

A Real Time Forecast Trial using Convective NWP in Australia



Peter Steinle

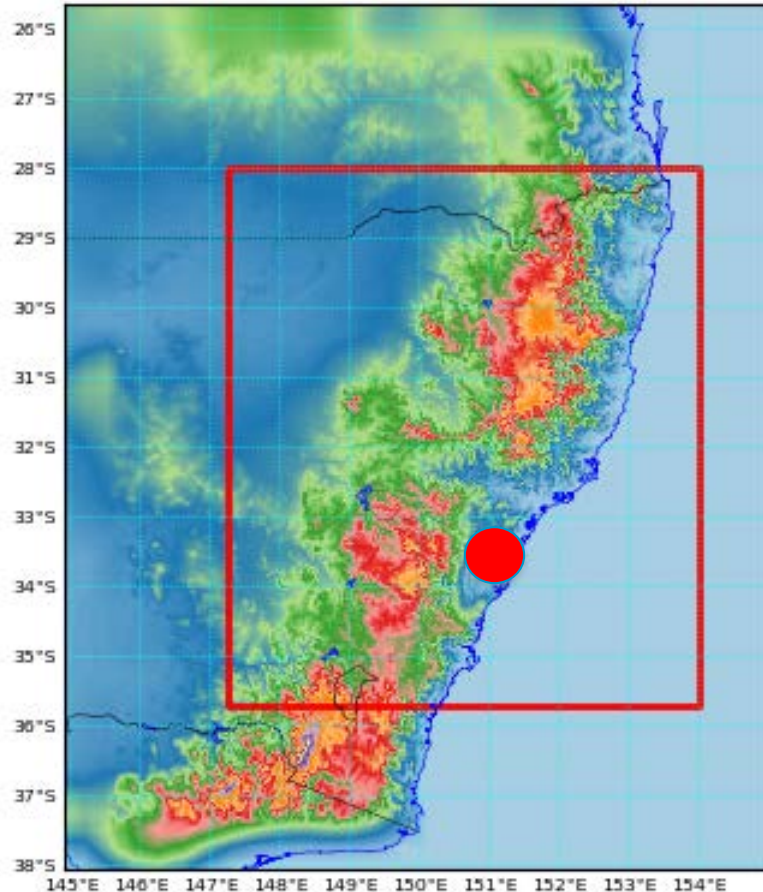
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WSN 16, Hong Kong, 25-29 July 2016



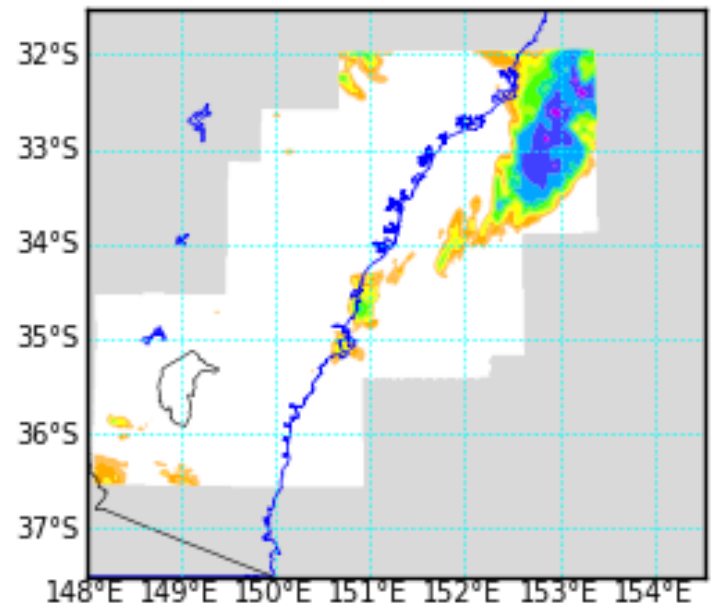
Australian Government
Bureau of Meteorology

Forecast Demonstration Project



- Major population centre
- Significant severe weather (storms, fires etc.)
- Reasonable topography
- Test 1.5km & Rapid Update Cycle
- Use latent heat nudging & Doppler winds
- Staggered 2 week forecaster rotation
- Detailed recording of forecaster perceptions

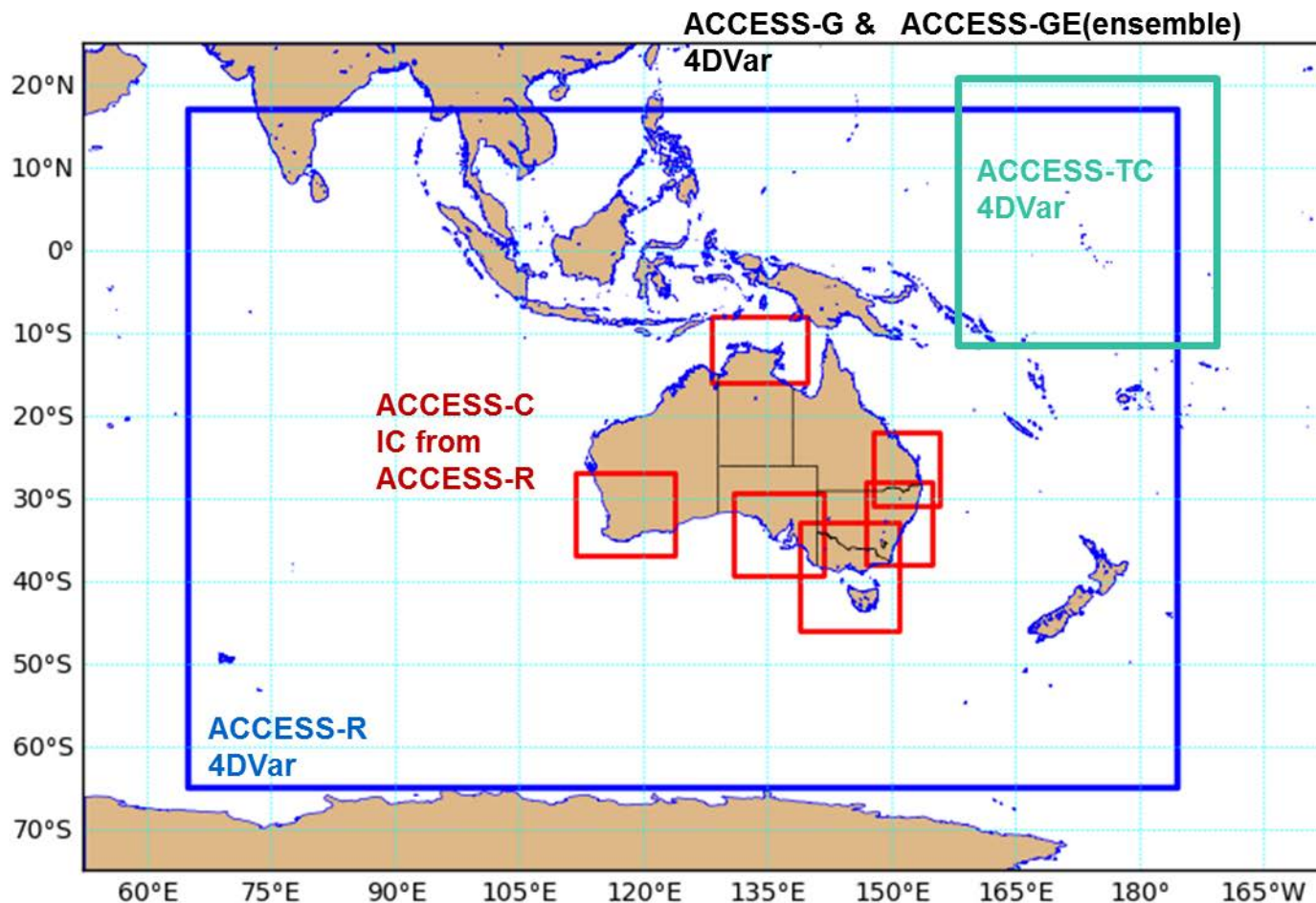
Radar+Gauge 201110150200 00hr



ACCESS: APS1 → APS2



ACCESS Domains



70 vertical levels
Grid size (km)

	APS1	APS2
G	40	25
GE	-	60
R	12	12
TC	12	12
C	4	1.5

NWP system



- Based on UKV 2012/2013
 - 3dVAR + IAU + Latent Heat Nudging
 - 1.5km interior, stretched to 4km at boundary
- Modified
 - Latent Heat Nudging (reduced forcing)
 - Hourly update
 - Added clear air Doppler winds
- Data cutoff at T+55mins (T-30 to T+30mins)
- Forecast available ~ T+90 to T+120min



Does the RUC provide improved forecasts?



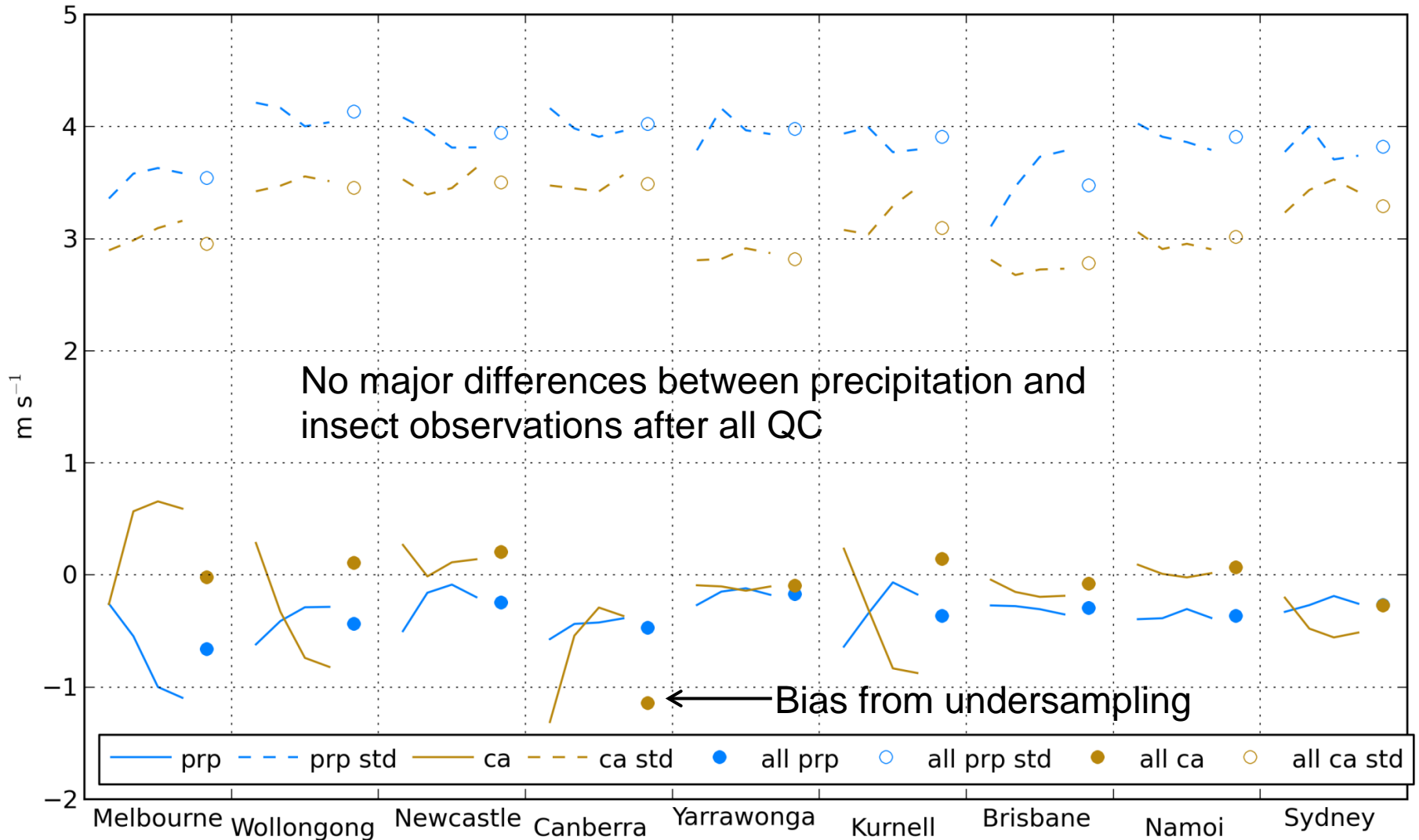
- No end of potential problems:
 - Initialization/noise, short cut-off, limited obs, QC of single polarized radars.....
- ...but despite all that
 - Improved temperature RMSE ~10%
 - & dew point, but less
 - Improved rainfall
 - Windspeed
 - variance somewhat improved
 - double penalty problem?
 - Improvements noticeable in downstream systems
- **Added value 14-3 out of 50 forecasts !**



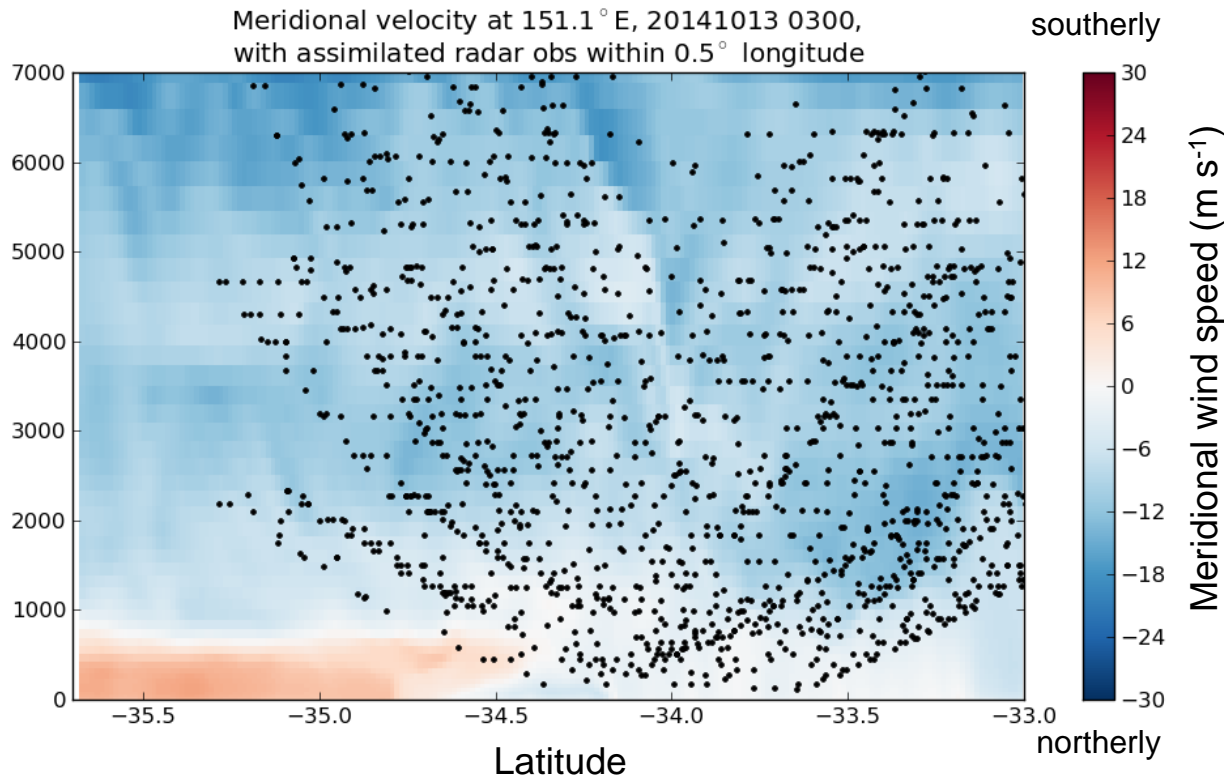
Mean of assimilated innovations



These have undergone OPS QC and superobbing



Observation impact and limitations



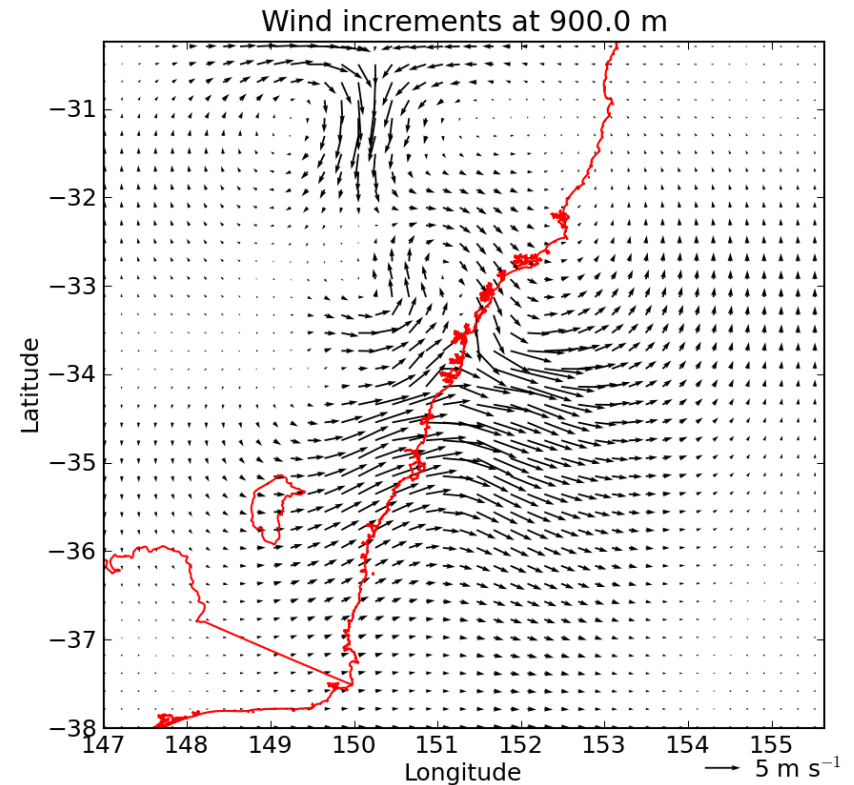
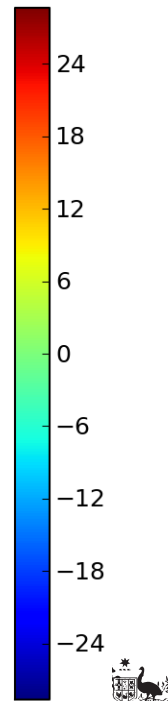
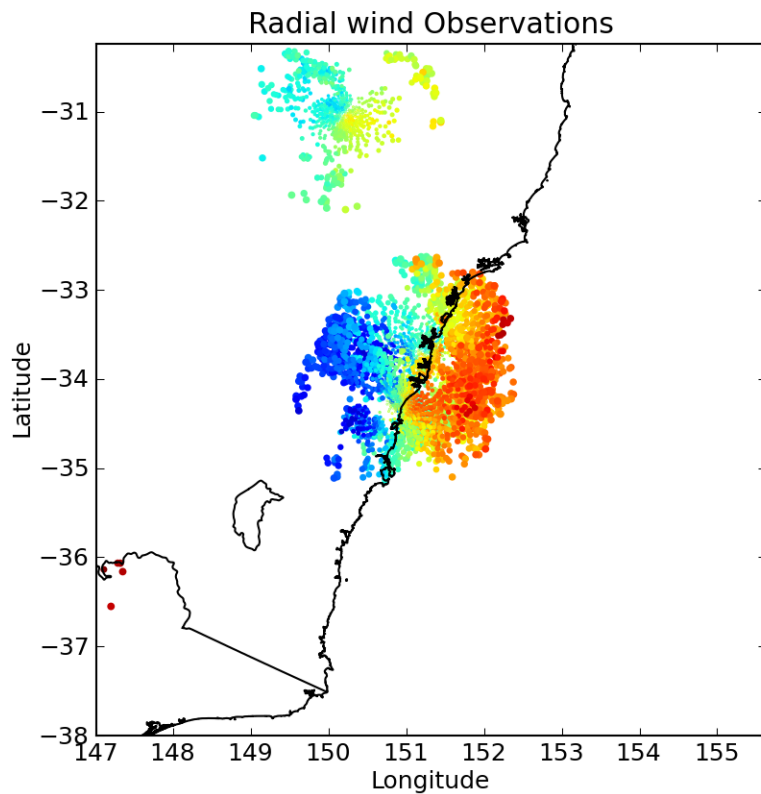
- Observations at the time of an approaching southerly change
- Most radar observations are above the height of the change, except near the radar.



Assimilation in ACCESS-Sydney domain



- Observations from multiple radars within Sydney domain
- Modification to model wind field after assimilation



Forecaster/User reaction



- Importance of full (seamless) integration nowcasting & forecasting
- About a week to get used to the system
 - Had time to discuss and get used to the system
 - During 2nd week really start to see the opportunities
- Scenario / Interactions of boundaries valuable
 - Prepared for the event well in advance
 - Could refine timing once radar/satellite features appear
- Lack of responsiveness of DA system
- Mid level convection a problem



Conclusions



- Much improved wind changes & convective storm lifetime
 - Mostly courtesy of model
- Data assimilation added value
 - But needs more high resolution detail
 - Value of DA fades after about 12 hours
 - Latent Heat nudging marginal value, fades by ~ 6 hours
- Need ensemble DA & high res Land DA
- Rapid Update very constrained by lateral boundary conditions
 - Larger scale RUC?
- Nowcasting processes need enhancing!



Summary & Thoughts



- Showed enough to proceed to develop full operational system
 - EPS, Hybrid VAR
 - UM and DA science updates
- Phased introduction
 - 1.5km downscaler → RUC → Fully integrated nowcast systems
- A few days for forecasters to move from current thought processes
 - Current 6 hour NWP cycle deeply entrenched in processes & systems
 - By 2nd week forecasters really get it.

