The UFS Short-Range Weather (SRW) Application: An Overview and Update

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UFS Short-Range Weather (SRW) Application

Components →	Atm	Land	Ocean	Sea Ice	Aerosol	Ionosphere	Storm Surge	Wave
Medium-Range Weather	●	●						●
S2S	●	●	●	●	●			
Hurricane	●	●	●					●
Short-Range Weather	●	●						
Space Weather	●	●				●		
Coastal							●	●
Air Quality	●	●			●			

Apps

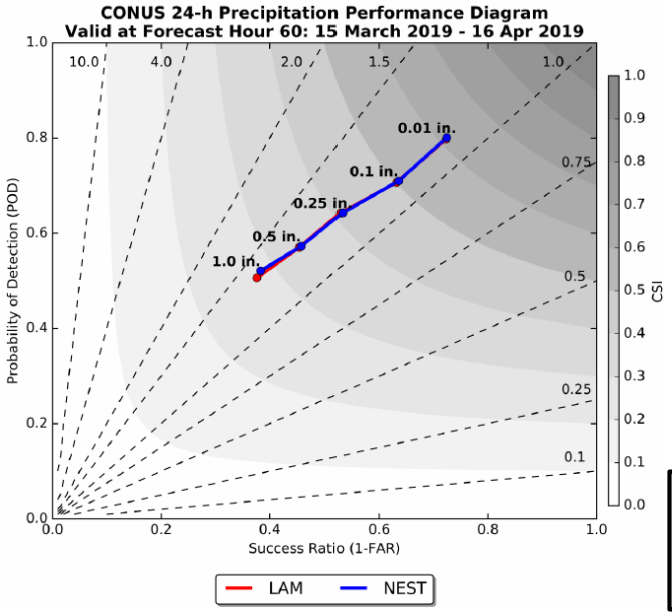
Encompasses Short-Range Weather/Convection Allowing Atmospheric behavior from less than an hour to several days

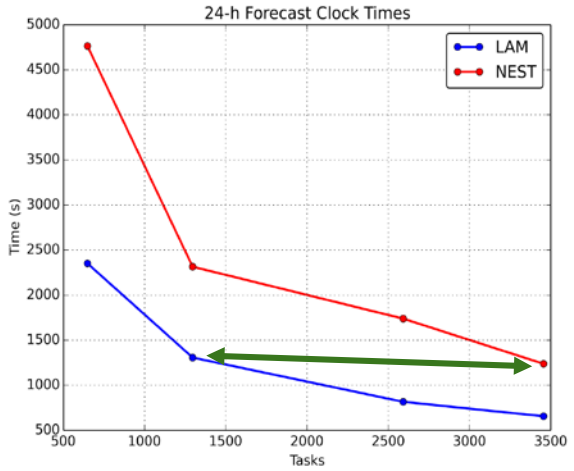
UFS Short-Range Weather (SRW) Application

- Model
  - Finite-Volume Cubed-Sphere Dynamical Core (FV3)
    - Limited Area Model capability
  - Common Community Physics Package
- End-to-end workflow
  - Pre-processing, model execution, post-processing
- Complete documentation and forum
- When?
  - **Public Release ~Nov. 2, 2020**

A Limited Area Model Capability

- FV3 originally provided regional refinement through Schmidt transformation and nesting
  - Required execution of a global domain
- New Limited Area Model capability (formerly called SAR)



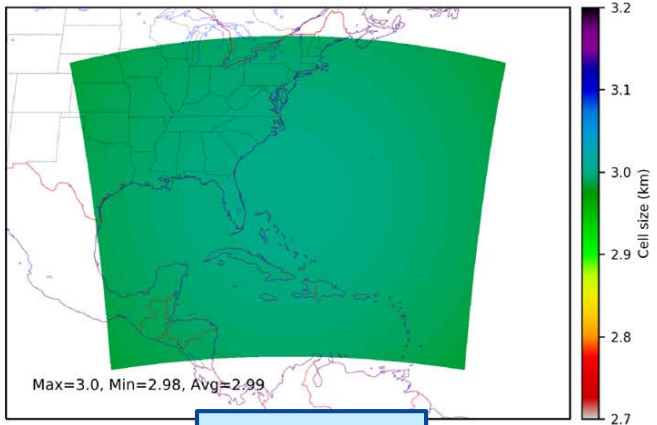


LAM uses < ½ the tasks that the nest needs for completing in the *same* amount of time

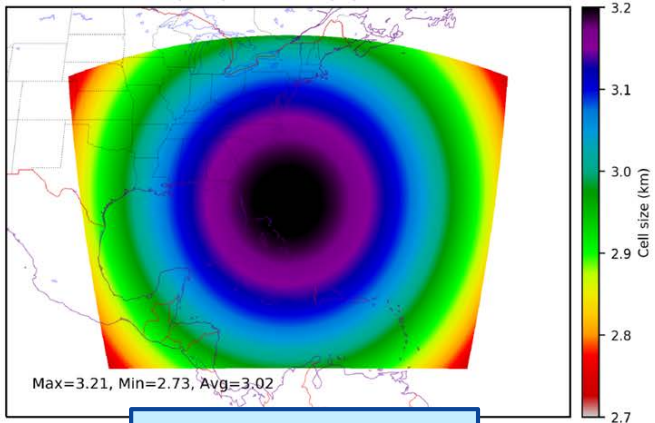
More info: Talk at 3:45 pm on Wednesday, *A Limited Area Modeling Capability for the Finite-Volume Cubed-Sphere (FV3) Dynamical Core* by Carley et al.

Domains and Resolutions

- 3-km, 13-km, and 25-km predefined Contiguous U.S (CONUS) domain
  - Preliminary tools for users to define their own domain will also be included in the release
- New, highly uniform Extended Schmidt Gnomonic grid



ESG grid



Gnomonic grid

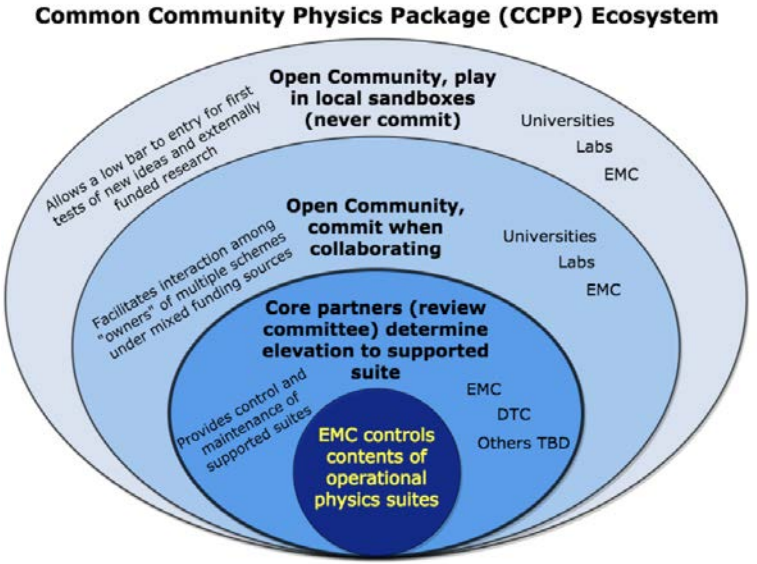
More info → 4pm on Wednesday, *The Extended Schmidt Gnomonic Grid for Regional Applications* by Purser et al.

Thanks to C-H Jeon for the figures

Physics Suites

Two Supported Configurations through CCPP

1. GFS suite
2. Rapid Refresh Forecast System *beta* suite
   - Microphysics → Thompson-Eidhammer
   - PBL/Surface → MYNN
   - Radiation (SW/LW) → RRTMG(P)
   - LSM → Noah-MP
   - No parameterized deep convection



The Workflow

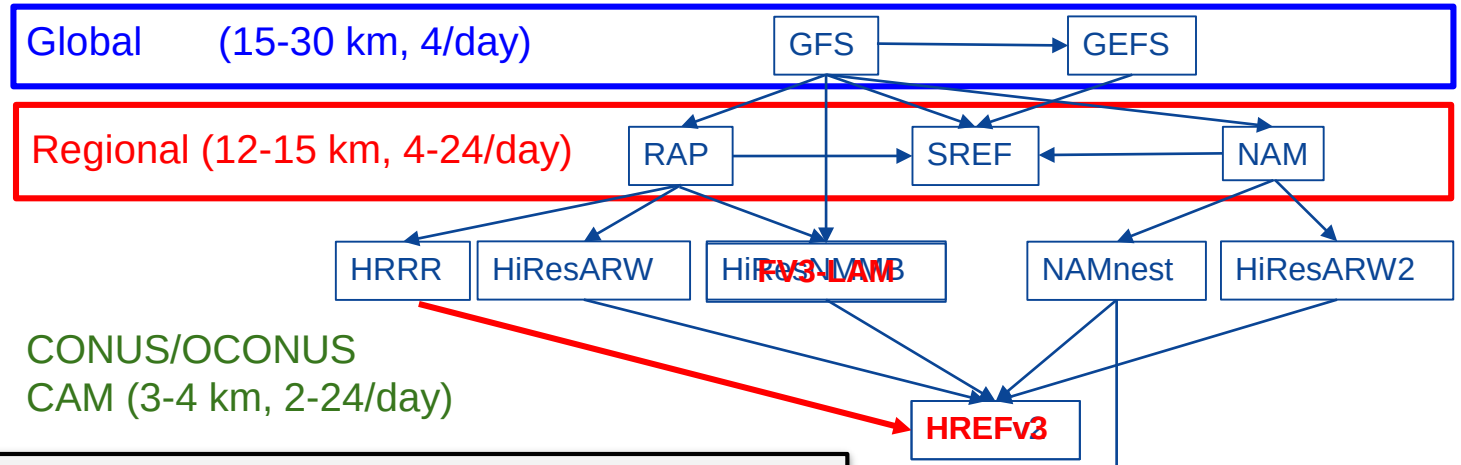
- Build and compile
  - Umbrella CMake-based build system for all of the components to run end-to-end regional workflow
- End-to-end execution with task management using Rocoto
  - Pre-processing
    - IC/LBCs from: GFS, HRRR, RAP, and NAM
  - Model execution
  - Post-processing with the Unified Post Processor
- Scripts for basic graphics with Python
- Platforms supported
  - NOAA R&D + operational HPC [fully preconfigured, out-of-the-box]
  - NCAR Cheyenne [fully preconfigured, out-of-the-box]
  - NSSL Odin [fully preconfigured, out-of-the-box] (*likely*)
  - TACC/NSF Stampede2 [fully preconfigured, out-of-the-box] (*likely*)
  - Your Linux machine or macOS system [limited testing/build only]

User Support

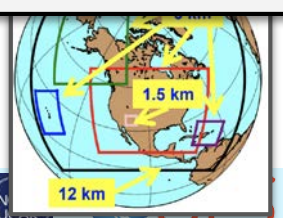
- Documentation
  - End-to-end
- Utility scripts
  - Graphics for verifying configuration, grids, inputs and outputs
- Forums
  - https://forums.ufscommunity.org/
  - Participation from experts
  - Build knowledge within the community

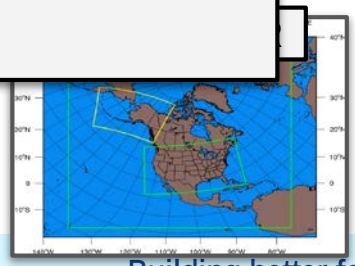
UFS SRW App and The NCEP Production Suite

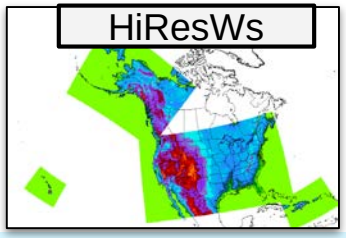
Current Snapshot of Regional Model Suite



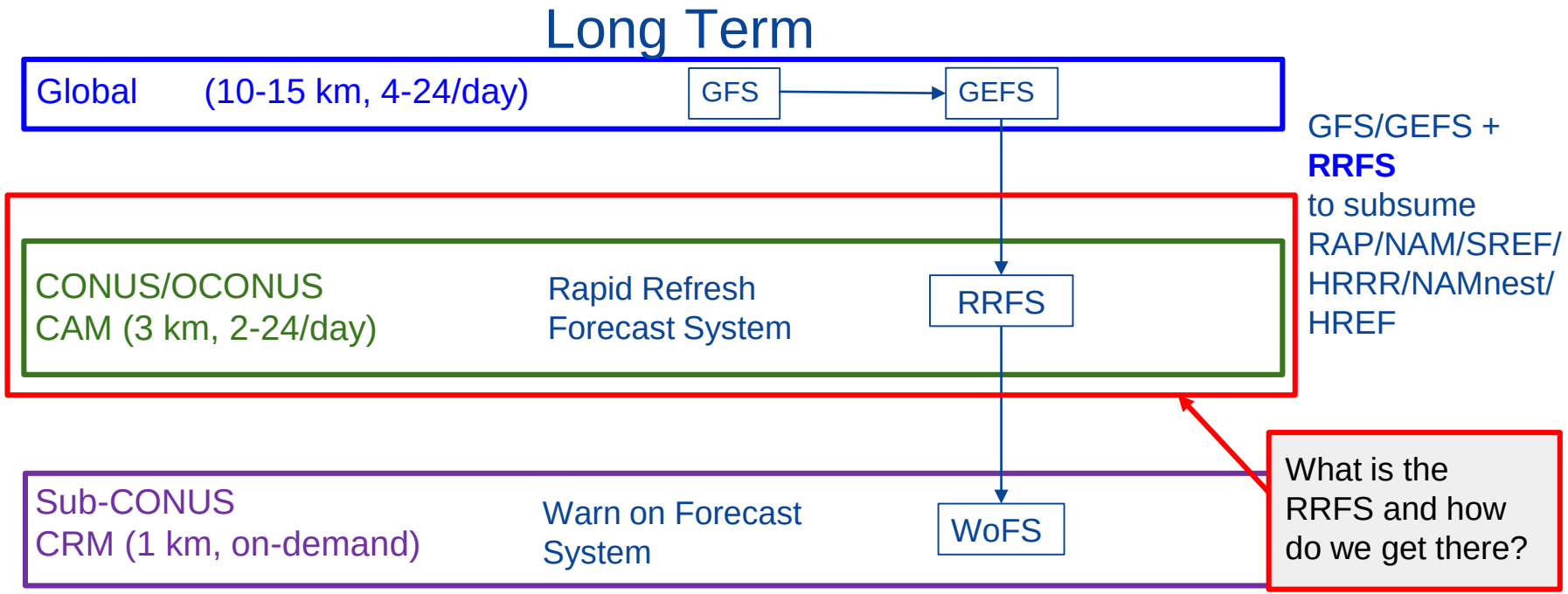
HREFv3: *Add* HRRR extensions and *replace* HiResW-NMMB with FV3-LAM (Limited Area Model) → This Winter





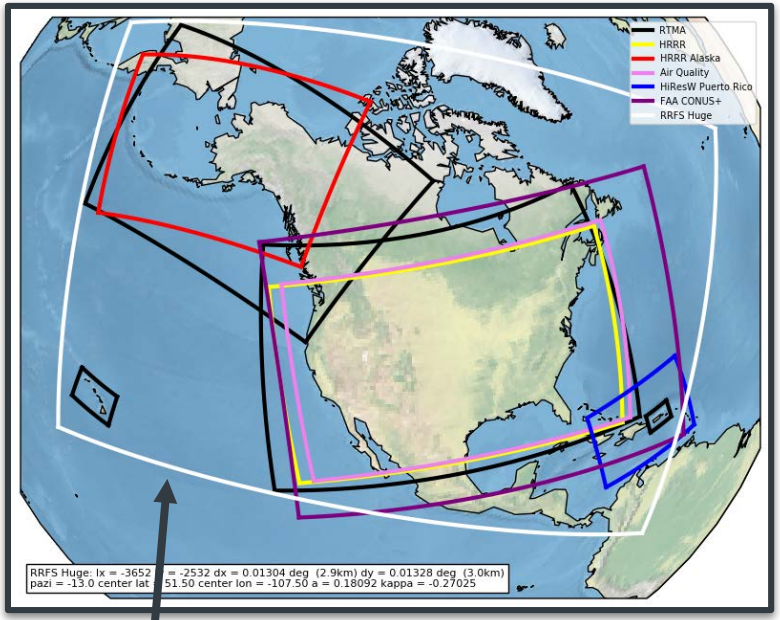


UFS: Simplification of Regional Model Production Suite



The Rapid Refresh Forecast System

- Rapid Refresh Forecast System (RRFS)
  - Based on the FV3-Limited Area Model (LAM)
  - Rapidly updated
  - Convection-allowing (~3 km)
  - Ensemble data assimilation (est. 30 or 40 members)
  - Ensemble forecasts (est. 10 members)
    - 18h+ hourly
    - 60h every 6 to 12 hours
- When? ~FY23



3 km RRFS domain (notional)

UFS SRW Application and the RRFS

UFS motto - *Building better forecasts through community partnerships*

FV3 Limited Area Model code sprint, Boulder, CO July 2019

- Community, collaborative efforts are fundamental to advancement of RRFS
- UFS SRW App → RRFS
- UFS SRW App release: ~Nov. 2, 2020
- RRFS implementation ~2023

****Special acknowledgement to the UFS-SRW App Team, who are a group of excellent scientists, software engineers, and colleagues!**