DEVELOPMENT OF MOVING NEST IN HAFS: PROGRESS AND ONGOING EFFORTS

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Collaborators:

AOML/HRD Modeling team

Lucas Harris and Weather and Climate Dynamics Group at GFDL

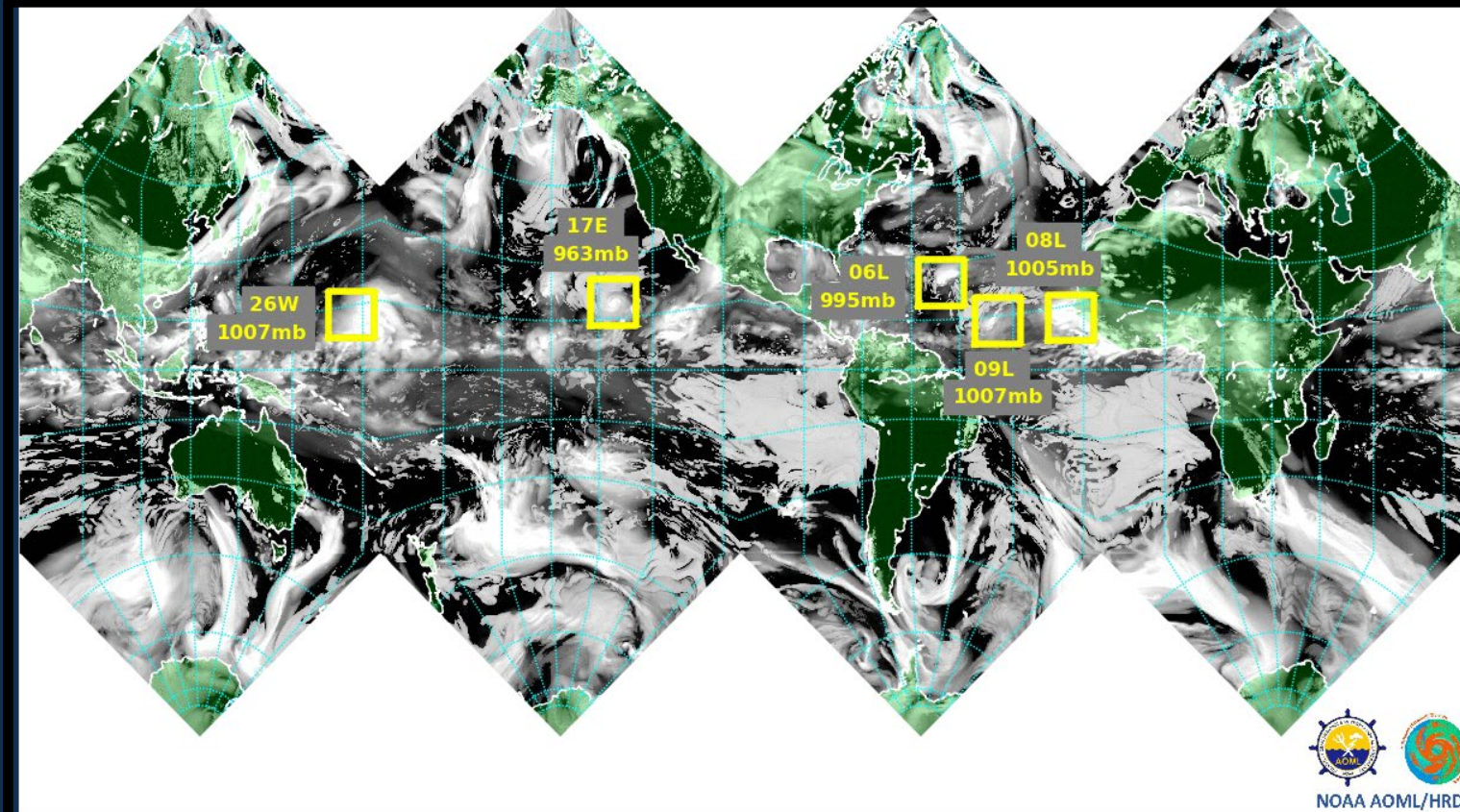Avichal Mehra and Hurricane Project Team at EMC

2020 HFIP Annual Meeting, Miami, FL, 17-19 November 2020

OUTLINE

- Goal of Moving Nest in HAFS

- Current Efforts and Accomplishments
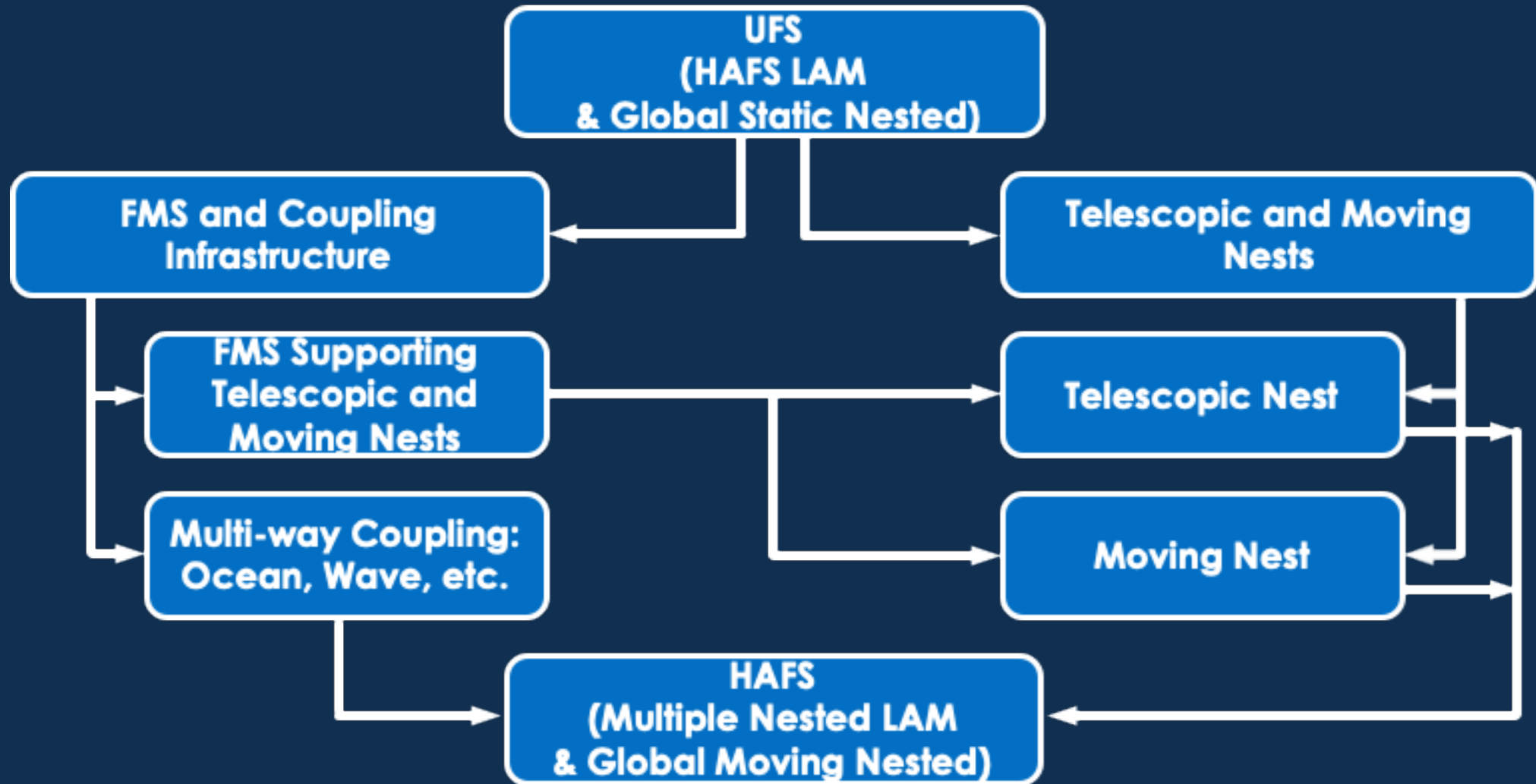
- Ongoing Work

The Ultimate HAFS

06L: Florence; 08L: Helene; 09L: Isaac; 17E: Olivia; 26W: Mangkhut

CURRENT EFFORTS AND ACCOMPLISHMENTS

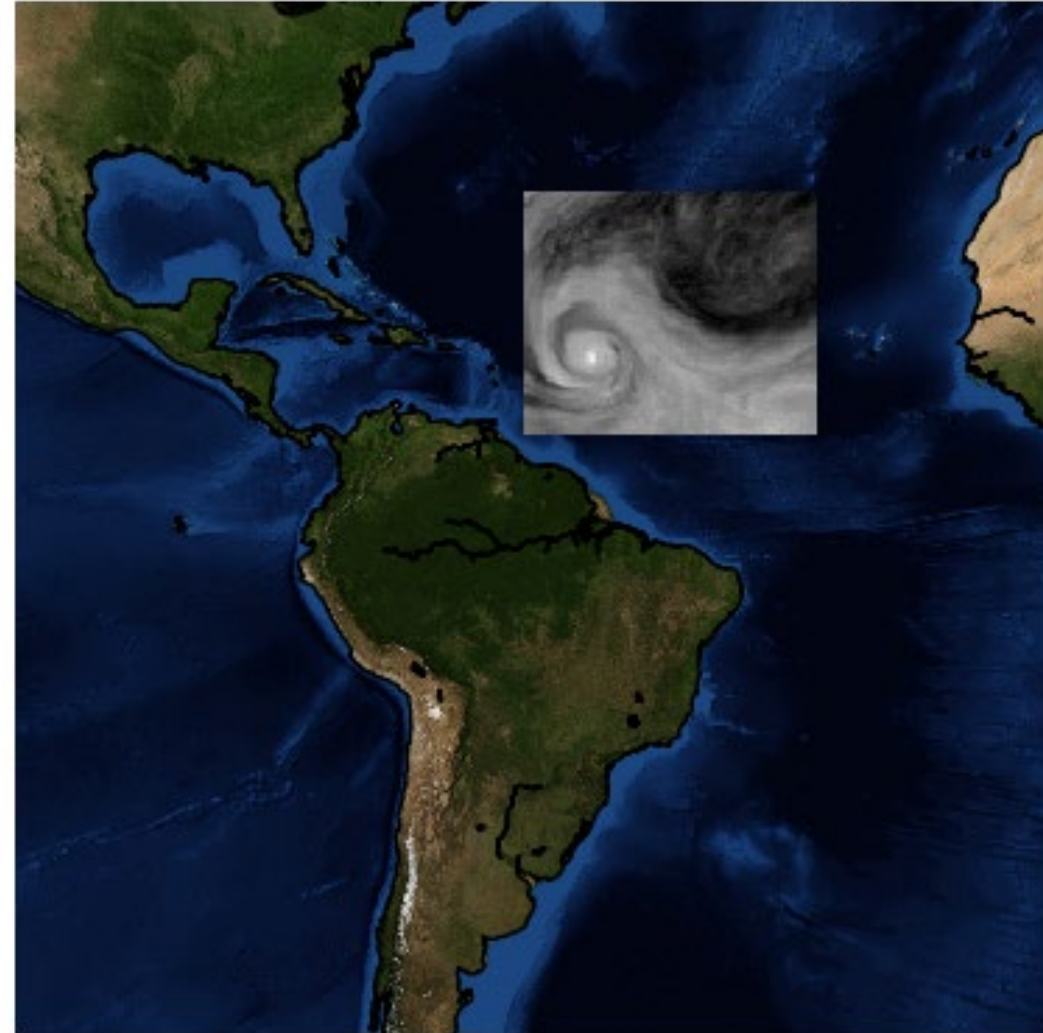# HAFS MOVING NEST DEVELOPMENT APPROACH

MOVING NEST IMPLEMENTATION

o Development of hurricane nests on global cubed sphere

o All prognostic variables moving

o Diagnostic variables recalculated

o Dynamics run for multiple timesteps

o Stable in 6 hour run

o Physics run over open ocean

FV3 Moving Nest WV at Timestep 000

MOVING NEST IMPLEMENTATION

Current Functionality

o Stable dynamics after nest move

o Multiple nest moves

o Dynamic core runs

o Physics routines run over ocean

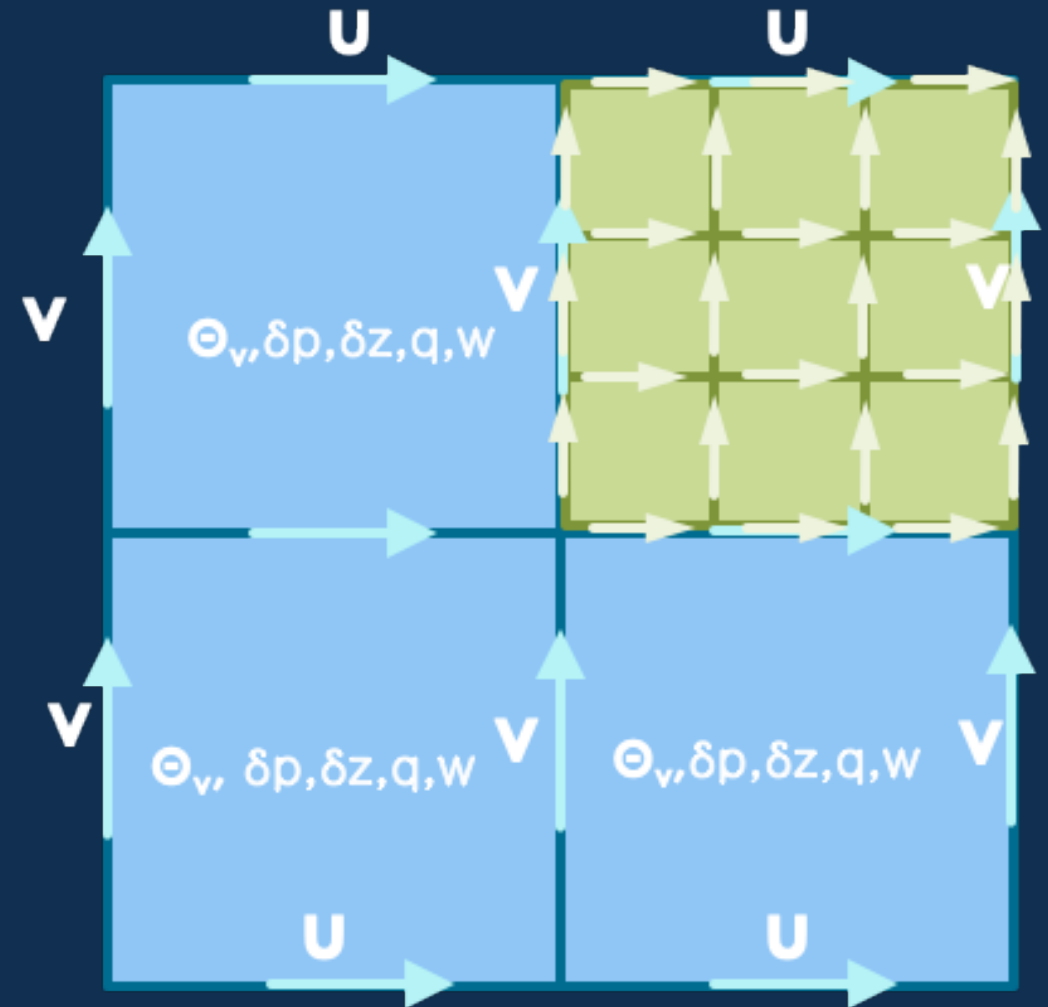o Grid/nest metadata moved

Configuration

o C96 with 3X nest refinement

o 4x4 PEs each parent cube face

o 5x4 PEs for nest

o 90s timesteps; 6 hour run

FV3 Moving Nest WV at Timestep 000

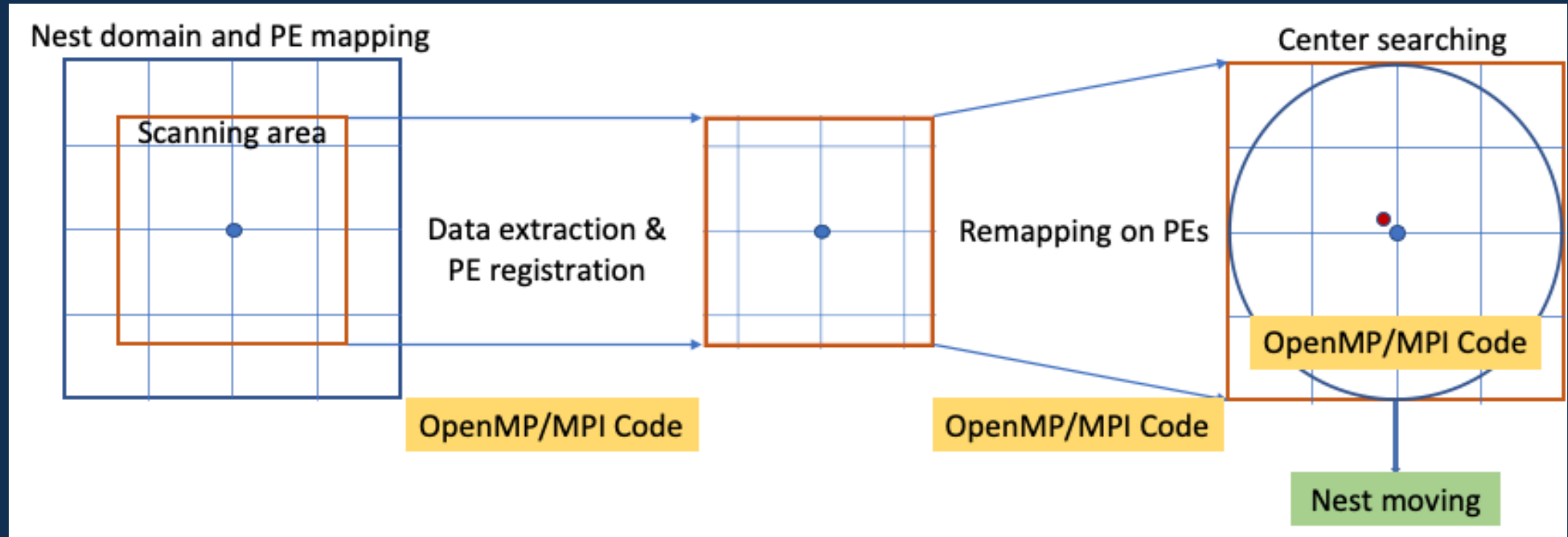Moving Nest Data at Timestep   0 Level 001 sphum
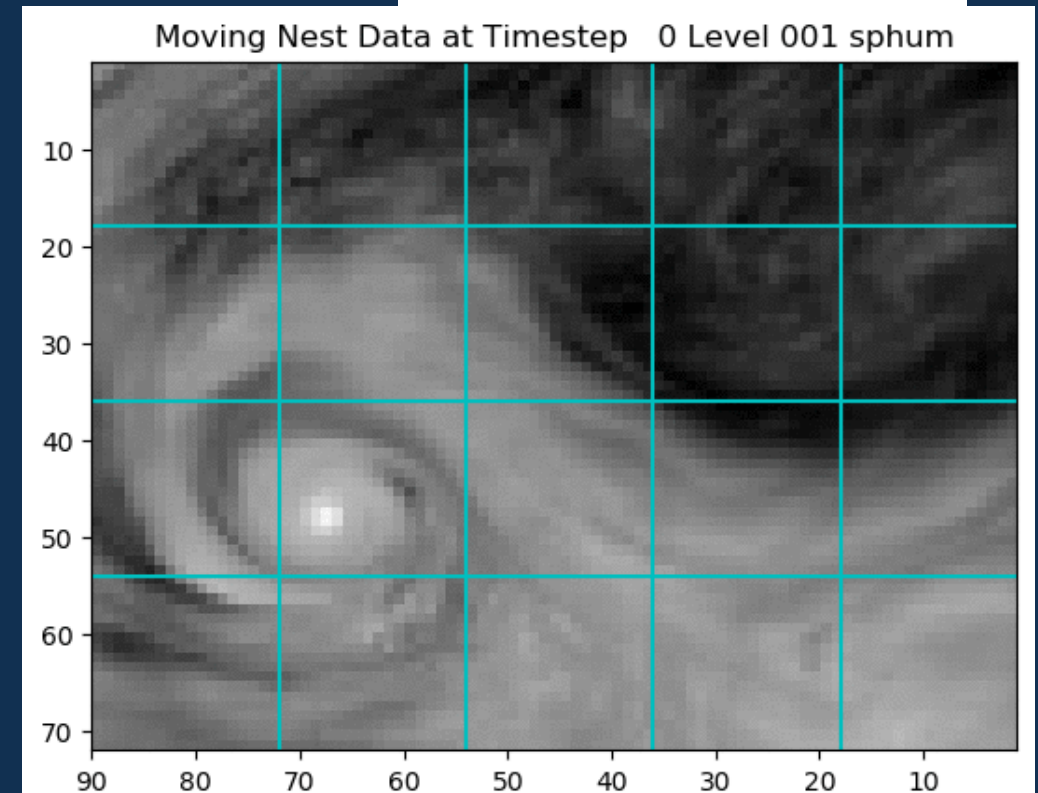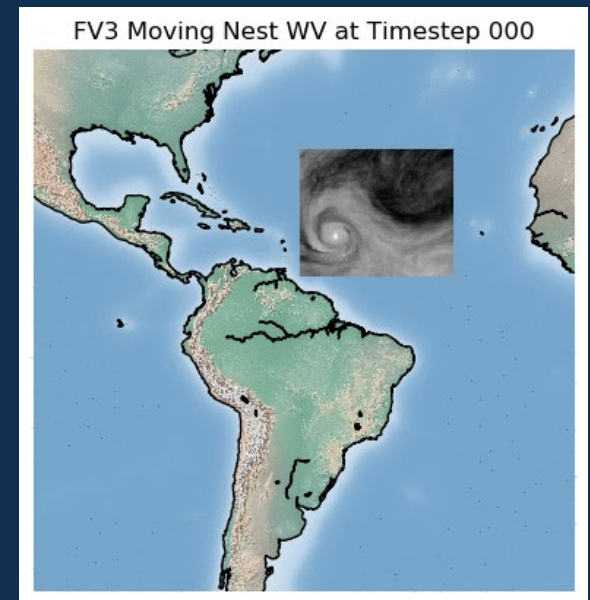
VARIABLE STAGGERING

o Most prognostic fields on A-grid

o Winds staggered on D-grid

- Interpolated winds
  - A-grid
  - C-grid for flux calculations

FV3 Prognostic Variable Staggering (Non-hydrostatic)

STORM TRACKING ALGORITHM

Offline code test & evaluation
- Stability, uniqueness, and completeness (completed)
- Parallel code reproducibility (ongoing)
- Scalability test (ongoing)

ONGOING DEVELOPMENT

MOVING NEST IMPLEMENTATION

Moving Nest

o   Feedback to parent grid

o   Merge w/new GFDL dycore code

o   Validate with idealized cases

o   Higher resolution tests
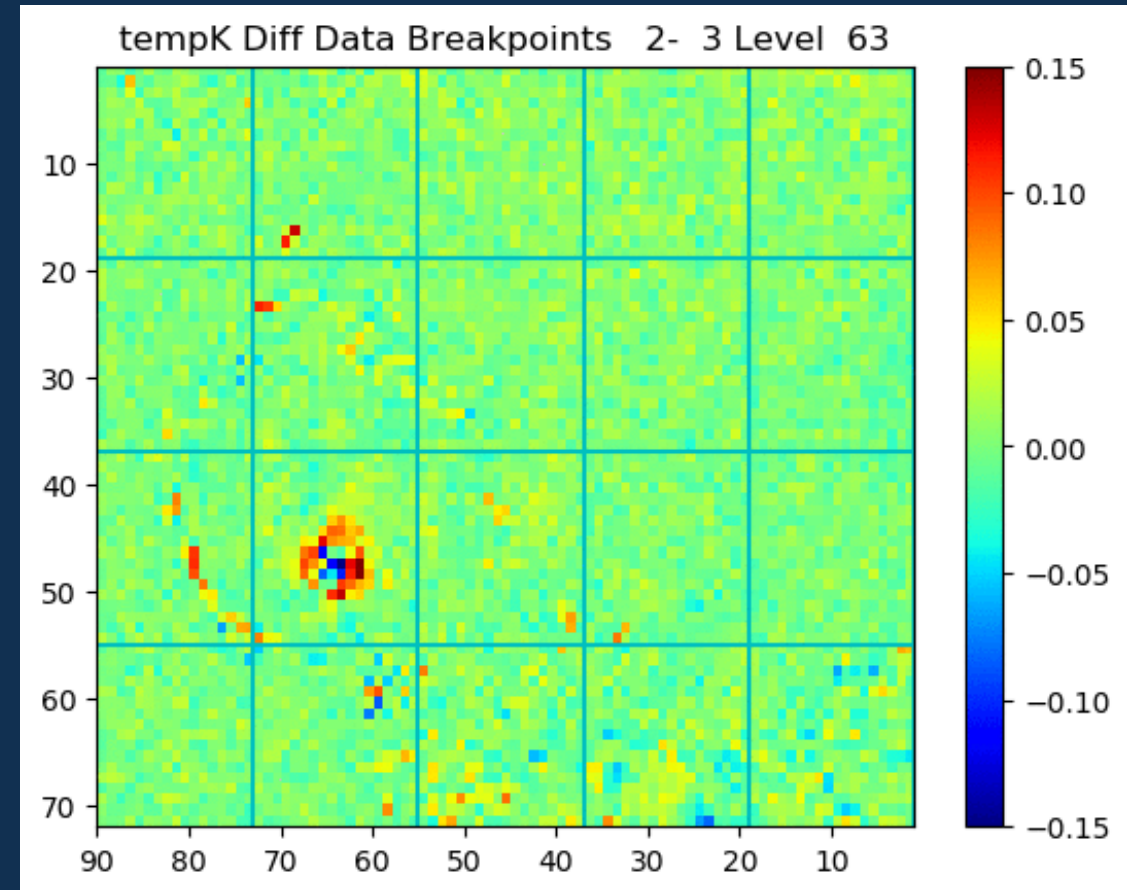
o   Regional configuration (LAM)

Tracking Algorithm

o   Online storm tracking T & E

Pre-processing

o   Workflow

o   High-resolution grid generation

o   High-resolution orography including land attributes

Post-processing

o   Workflow

o   Research and forecast products for moving nest(s)

SUMMARY

Moving nest capability in global and regional HAFS can provide the accuracy, timeliness, and efficiency of forecasts within available HPC resources

o Significant progress on moving nest implementation has been demonstrated

o Full functionality of moving nest, storm tracking, and workflow requires ongoing development, test, and evaluation in the coming months

ROADMAP TO HURRICANE ANALYSIS & FORECASTING SYSTEM (HAFS)