Strategic Implementation Plan (SIP) for a Community-based Unified Forecast System (UFS)

Dynamics and Nesting Working Group

Presented by

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Presented at Coordination Meeting

for UFS SIP

August 2, 2018; College Park, MD

Dynamics and Nesting WG *Membership*

Last Name	First Name	Org
Tallapragada	**Vijay****	**NCEP/EMC**
Harris	**Lucas****	**GFDL**
Gopalakrishnan	**Sundararaman****	**HRD/AOML**
Jablonowski	**Christiane****	**U. of Michigan**
Lin	Shian-Jiann ("SJ")	GFDL
Reinecki	Alex	NRL Monterey
Wang	Ning	ESRL/GSD
Black	**Tom@**	**NCEP/EMC**
Trahan	Samuel	NCEP/EMC
Jovic	Dusan	NCEP/EMC
Michalakes	John	UCAR (NRL)
Diaz	Steven	HRD/AOML
Bender	Morris	GFDL

Last Name	First Name	Org
Wicker	Lou	NSSL
Sun	Shan	ESRL/GSD
Govett	Mark	ESRL/GSD
Putnam	Bill	NASA/GMAO
Goldhaber	Steve	NCAR/CGD/CESM
Zhang	**Xuejin@**	**HRD/AOML**
Liu	Fei	NESII/ NEMS
Mehra	**Avichal@**	**NCEP/EMC**
Juang	**Henry@**	**NCEP/EMC**
Viereck	Rodney	NCEP/SWPC
Yudin	**Valery@**	**CIRES/CSU**
Doyle	Jim	NRL Monterey

- *Co-Chairs ***
- *Core WG Members @*

Dynamics and Nesting WG Project Milestone Accomplishments

- **SIP project accomplishments to date:**
  - **FV3 Dynamics:**
    - FV3GFS V1.0 is on target for Q2FY19; FV3GEFS V12 planned for Q2FY20
    - FV3+MOM6+CICE5 Coupled System Development is in progress
    - FV3 dynamic core integrated into CESM; shared with NASA/GSFC for GEOS
  - **Stand-Alone Regional FV3 (Project 1):**
    - EMC completed initial construction of FV3 regional capability in April 2018 and pushed it to NEMSfv3gfs master branch in July 2018.
    - EMC, GSD, and NSSL met to discuss setup/execution of FV3 in regional mode
    - GFDL has merged regional changes into their code
    - Running daily forecasts of 2 regional configurations of the FV3 model at EMC

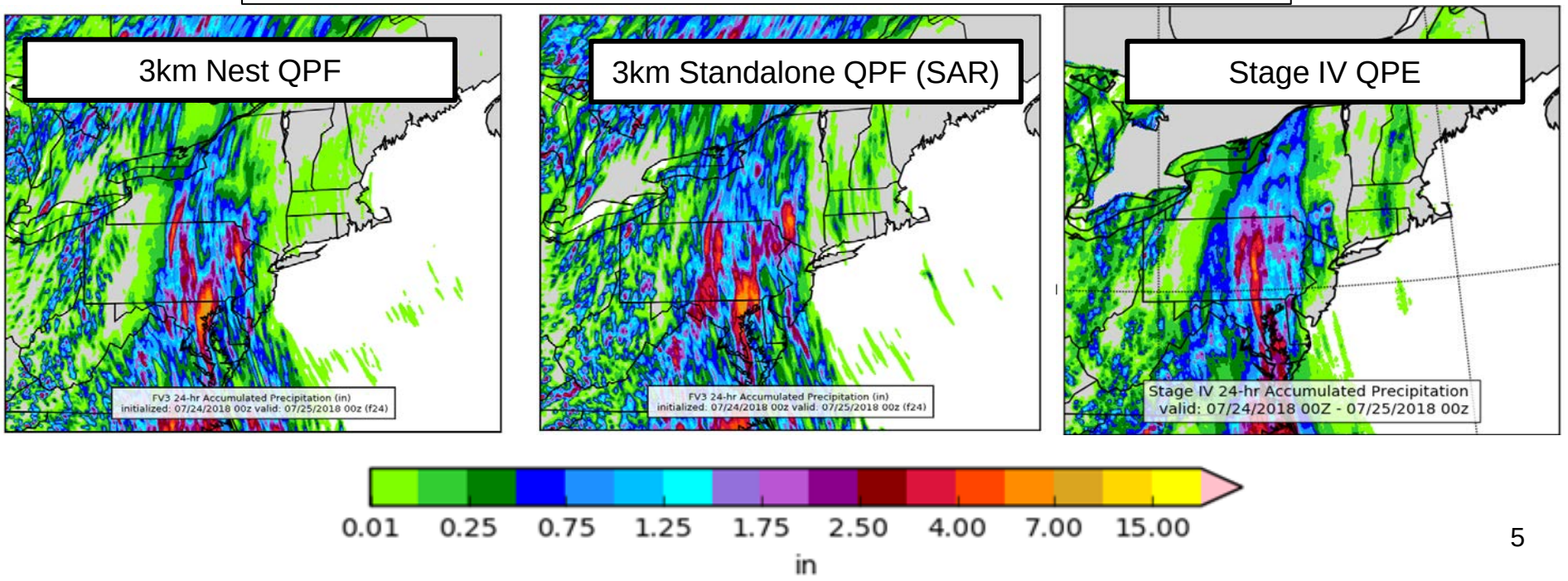
Dynamics and Nesting WG Project Milestone Accomplishments

- **SIP project accomplishments to date:**
  - **Hurricane Moving Nests (Project 2):**
    - Merged AOML and EMC Approaches from SIP V1; created a new project
    - Linked hurricane moving nest developmental efforts to Hurricane Analysis and Forecast System (HAFS) and Hurricane Supplemental Projects
    - Successfully synchronized the hurricane moving nest developmental branch with the current NEMS-FV3GFS with static nest and transitioned the hurricane developmental and evaluation tools into FV3GFS on JET
  - **DAD and WAM (Project 3):**
    - WAMFV3 IC for L150 from GFS IC (cold start)
    - Correct WAM lower atmosphere warm bias
    - Extend L64 FV3 to L150 FV3 with GFS physics

FV3 Real-Time CAM Testing

- Work is in progress running daily forecasts of 2 regional configurations of the FV3 model at EMC on WCOSS Cray: 3-km nest within the FV3GFS global domain compared to 3-km stand-alone regional configuration.
- The FV3 regional configurations will run once a day over the CONUS at 00Z out to 60 hours and use GFDL microphysics, initialized from the FV3GFS anl.
- A web page comparing the two runs is at www.emc.ncep.noaa.gov/mmb/bblake/fv3/

24 HR Totals covering 07/24 00Z - 07/25 00Z, 2018



Hurricane Moving Nest

At the end of the exploratory phase (described in the SIP document, 2017), scientists at AOML have worked with EMC and GFDL to develop a blueprint for nest motion technique

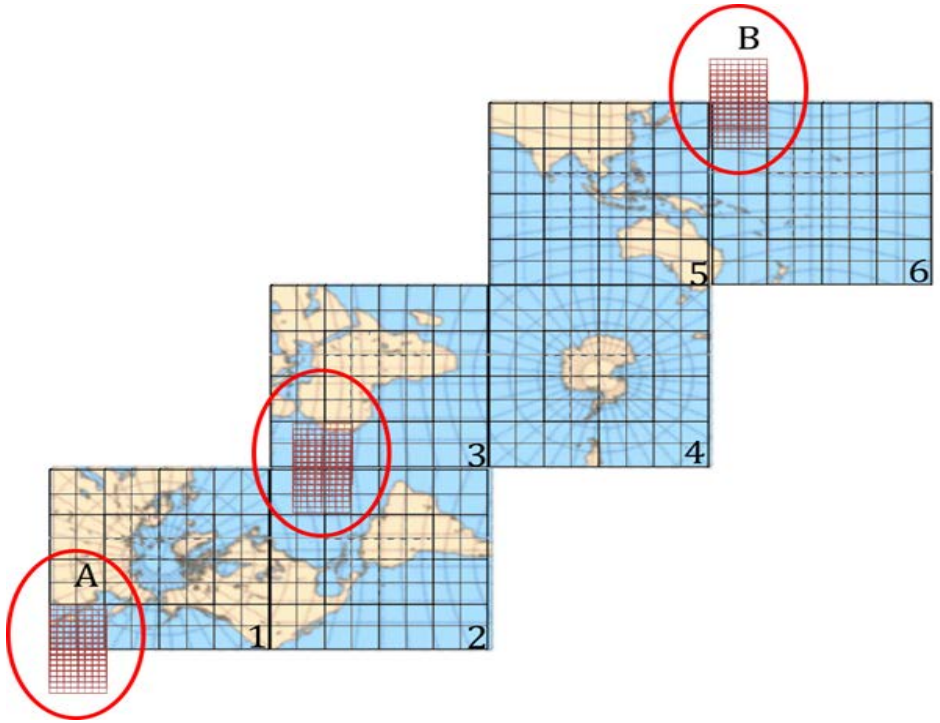
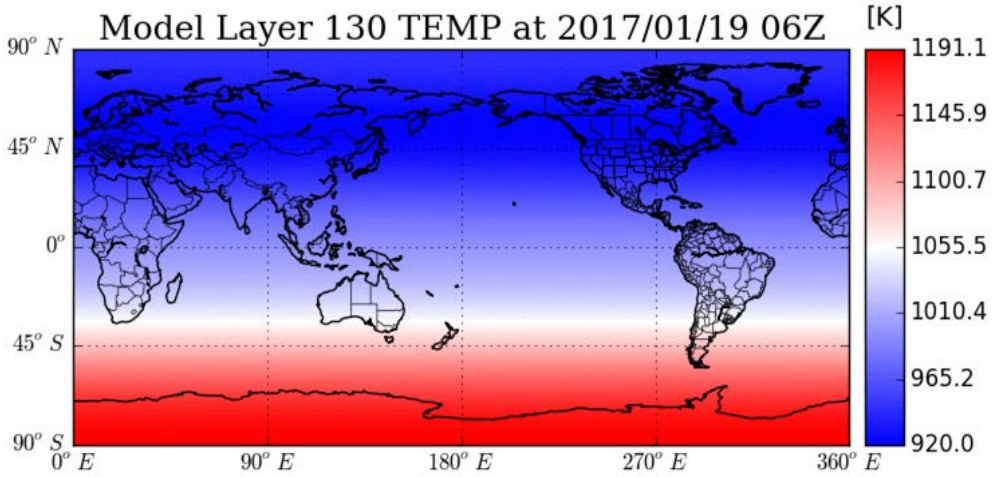
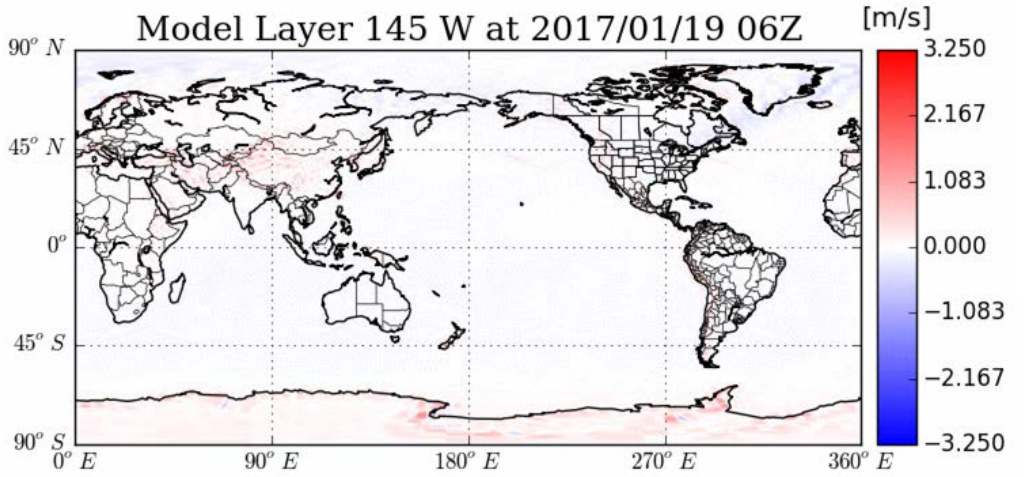


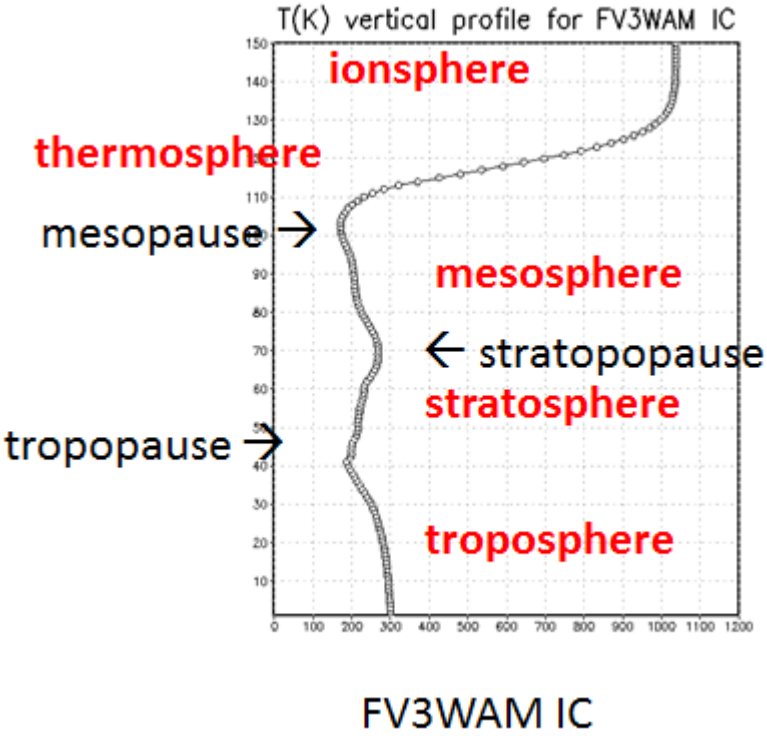
Figure 1: Cartoon from SIP presentations showing how high-resolution nests may be moved seamlessly within the 6 faces of the FV3 cube sphere grid. For example, nest in position A and B crosses the edge of face 1 and face 6. The nest will stay on one projection. The feedback and downscale at the leading edge of the moving nest will be on the interchangeable equivalent projections between face 1 and face 6 in this instance. The design will guarantee the physical equivalence in the finite volume framework on different cubic faces.

C96 FV3 L150 gfs-physics with Rayleigh damping: 5-day integration at layer 145



Diurnal cycle of tidal wave





FV3WAM IC

Dynamics and Nesting WG Team Coordination and Dependencies

- **General D&N WG Team Coordination and Dependencies:**
  - Bi-Weekly calls with WG core group members; occasional meetings with other WGs
- **FV3 Dynamics**
  - Multiple meetings each week led by EMC, attended by core partners and collaborators
  - Two public releases (FV3GFS v0 and FV3GFS v1) and two tutorials on FV3GFS
- **DAD and WAM**
  - Weekly FV3 DAD meetings led by EMC; 1 FTE funded by SWPC
- **Stand-Alone Regional FV3:**
  - Dependency on FMS modifications by GFDL to develop static and moving nests in regional/global FV3
  - HPC resource availability slowing down Regional FV3 development
  - CCPP enabled high-resolution physics needed for testing
  - Regional FV3 Workshop on early adopters of FV3 Regional Model is planned for February 2019
- **Moving Nests in FV3:**
  - Hurricane moving nest developments depend on availability of Hurricane Supplemental funding