



MRW/S2S -- Medium-Range Weather / Subseasonal to Seasonal

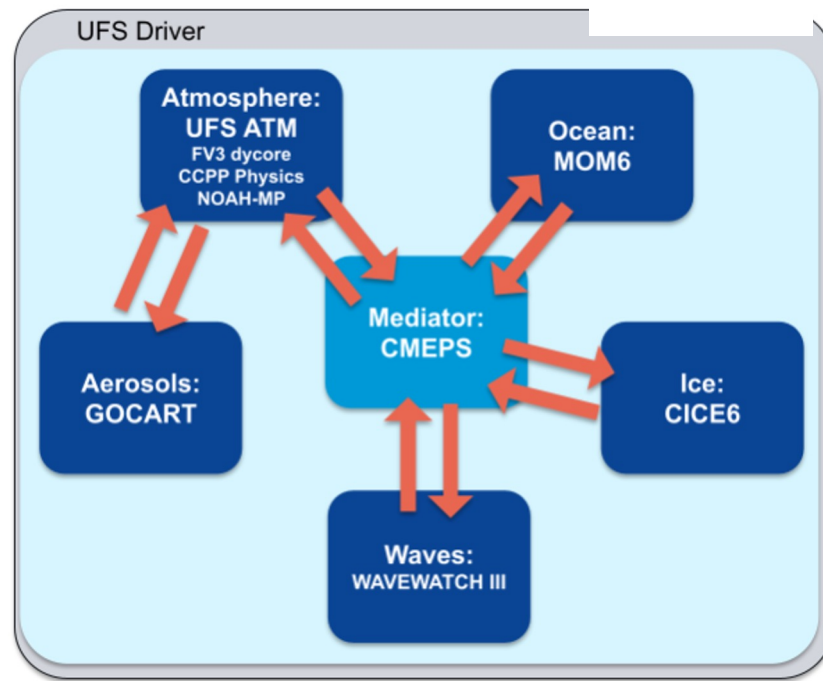
Three Operational Applications with Global Coupled Models:

- **Global Forecast System (GFSv17)**: deterministic medium-range forecast guidance for up to 2 weeks lead-time
- **Global Ensemble Forecast System (GEFSv13)**: probabilistic sub-seasonal forecast guidance up to 6 weeks
- **Seasonal Forecast System (SFSv1)**: probabilistic seasonal forecast guidance up to 1 year



Components

- 1) Finite Volume Cubed Sphere (FV3) dynamical core
- 2) Common Community Physics Package (CCPP)
- 3) Noah-Multi Parameterization Land Surface Model (Noah-MP LSM)
- 4) Modular Ocean Model (MOM),
- 5) Los Alamos Sea ice model (CICE)
- 6) WAVEWATCH III wave model (WW3)
- 7) Goddard Chemistry Aerosol Radiation and Transport (GOCART)
- 8) Community Mediator for Earth Prediction System (CMEPS)
- 9) Joint Effort for Data Assimilation Integration (JEDI)



**MRW/S2S Applications:
GFSv17, GEFSv13, SFSv1**

Global Forecast System v17 Upgrade

EMC Implementation Plan FY23-27

	<u>GFSv16</u> : Implementation Mar 2021	<u>GFSv17</u> : Target Implementation Mar 2026
Model	FV3/Noah WW3 (one-way coupling)	FV3/Noah_MP MOM6/CICE6/WW3 (two-way coupling)
Resolution	C786L127 (13km, 80km top)	C786L127 or C1152L127 (13km or 9km, 80km top)
Physics	GFDL MP, sa-TKE-EDMF, non-orographic GWDs	Thompson MP, CA, UGWD, tuning of convection, surface and PBL physics schemes MERRA-2 aerosol climatology
Deterministic Forecast (up to 16 days)	GSI, GLDAS 16 days from 00Z, 06Z, 12Z and 18Z	GSI, JEDI Ocean/Sea Ice, JEDI Snow 16 days from 00Z, 06Z, 12Z and 18Z
Evaluation	2 year retrospective and real-time runs MEG Group, Field evaluation focusing on hurricane, winter storms, severe weather, extreme temp and prec. Evaluation of impacts on downstream models	2 year retrospective and real-time runs MEG Group, Field evaluation focusing on hurricane, winter storms, severe weather, extreme temp and prec., sea ice, ocean Evaluation of impacts on downstream models



Global Ensemble Forecast System v13 Upgrade

EMC Implementation Plan FY23-27

	<u>GEFSv12</u> : Implementation Sep 2020	GEFSv13 : Target Implementation Mar 2026
Model	FV3/Noah WW3/GOCART (one-way coupling)	FV3/Noah_MP MOM6/CICE6/WW3/GOCART (two-way coupling)
Resolution	C384L64 (~25km, 55km top)	C384L127 (~25km, 80km top)
Physics	GFDL MP, Stochastic physics (SPPT, SKEB)	GFSv17 physics + Stochastic physics (SPPT, SKEB, ocean)
Ensemble Forecast - Realtime	GSI, GLDAS 16 days (06Z, 12Z and 18Z), 31 members 35 days (00Z), 31 members	GSI, JEDI Ocean/Sea Ice, JEDI Snow 16 days (06Z, 12Z and 18Z), 31 members 48 days (00Z), 31 members
Ensemble Forecast - 31-years Reforecast	GEFSv12 reanalysis (CFSR) in 2000-2019 (1989-1999) 16 days, every day, 5 members 35 days, every Wednesday, 11 members	Replay to ERA5 Atmos, ORAS5 Ocean/Sea Ice, Noah_MP spin up, snow DA in 1994-2024 16 days, every day, 6 members 48 days, every Monday, Thursday, 11 members
Evaluation	Weather/hurricane: 2.5 year retrospective experiments Subseasonal: 31-year reforecasts	Weather/hurricane/waves: 2.5 year retrospective experiments Subseasonal: 31-year reforecasts

Seasonal Forecast System upgrade

NOAA SFS Development Plan FY24-28

	<u>CFSv2</u> : Implementation March 2011	<u>SFSv1</u> : Target Implementation 2028?
Model	GSM/Noah MOM4/2-layer sea-ice model	FV3/Noah_MP MOM6/CICE6/WW3/GOCART (two-way coupling)
Resolution	T126L64 (~100km, 55km top), 0.5->0.25 ocean	C192L127 (~25km, 80km top) 0.25 degree ocean/ice
Physics	Zhou Carr MP, Convective GWD (Chun and Baik 1998)	GFSv17 physics + Stochastic physics (SPPT, SKEB, ocean)
Ensemble Forecast - Realtime	GDAS/GODAS 4-members 4x per day	Operational coupled GDAS, TBD
Ensemble Forecast - 40+ years Reforecast	CFSR1 1982-2011, 4-member lagged ensemble every 5th day.	UFS coupled reanalysis, 1981-2027? TBD
Evaluation	???	30-year hindcasts, May and Nov initializations. Mean biases, ENSO forecast skill, sea-ice prediction.