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

Dynamics and Nesting Working Group

Presented by

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Presented at SIP Coordination Meeting

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Dynamics and Nesting WG
Membership

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Last Name	First Name	Org
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Sun	Shan	ESRL/GSD
Govett	Mark	ESRL/GSD
Putnam	Bill	NASA/GMAO
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- *Co-Chairs* **
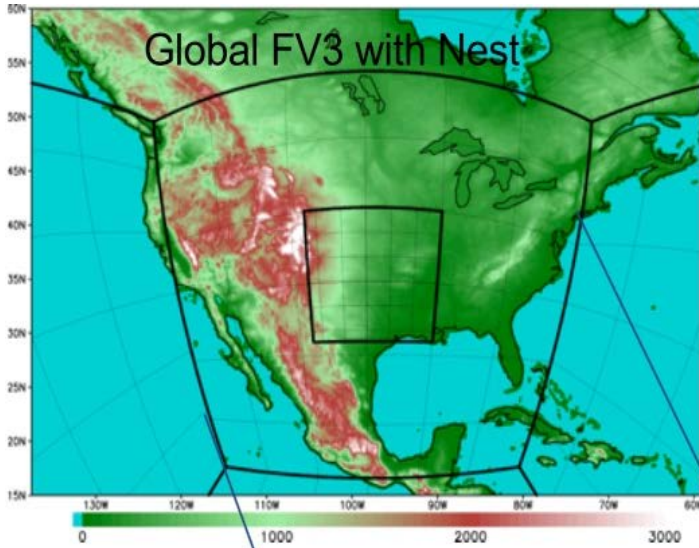- *Core WG Members* @

Dynamics and Nesting WG
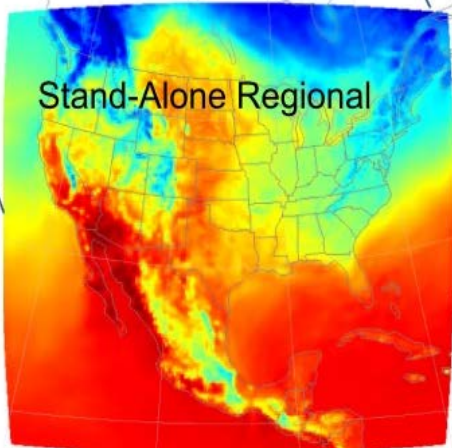# Project Milestone Accomplishments

- **SIP project accomplishments to date:**
  - **FV3 Dynamics:**
    - FV3GFS Beta implementation is on target for Q3FY18
    - FV3 dynamic core integrated into CESM; shared with NASA/GSFC for GEOS
  - **DAD and WAM:**
    - Added multi-gas module (R_i and Cp_i) and GSM WAM IDEA Physics to FV3; conducted adiabatic simulations with C48/C96; L64/L150 out to 15 days; Extended model top to 128L 80 km
  - **Stand-Alone Regional FV3:**
    - Developed pre-processing tools and IC/BC generation including vertical remapping of BC variables from Global domain to regional domain within FV3
  - **Moving Nests in FV3 (Free Floating Nests):**
    - Conducted tracer experiments to demonstrate use of ESMF tools for moving nests within an idealized model configuration using "coupling" approach
  - **Moving Nests in FV3 (Parent Oriented Nests):**
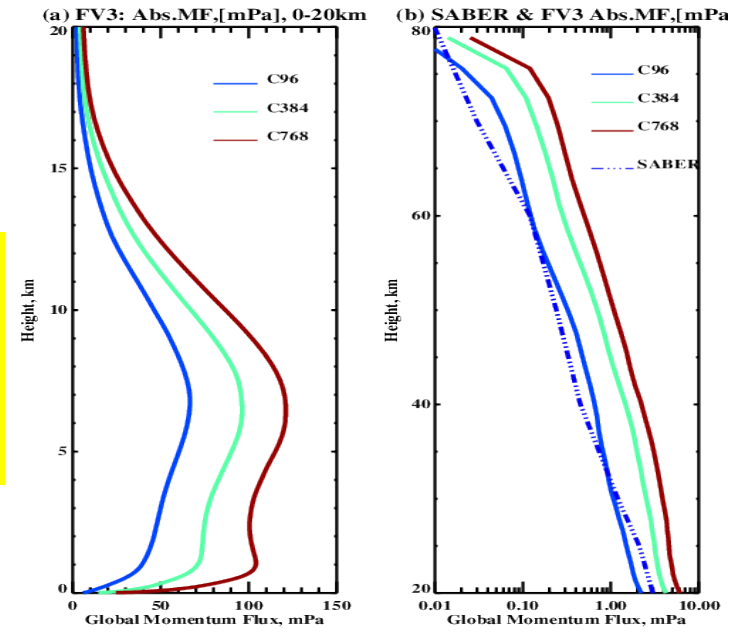   - Currently in planning stage, will commence once regional FV3 development matures

Dynamics and Nesting WG Accomplishments

Global FV3 with Nest

Stand-Alone Regional

SIP D&N
Regional FV3

(a) FV3: Abs.MF,[mPa], 0-20km
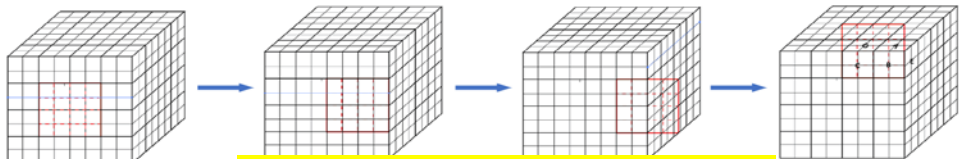
(b) SABER & FV3 Abs.MF,[mPa
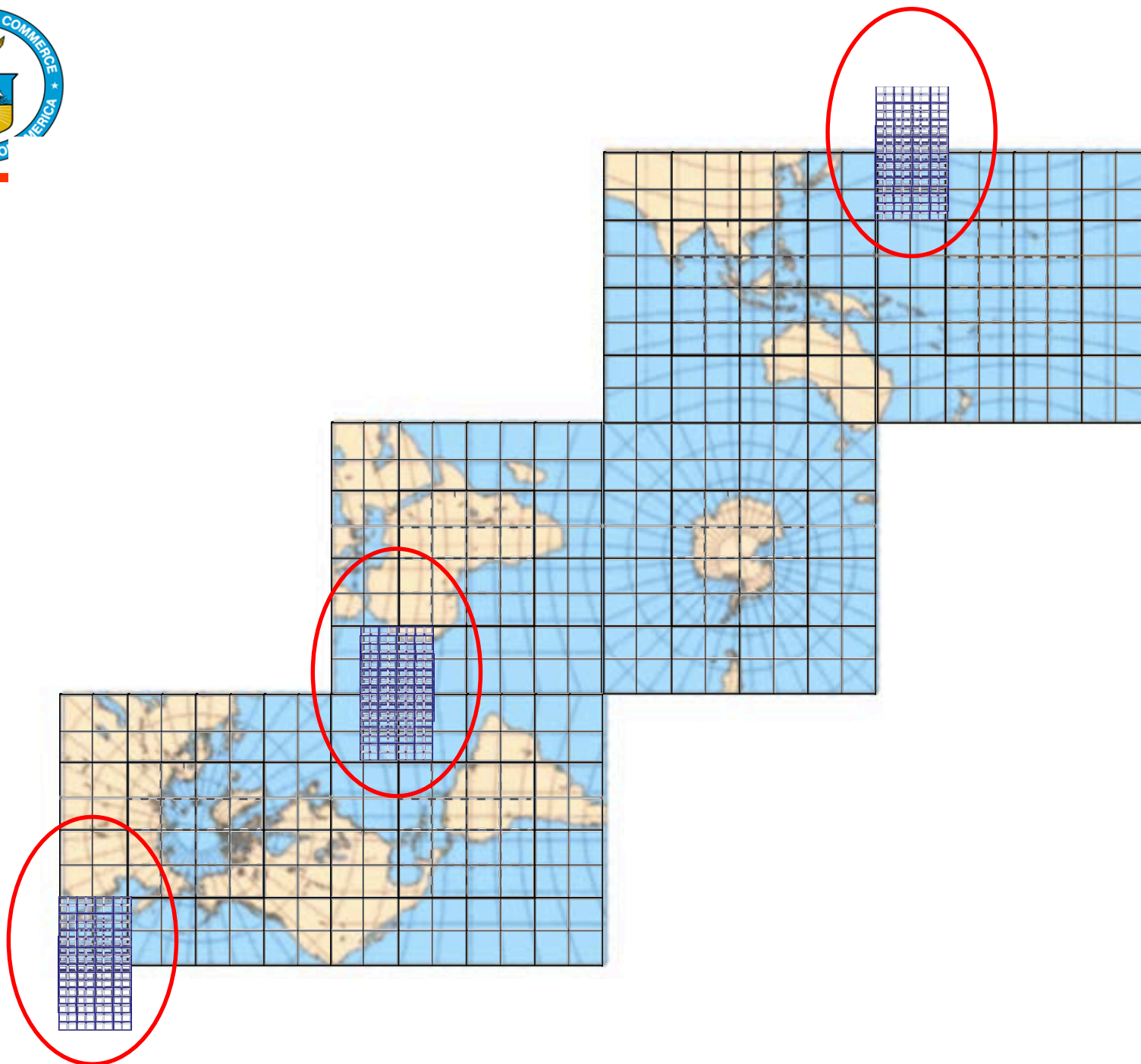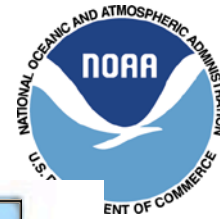
C96
C384
C768
SABER

SIP D&N
FV3 DAD
and
WAM

Absolute Momentum Fluxes of GWs resolved by FV3GFS-128L

Design of Moving Nest and Refinement

SIP D&N Moving Nests

Dynamics and Nesting WG
Project Issues

- **SIP project issues:**
  - **FV3 Dynamics:**
    - Code documentation; training on use of APIs; microphysics-dynamics interactions
  - **DAD and WAM:**
    - Progressing well, no issues at this time
  - **Stand-Alone Regional FV3:**
    - Infrastructure for nests spanning multiple tiles and especially those containing corners has been more difficult than initially expected
    - Time interpolation of BC data into FV3's integration considering vertical remapping frequency, acoustic timestep, and split tracer timesteps is now being added.
  - **Moving Nests in FV3 (Free Floating vs. Parent Oriented Nests):**
    - Moving nest requires shifting of data after every nest motion – need ESMF capabilities transition to FMS (or develop within FMS)
    - Parent oriented nesting within FV3 appears to be the potential pathway
    - EMC and AOML will combine the two projects into one using Hybrid NEMS/ESMF – FMS approach for developing parent oriented moving nests

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 interactions with other WG members
- **FV3 Dynamics**
  - Multiple meetings each week led by EMC, attended by core partners and collaborators
  - Dependencies include Documentation, Training & Support from GFDL
- **DAD and WAM**
  - Weekly FV3 DAD meetings led by EMC; 1 FTE funded by SWPC
  - Dependencies include IPD, DA, UPP, V&V, NEMS infrastructure
- **Stand-Alone Regional FV3:**
  - EMC is leading the development with some support from GFDL/FMS. GSD and NSSL will start contributing to the development.
  - Workshop on early adopters of FV3 Regional Model is planned for Sept. 2018
- **Moving Nests in FV3:**
  - Bi-Weekly D&N WG calls, quarterly program review.
  - AOML funded by NGGPS and OAR to develop moving nests in FV3 using two different approaches
  - For parent centric moving nest, alignment with FMS team becomes critical
  - A developer's workshop for FV3 detailing FMS and dynamics is recommended