

HAFS Coupling

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HSUP Activities (NCAR + GSD)

Q3FY20: Develop coupling capability for the regional stand-alone FV3.

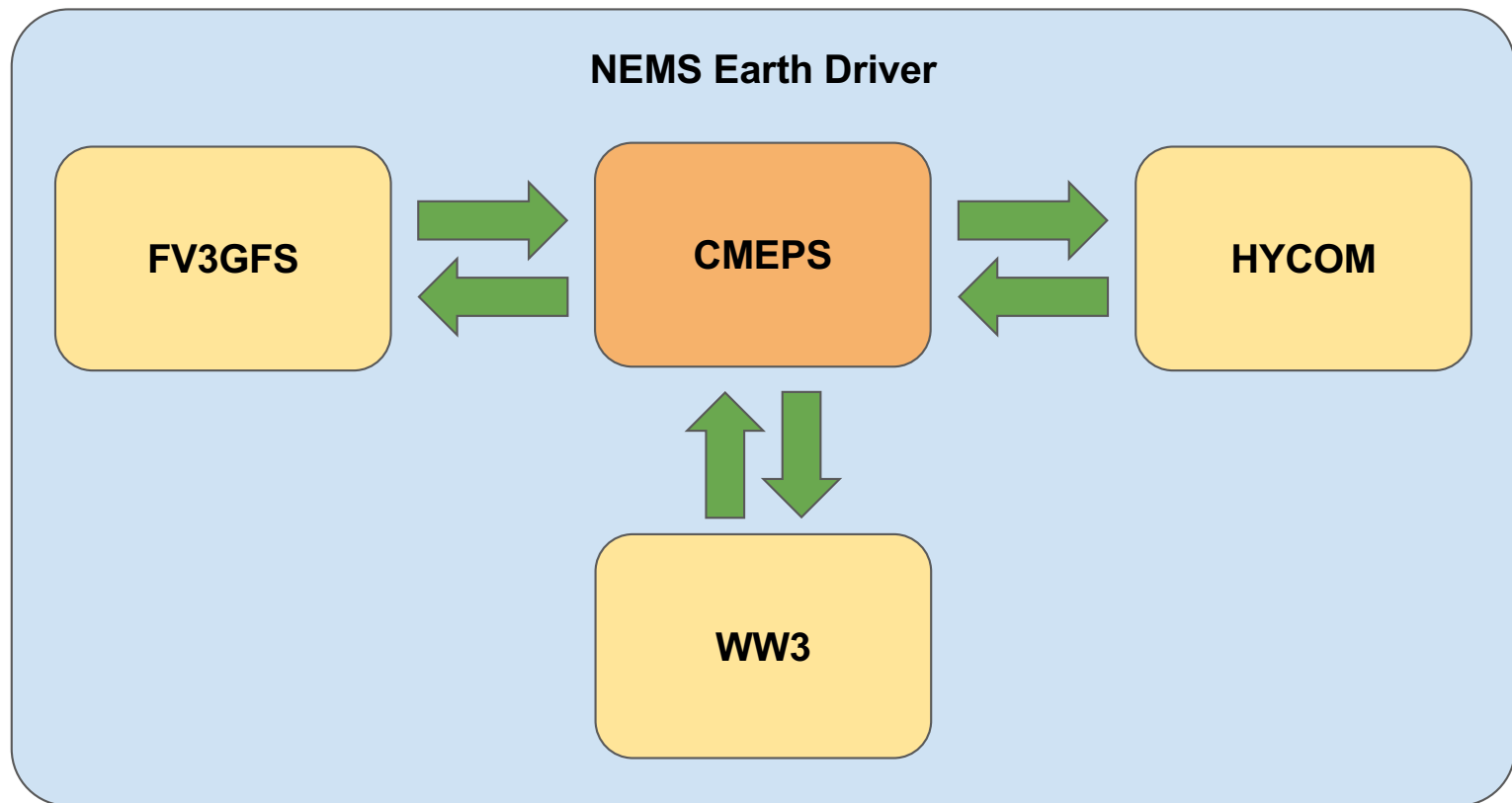
Q3FY20: FV3GFS static nest coupled to ocean (HYCOM) and possibly wave, using CMEPS.

Q2FY21: Performance analysis and optimizations to coupling as needed for v0.1 tests of HAFS.

Q3FY21: Changes needed for Hurricane Supplemental applications integrated into a common CMEPS code base, with updated CMEPS User's Guide.

Q2FY22: Extend coupling to waves and multiple nests in HAFS v0.1.

Final Architecture



Coupling Fields

FV3GFS → HYCOM

- wind stress
- 2m temp
- 2m mixing ratio
- mean sea level pressure
- precipitation
- latent heat
- sensible heat
- total net radiation fluxes
- net shortwave radiation flux

HYCOM → FV3GFS

- SST
- u, v surface currents

WW3 → HYCOM

- mean Stokes drift

HYCOM → WW3

- u, v currents for mixed layer depth

WW3 → FV3GFS

- modified roughness
- modified wind stress

FV3GFS → WW3

- wind stress

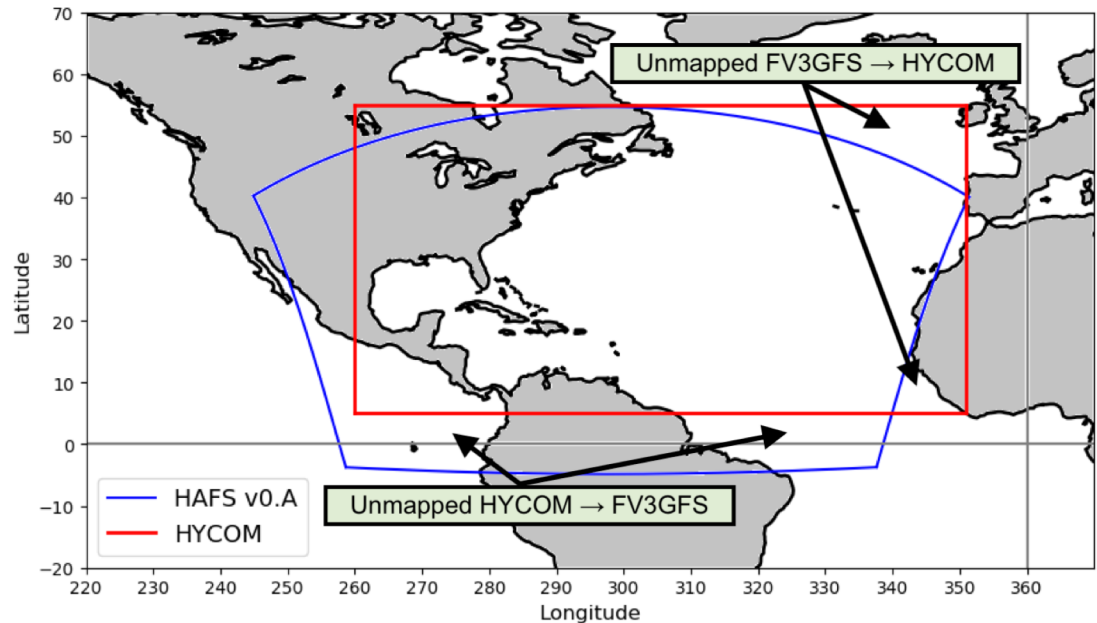
Unmapped Points

FV3GFS → HYCOM

- filled or computed from atm forcing files
- blended / smoothed

HYCOM → FV3GFS

- uses ATM IC SST (from GFS/GDAS)



Future Coupled HAFS: Potential Ocean Domain
A. Mehra (2019)

Run Sequence (after initialization)

Mediator Restart

@360
MED -> ATM
MED -> OCN
MED -> WAV
ATM
OCN
WAV
ATM -> MED
OCN -> MED
WAV -> MED
MED prep_atm
MED prep_ocn
MED prep_wav
@

Models Restart

@360
ATM -> MED
OCN -> MED
WAV -> MED
MED prep_atm
MED prep_ocn
MED prep_wav
MED -> ATM
MED -> OCN
MED -> WAV
ATM
OCN
WAV
@

ATM->OCN->WAV

@360
ATM
ATM -> MED
MED prep_ocn
MED -> OCN
OCN
OCN -> MED
MED prep_wav
MED -> WAV
WAV
WAV -> MED
MED prep_atm
MED -> ATM
@

Initial Work Plan

- Bring HYCOM into ufs-hafs-model repository
- Add HYCOM to build
- Validate HYCOM standalone regional in HAFS using forcing files
- Define coupled FV3GFS-HYCOM test case and validation target for development
- Update HYCOM NUOPC cap for HAFS ocean domain (including land/sea mask) and coupling fields
- Update FV3GFS NUOPC cap for regional coupling
- Bring CMEPS coupler into ufs-hafs-model repository and add to build
- Extend CMEPS to support blending in atmospheric data for unmapped HYCOM points outside the domain; leverage data components for this
- Set up and test two-way parent domain to parent domain coupling
- Set up and test two-way parent (OCN) to static nest (ATM) coupling, both with data components and active FV3GFS-HYCOM