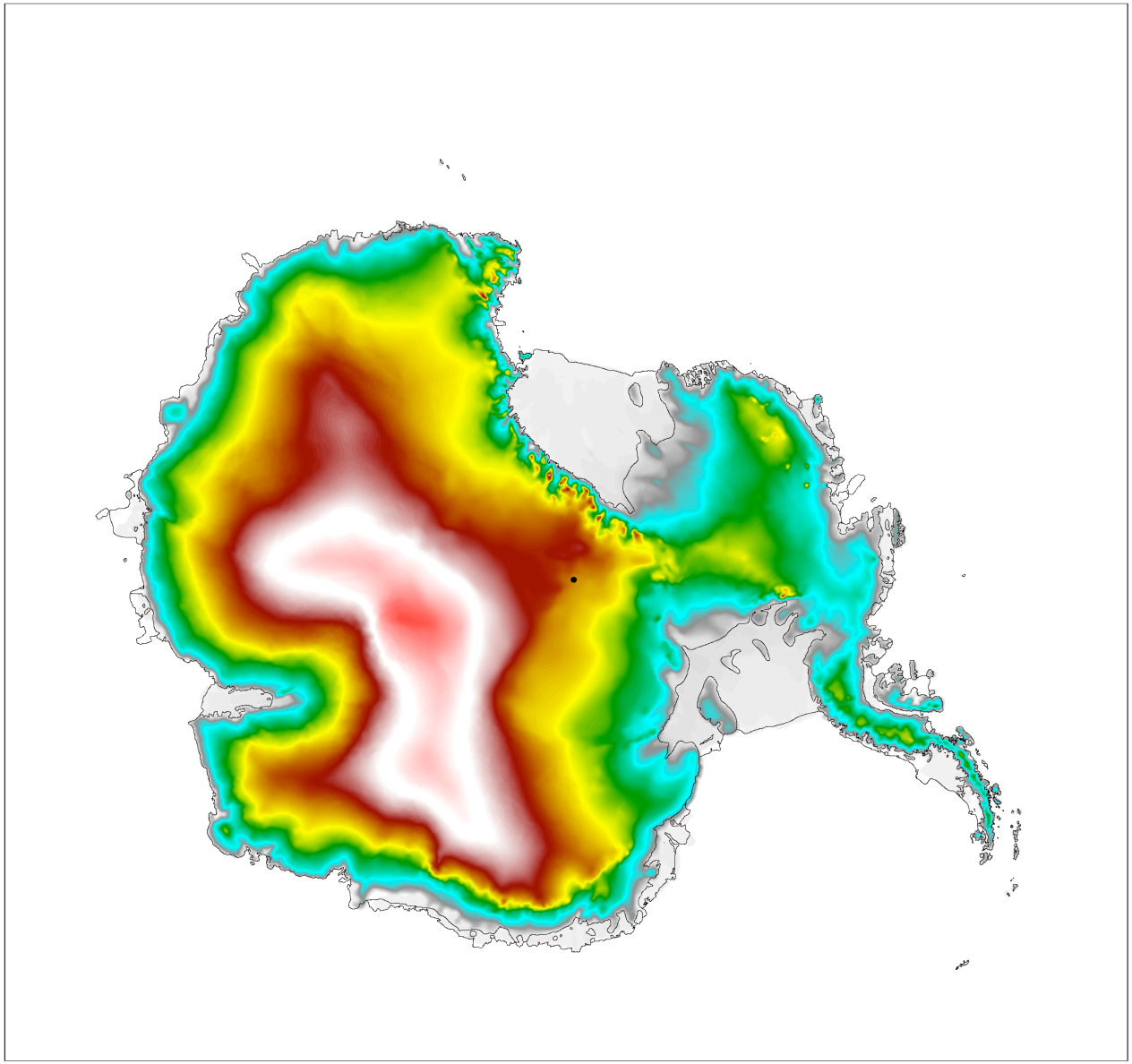


Horizontal resolution increased

- Increased horizontal resolution overall
  - 45-km grid → 30 km
  - 15-km grid → 10 km
  - 5-km grid → 3.3 km
  - 1.67-km grid -> 1.1 km



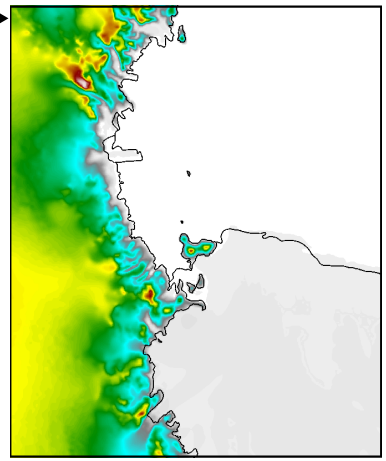
AMPS Domain 2: 15-km → 10-km



AMPS Domain 3

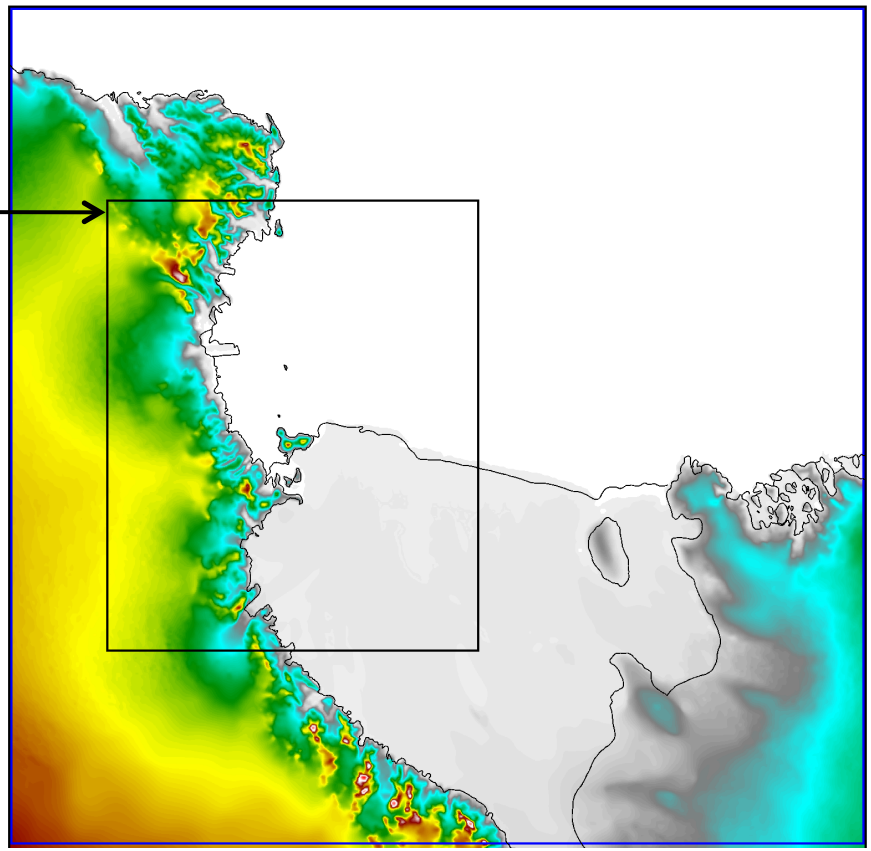
Old D3 at
at 5-km

746×10^3 km^2



AMPS Domain 3

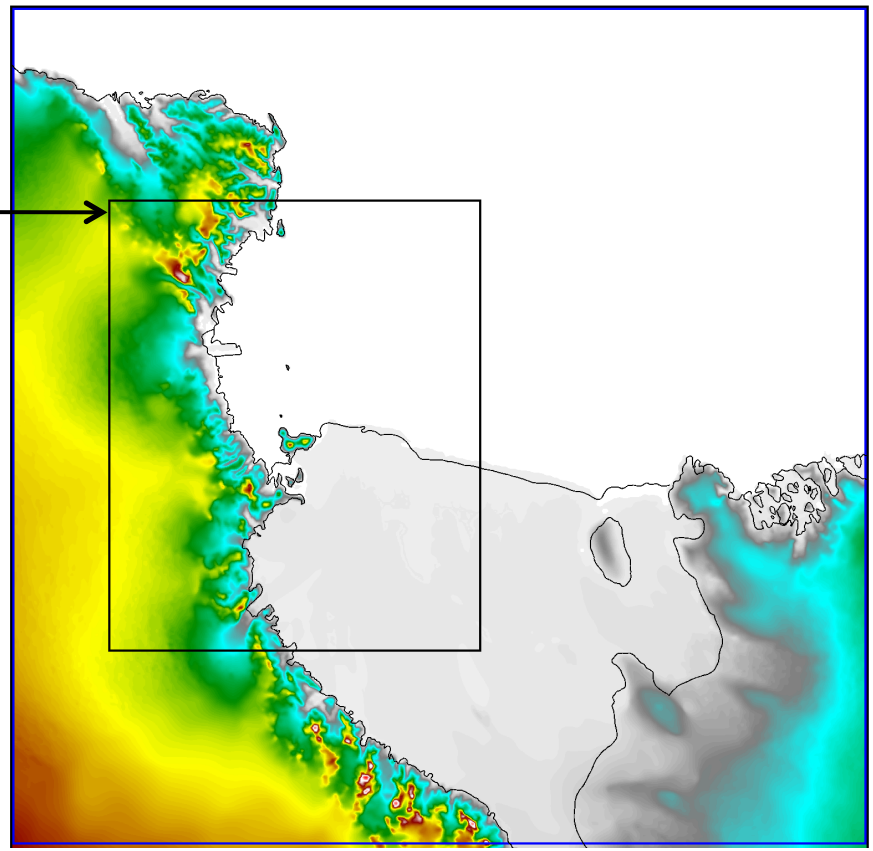
Old D3 at
at 5-km
746×10^3 km^2



Initial D3 expansion
at 3.3-km
3140×10^3 km^2

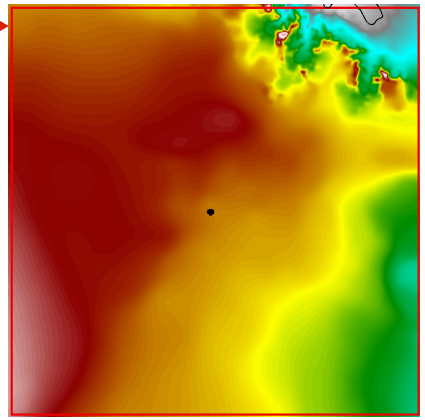
AMPS Domain 3

Old D3 at
at 5-km
746 × 10^3 km^2

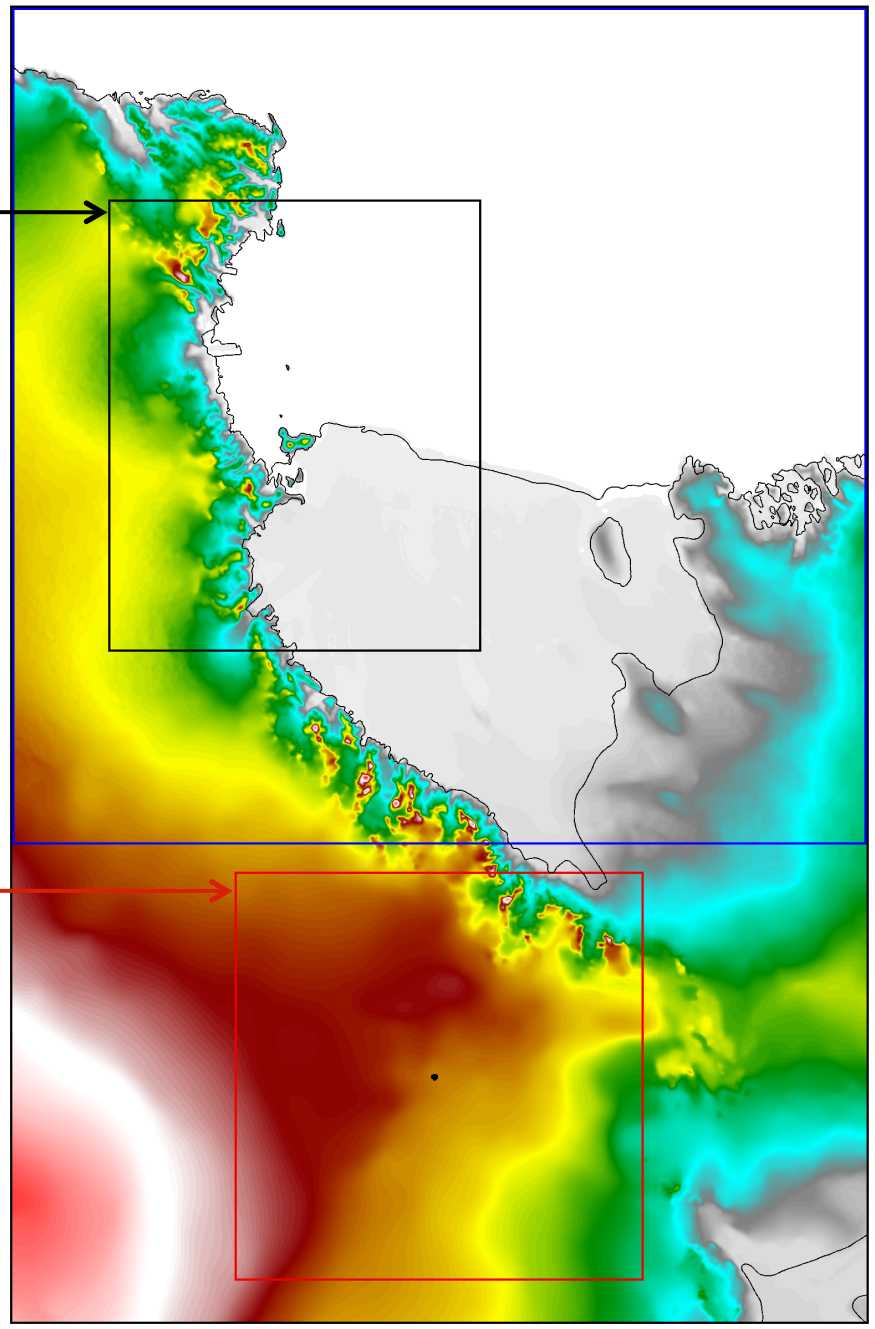


Initial D3 expansion
at 3.3-km
3140 × 10^3 km^2

Old D4 at
at 5-km
714 × 10^3 km^2



AMPS Domain 3



Old D3 at
at 5-km
746 × 10^3 km^2

Initial D3 expansion
at 3.3-km
3140 × 10^3 km^2

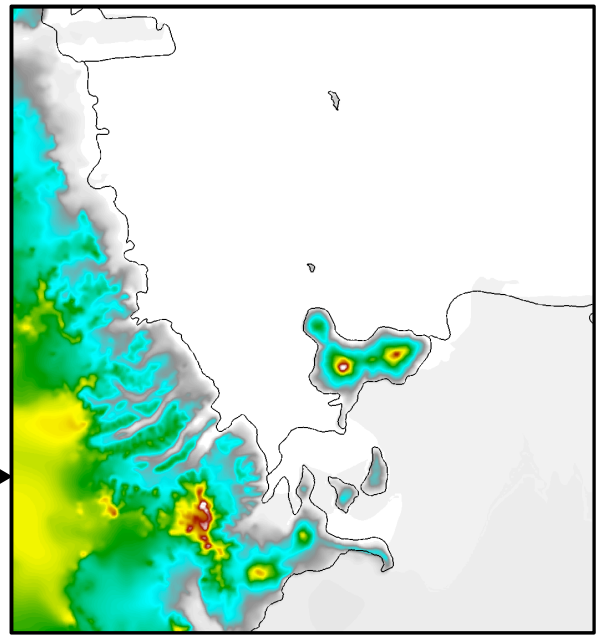
Later D3
expansion
at 3.3-km
4940 × 10^3 km^2

Old D4 at
at 5-km
714 × 10^3 km^2
(Eliminated)

AMPS Domain 5:
1.67-km → 1.1 km

136×10^3 km^2

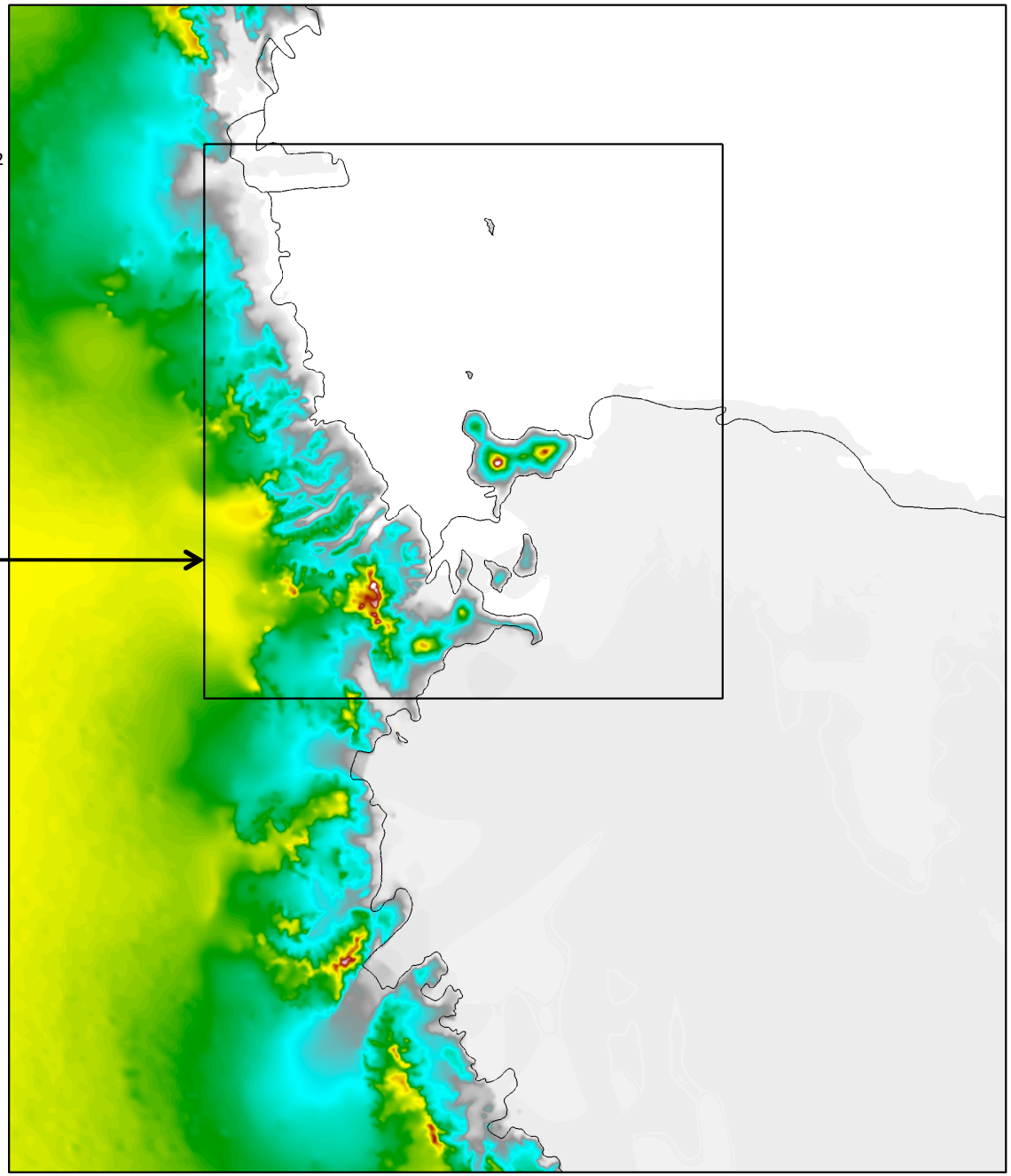
Old D5 at
at 1.67-km →



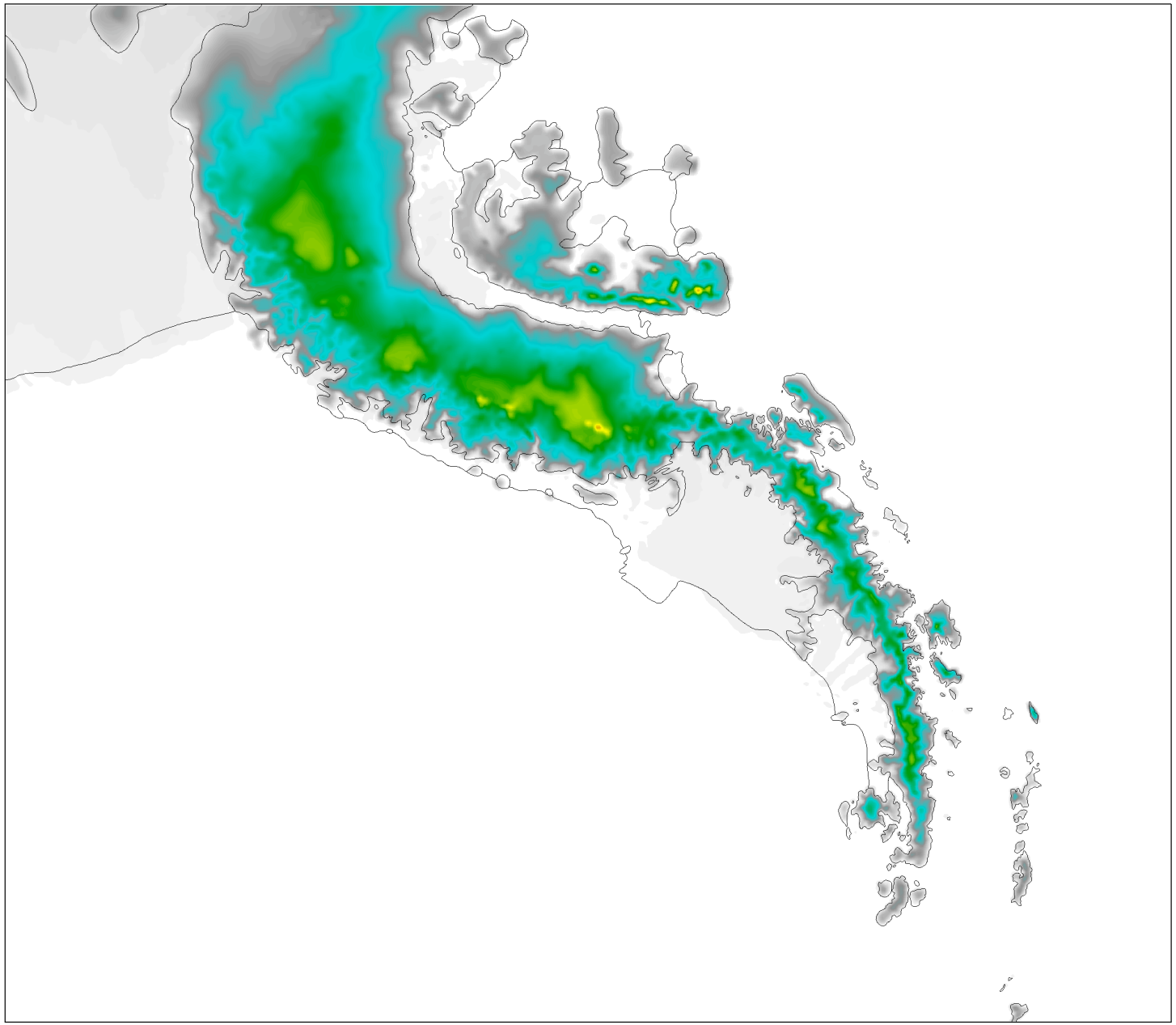
AMPS Domain 5:
1.67-km → 1.1 km

136×10^3 km^2 → 543×10^3 km^2

Old D5 at
at 1.67-km

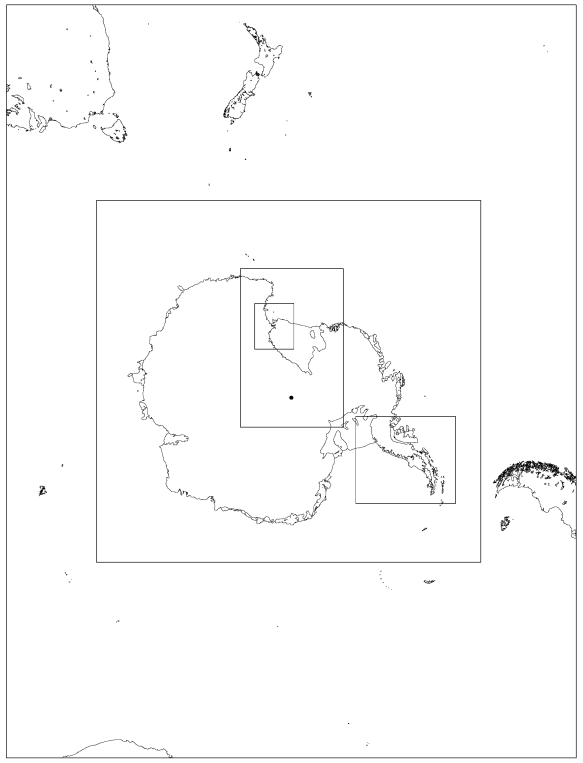


AMPS Domain 6:
5-km → 3.3 km

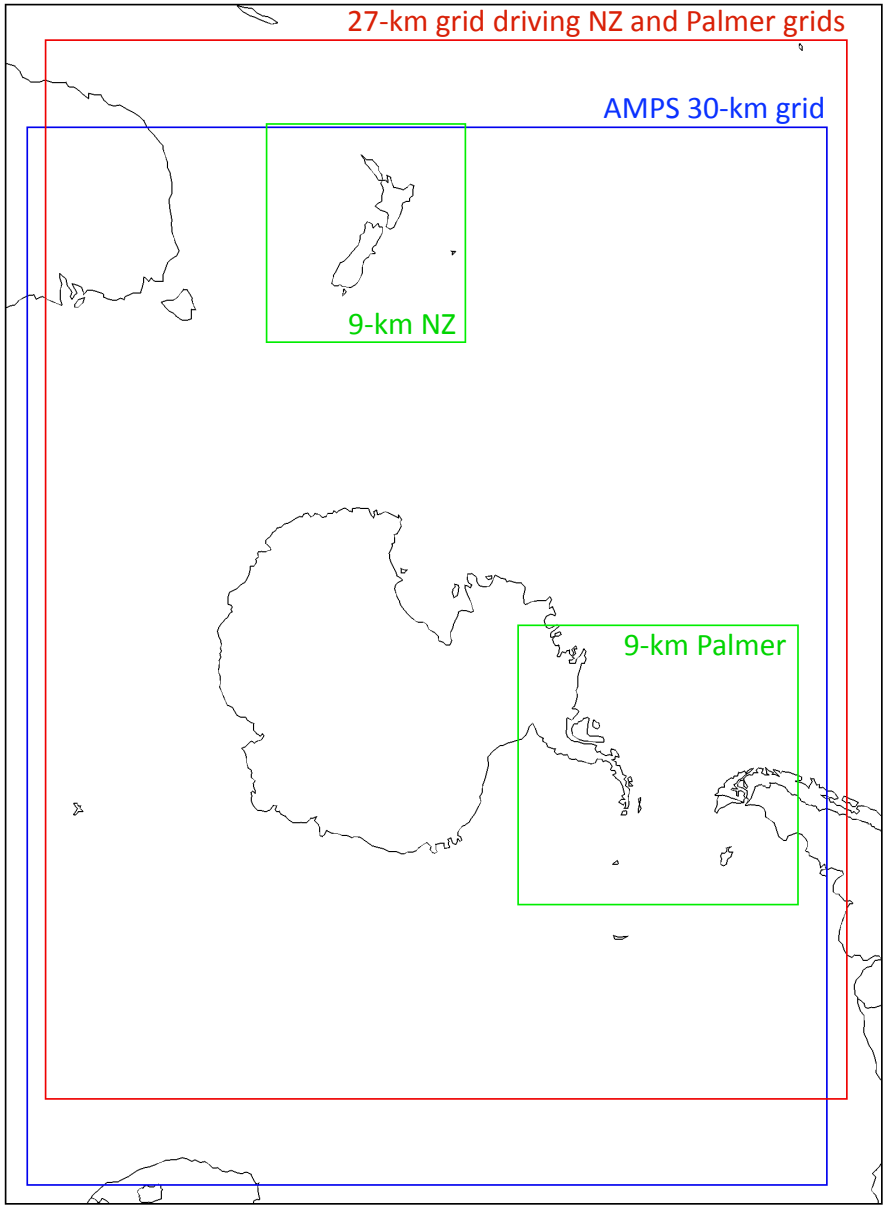


New and reconfigured grids

- Expanded and reconfigured grids
  - Domain 3 (1st expansion)
  - Domain 3 (2nd expansion covering area of domain 4)
  - Domain 4 removed
  - Domain 5 expanded
  - Extend high-resolution nest forecasts out to 39 hours
  - New NZ/Palmer grids in a separate 2-way run
  - New WAIS Divide one-way nest

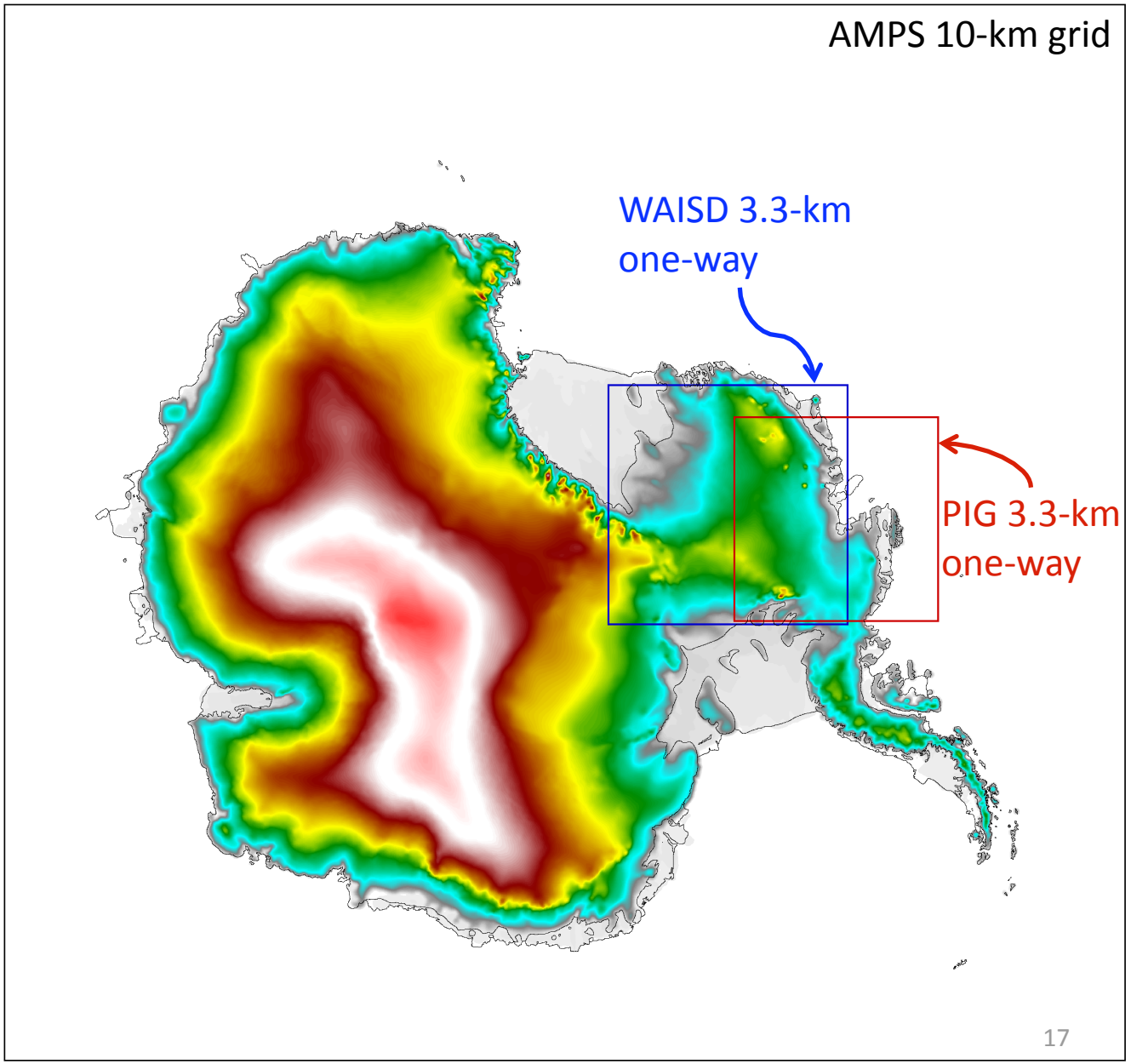


- New NZ grid and a reconfigured Palmer grid (formerly a one-way nest) now running as two-way nests driven by a separate 27-km grid
  - Avoids computational overhead of one-way nests
  - Can run concurrently with the usual AMPS suite
  - Not limited by the configuration of the usual AMPS suite
  - Moves nests away from outer boundaries



New one-way nest over WAIS Divide

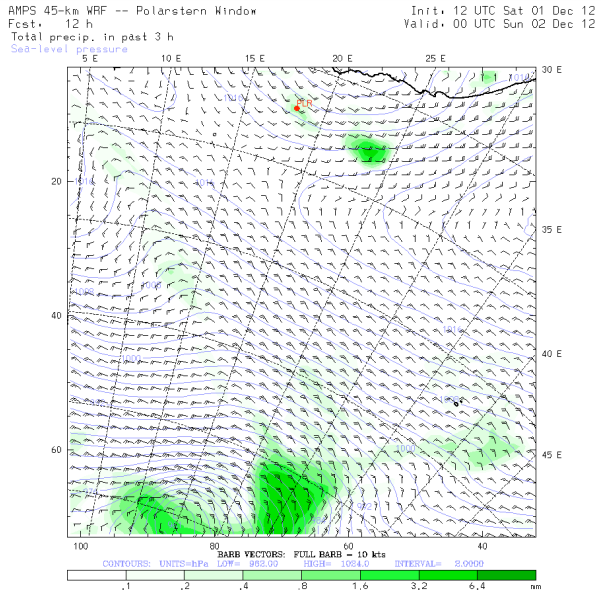
- 3.3-km grid out to 39 hours
- Joins PIG one-way nest from prior seasons



Other AMPS changes

- Difficulties getting WRFDA working on new platform
  - Runtime environment tweaks for AMSU radiance assimilation
  - Unable to generate background error statistics for domain 2 until recently
- Files from AMPS archive available through Earth Systems Grid portal (see Powers presentation)

Other AMPS changes



- Polarstern-following plotting window
  - Requested by DWD forecasters
  - Added to our suite of ship-following windows that began with *R/V Nathaniel B. Palmer* and later added *R/V Laurence M. Gould*
- Difficulties getting WRFDA working on new platform
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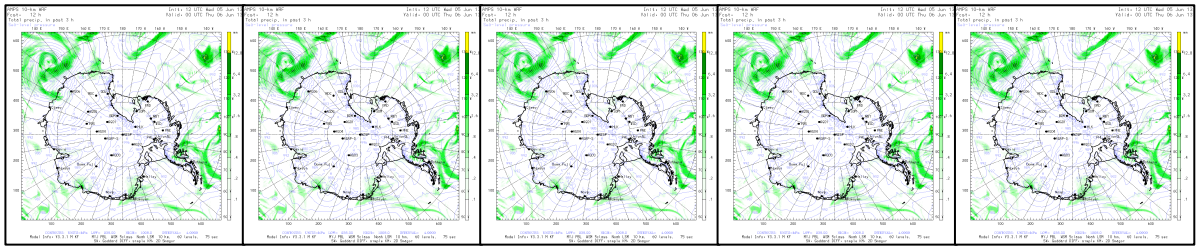
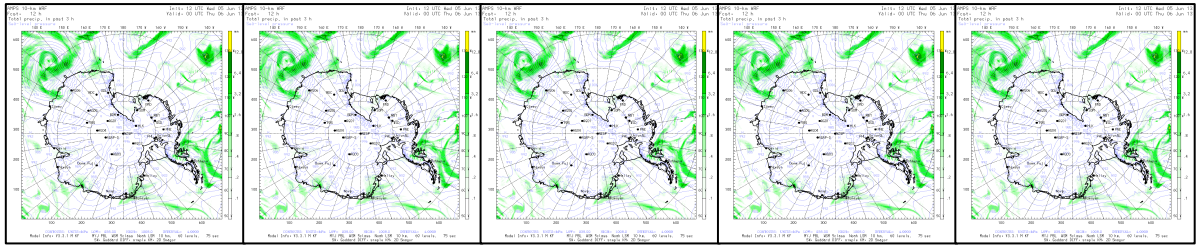
In Progress.... (very early stages....)

- AMPS ensemble forecasting



  - Approximately 10 members of the AMPS 30 and 10-km grids out to 5 days
  - Same model physics – varying initial and boundary conditions
    - May later test different combinations of WRF physics packages
  - Help quantify forecast uncertainty
    - How to best present this information to forecasters?



Summary

- Major changes in the past year have been largely driven by the new computational resources
  - Higher horizontal and vertical resolution
  - Expanded grids
  - Grids reconfigured
  - Additional grids
- New computer allows further exploration
  - E.g. AMPS ensemble