Plans for Future Regional Ensembles: A Possible Vision

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24 March 2014

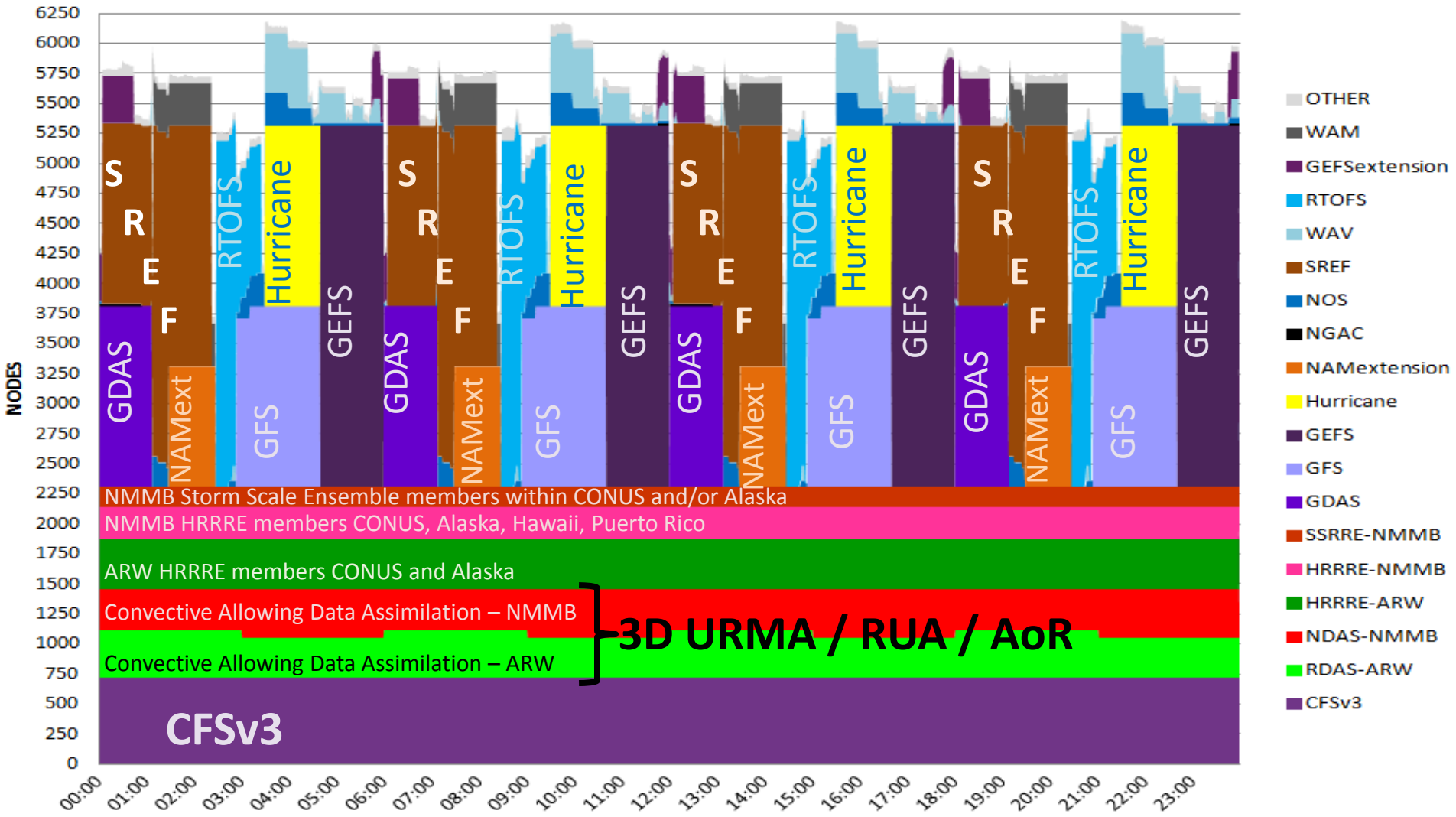
HRRRE – NARRE – SREF

- High Resolution Rapid Refresh Ensemble
- North American Rapid Refresh Ensemble
- Short Range Ensemble Forecast

NARRE – HRRRE
A Brief Briefing History

- 9 April 2009 — MMB UCAR Review in backup slides
- 24 April 2009 — Briefing for Berchoff & Tuell
- 5 December 2009 — NCEP Production Suite Review
  - a ***multitude*** of times
  - by me and/or Stan Benjamin
  - since then
- **28 March 2013 — NWS AA**
- 8 April 2013 — Synergy (NCEP ctrs & NWS regions)
- 6 December 2013 — NCEP Production Suite Review
- 11 January 2014 — UCACN

Projected End State of 2 petaflop WCOSS

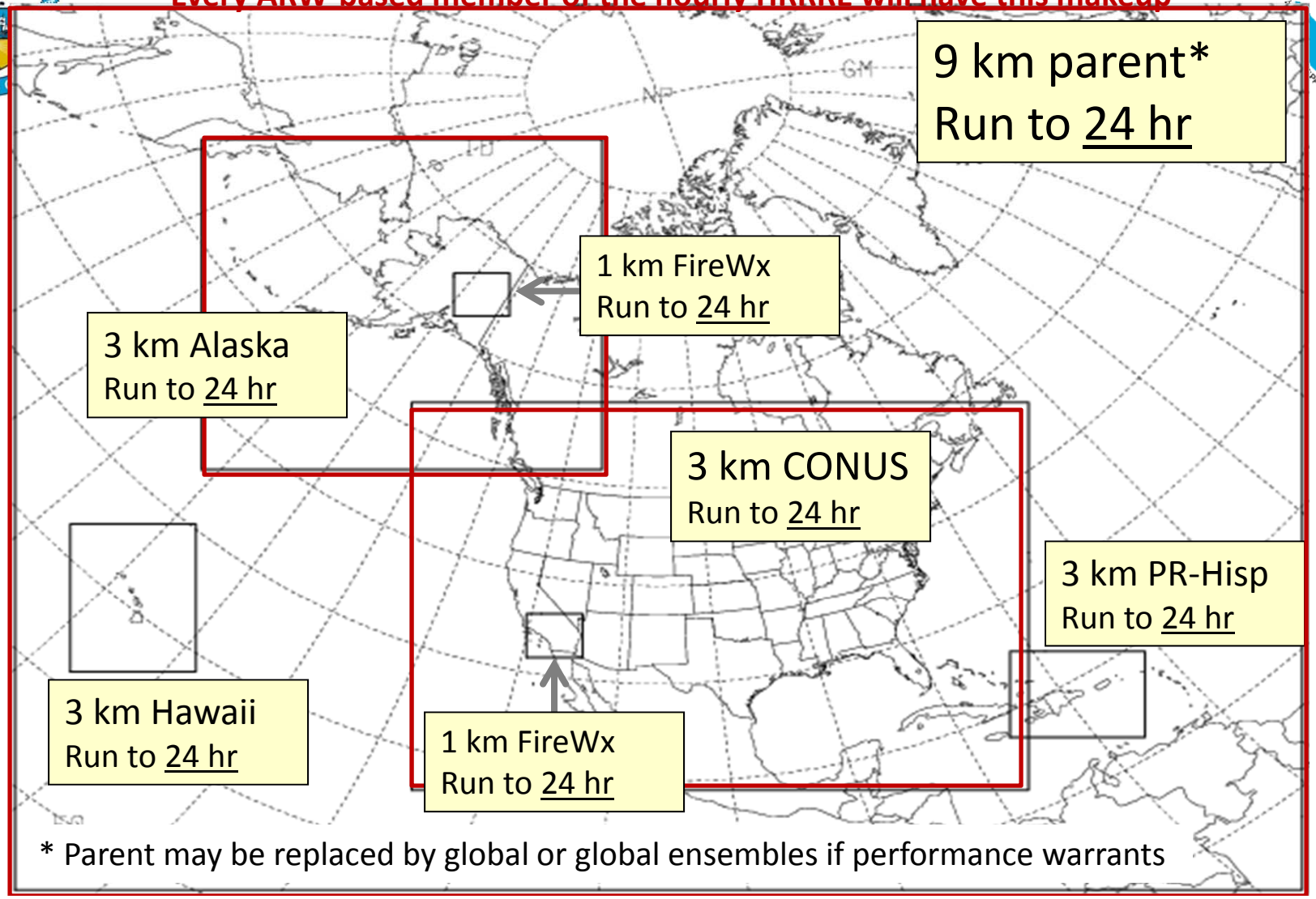


Mesoscale Ensembles Replace Regional Deterministic Guidance

Start of WCOSS Phase1 Current	End of WCOSS Phase 1 ~2015	End of WCOSS-era 2 petaflop Machine
SREF continental scale	**SREF continental scale**	**SREF continental scale**
WRF-ARW, WRF-NMM, NMMB	WRF-ARW & NMMB	WRF-ARW & NMMB
7 each = 21 members 16 km	10 each = 20 members ~12 km	10 each = 20 members ~9 km (parent)
35 levels 6 hourly to 84 hr	40-60 levels NARRE-TL run hourly to 18 hr 6 hourly to 84 hr	50-60 levels NARRE run hourly to 24 hr 6 hourly to 96 hr
WILL BE A MAJOR CHALLENGE	Product streams for all scales will need to be added, consolidated, repurposed & renamed. Products may have later delivery times.	
Convection-Allowing-Scale	**Convection-Allowing-Scale**	**Convection-Allowing-Scale**
Irregular suite of guidance 3-6km [HiResWindows & NAM nests] ~6 hourly to 48/60 hr for CONUS, Alaska, HI, PR	Single hourly 3 km HRRR & NAM nest Run to 15 hr for CONUS Upgrade irregular suite to ~3 km 6 hourly to 48/60 hr for CONUS, Alaska, HI, PR	HRRRE Multiple hourly 3 km Run hourly to 24 hr 6 hourly extended to 60 hr for CONUS, Alaska, Hi, PR
Storm Scale	**Storm Scale**	**Storm Scale**
Single placeable sub-nest 1.33-1.5 km Run 6 hourly to 36 hr	Single placeable/movable sub-nest 1-1.5 km Run 6 hourly to 36 hr	Multiple placeable/movable sub-nests: ~1 km run hourly to 18 hr and Run 6 hourly to 36 hr

Every NMMB-based member of the hourly HRRRE will have this makeup

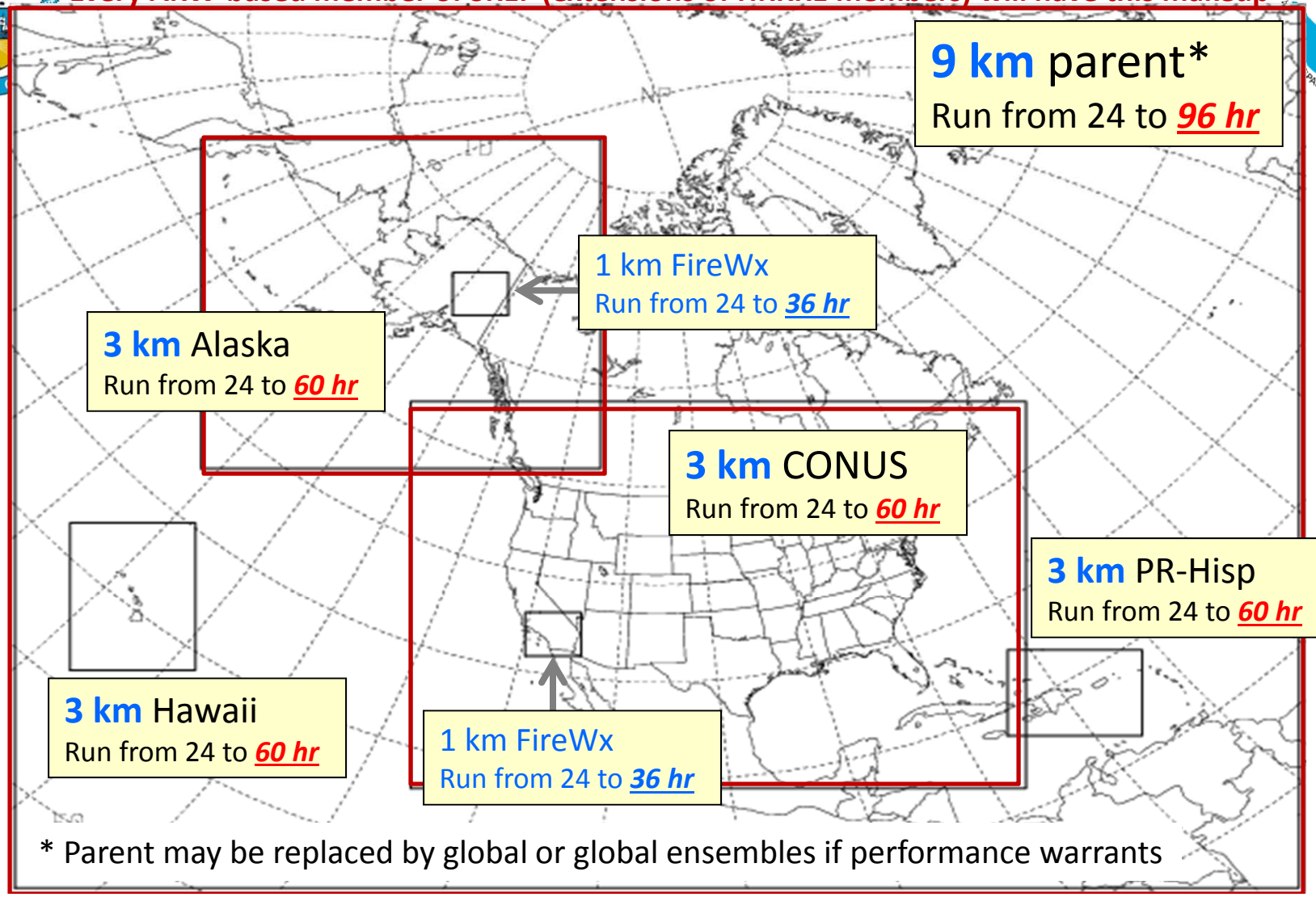
Every ARW-based member of the hourly HRRRE will have this makeup



* Parent may be replaced by global or global ensembles if performance warrants

Every NMMB-based member of SREF (extensions of HRRRE members) will have this makeup

Every ARW-based member of SREF (extensions of HRRRE members) will have this makeup



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TRADE SPACE

DECISIONS MADE TO MAKE THINGS FIT

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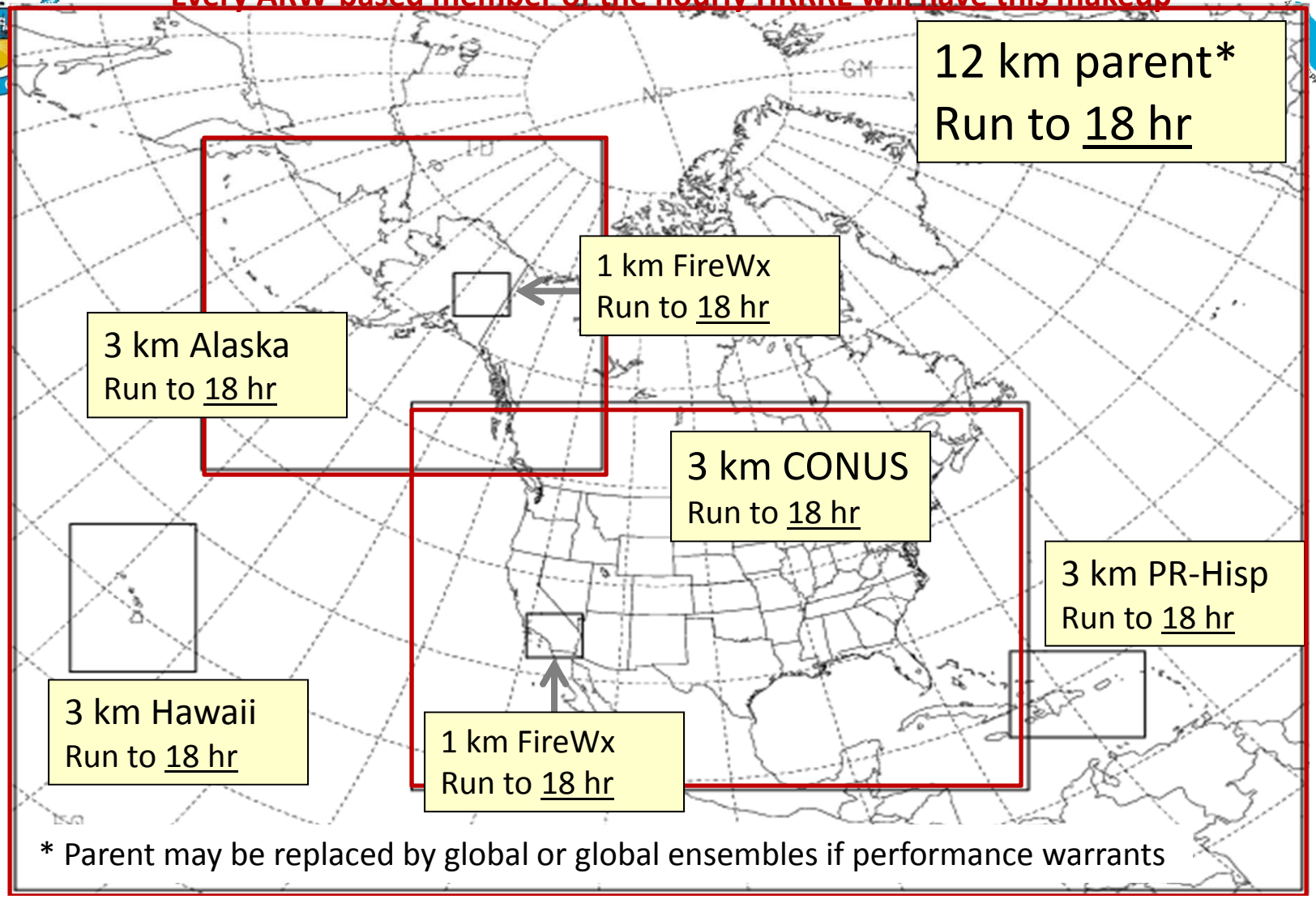

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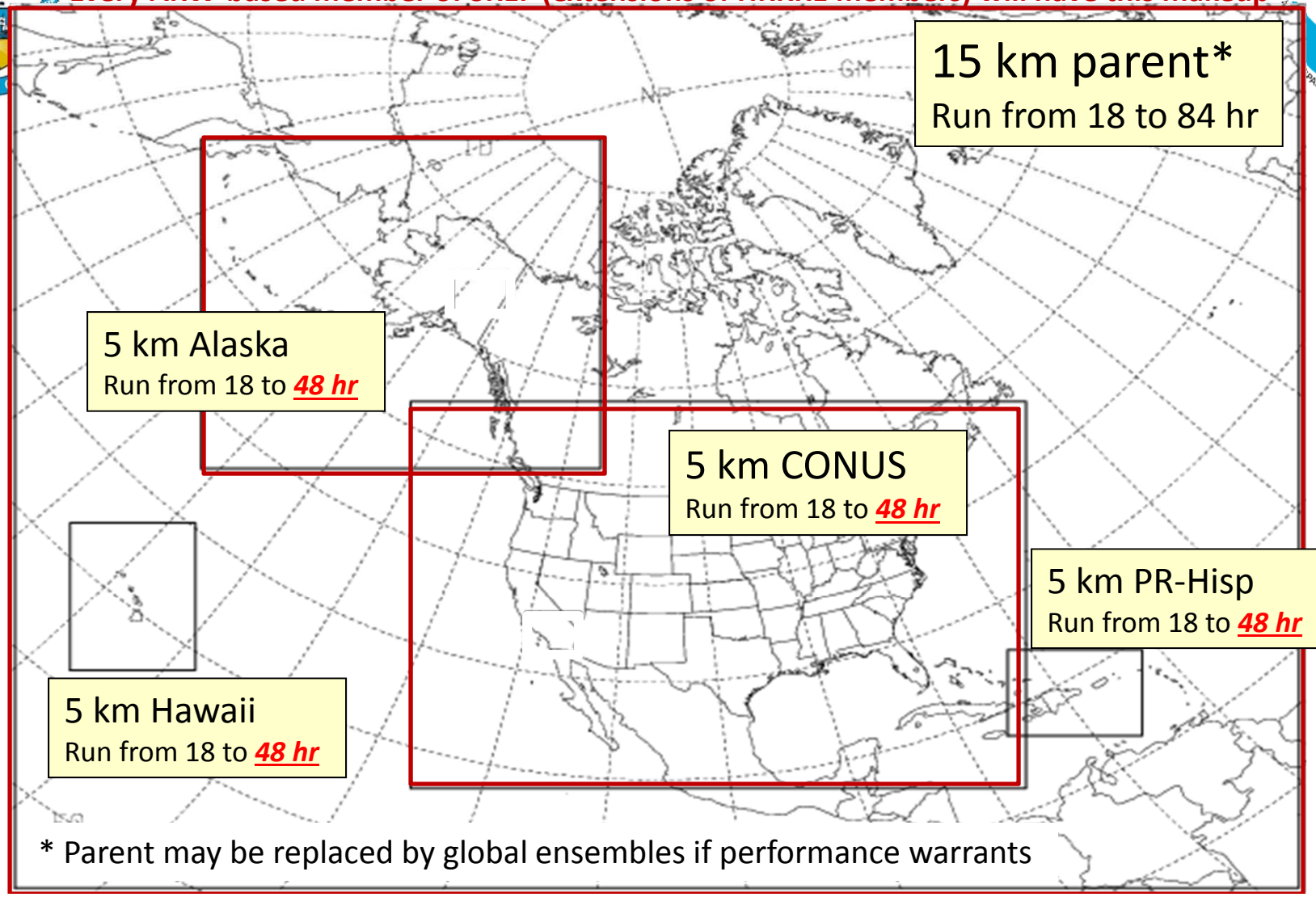

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Reasons to Believe - 1: This Plan Is Comprehensive

- First & foremost, it's designed to meet requirements
  - SPC, WPC, AWC, OPC, NWS, FAA, …
  - Includes the continental scale to support growing number of Outlooks requiring guidance to 4 days
  - Includes hourly updated convective scale (3 km) for
    - Convective mode, lightning, tornado and damaging winds
    - Domestic aviation and threats thereto
    - Flash floods, winter weather, waves, coastal surge
    - CONUS as well as OCONUS regions
  - Placeable and/or moveable storm scale (1 km or less)
    - Terminal Wx, High Impact Wx, and Warn-on-Forecast (eventually)

Reasons to Believe - 2: This Plan Is Achievable & Safe

- Based on an incremental approach
  - Provides continuity for customers
  - Lowers overall risk of failure for NCEP & NWS
- Based initially on familiar techniques already in use and taps the diversity of US weather enterprise
- Yet is positioned to take advantage of new technology and new modeling, ensemble, and data assimilation techniques

The Trade Space is ***Vast***

- From the 2010 White Paper – National Mesoscale Probabilistic Prediction: Status and the Way Forward by Eckel et. al. page 6

  "A challenging area of research is system optimization, that is, investigation into trade-offs in the design configuration (*model resolution, domain size, number of members, etc*.)."

- EMC seeks help & collaborators to accomplish this daunting amount of research

Many Questions Can & Will Be Asked, but We Can't Stand Still Until They're All Answered

- Why proceed at all when global systems are marching towards 'regional' resolutions?
- Why proceed at all if you can't afford to perform reforecasting?
- Agent Provocateur, Stan Benjamin, Asks
  - Could/should NCEP plan a merger of mesoscale and hurricane model efforts by expanding the domain of the HRRRE convective allowing scale runs southward and eastward to include all of the Caribbean and Leeward Islands? This would provide ARW and NMMB members to any HWRF ensemble.
  - Should NCEP consider including inline aerosol chemistry in all of its runs as the UK Met Office has recently decided to do? Possible to obtain direct benefit in radiation and indirect benefits through microphysics nucleation?