

UFS-Coastal Dev Team

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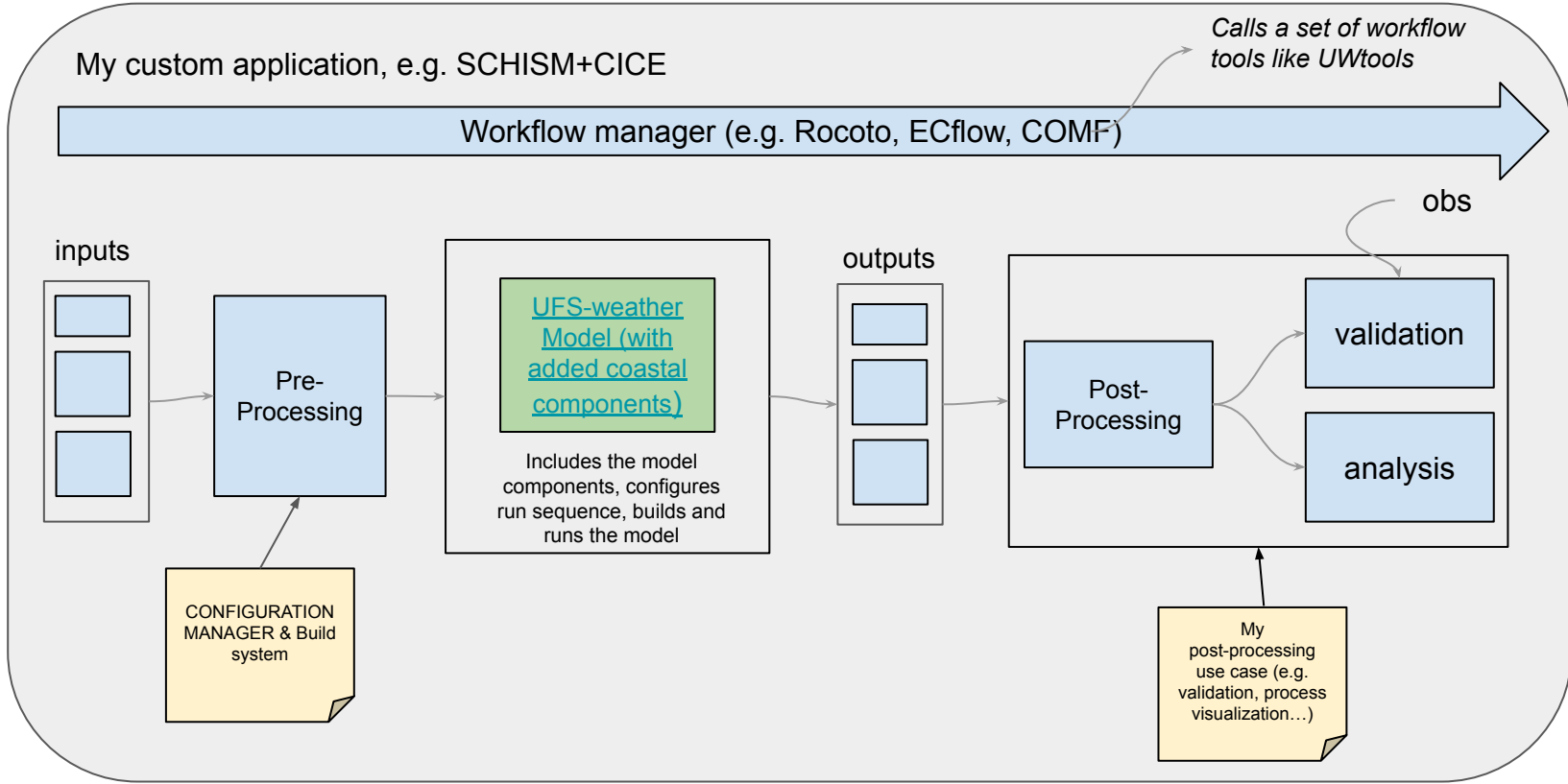
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April 22 2024

Agenda:

1. UFS Coastal code base (model) vs. application architecture & workflow
2. Relationship between **ufs-coastal** and **ufs-weather** (**ufs@noaa**)
3. GitHub presence: readme file, landing page, etc.

1. UFS Coastal application architecture & workflow



2. Relationship between UFS Coastal and UFS Weather-model (**Executable**)

There are two directions we could go in:

1. **Git submodule:** Submodule `ufs-weather-model` within `ufs-coastal-model` with the assumption that UFS Coastal will never merge to UFS Weather Model.
2. **Git fork:** Aim to merge with `ufs-weather-model` and include the coastal ocean model components into main UFS Weather Model with EPIC support.
 - a. At this point (for developing) UFS Coastal team advocates for this option, but needs EPIC support.

3. GitHub presence: landing page, readme file, documentation

- [Ufs-coastal-readme](#)
- Two repos:
 - [ufs-coastal-app](#)
 - [ufs-coastal](#)
- [Wiki](#)
- [App-level documentation](#)
- [GitHub Discussions/Forum](#)

The **ufs-coastal-app** repository is the umbrella for the UFS Coastal project currently under development by NOAA and NCAR, which supports coastal forecast requirements. The UFS Coastal Application is meant to constitute a workflow for coastal forecasting, wherein the coupling infrastructure is provided by the [ufs-coastal](#), which is currently in active development.

The [ufs-coastal](#) repository, forked from [ufs-weather-model](#), contains the model code and external links needed to build the Unified Forecast System (UFS) coastal model executable and associated *model components*, including the ROMS, FVCOM, ADCIRC and SCHISM plus WaveWatch III model components.

Here, *model component* means a forecast component (e.g. coastal ocean model) that represents a physical domain (e.g. Atlantic Ocean) or process (e.g. biogeochemistry). An [application](#) is a *workflow* that is designed for a particular forecasting purpose. A workflow consists of a set of model components and coupling infrastructure, provided by UFS Coastal Model, pre- and post-processing scripts, and is associated with a range of valid coupling configurations.

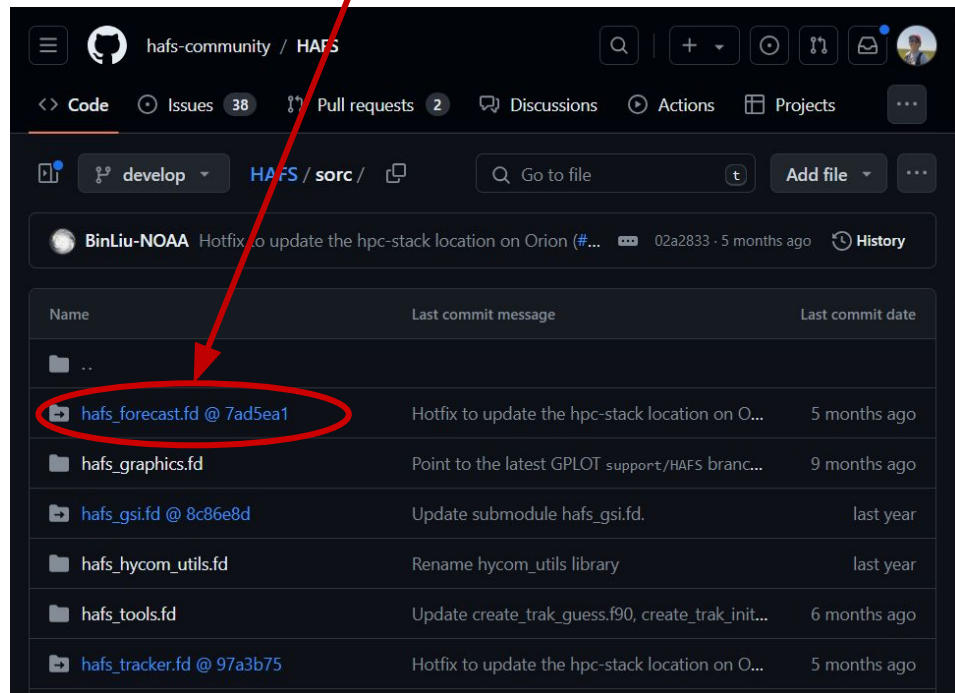
Extra slides

app-level

<https://github.com/hafs-community/HAFS>
<https://github.com/oceanmodeling/ufs-coastal-app>

forecast model submodule

UFS-Weather-model + added model component/s



hafs-community / HAFS

Code Issues 38 Pull requests 2 Discussions Actions Projects

develop HAFS / src / Go to file Add file

BinLiu-NOAA Hotfix to update the hpc-stack location on Orion (#... 02a2833 · 5 months ago History

| Name | Last commit message | Last commit date |
|-----------------------------------|---|------------------|
| .. | | |
| hafs_forecast.fd @ 7ad5ea1 | Hotfix to update the hpc-stack location on O... | 5 months ago |
| hafs_graphics.fd | Point to the latest GPLOTT support/HAFS branc... | 9 months ago |
| hafs_gsi.fd @ 8c86e8d | Update submodule hafs_gsi.fd. | last year |
| hafs_hycom_utils.fd | Rename hycom_utils library | last year |
| hafs_tools.fd | Update create_trak_guess.f90, create_trak_init... | 6 months ago |
| hafs_tracker.fd @ 97a3b75 | Hotfix to update the hpc-stack location on O... | 5 months ago |

2. Relationship between UFS Coastal and UFS Weather-model

Pros and cons of using forked branch:

| Pros | Cons |
|--|--------------------------------------|
| Enables collaboration and contribution | increase burden on network |
| Allows for easy experimentation and testing | merge conflicts more prevalent |
| Supports parallel development in an organized manner | less centralized development process |
| Allows for easier maintenance of old or inactive branches | security vulnerabilities in forks |
| Permits independent development and testing | risk of fork-induced merge mistakes |
| Allows for easily taking over development | missing or outdated dependencies |
| Increases the probability of contributions from outside the organization | spiky scaling for the infrastructure |

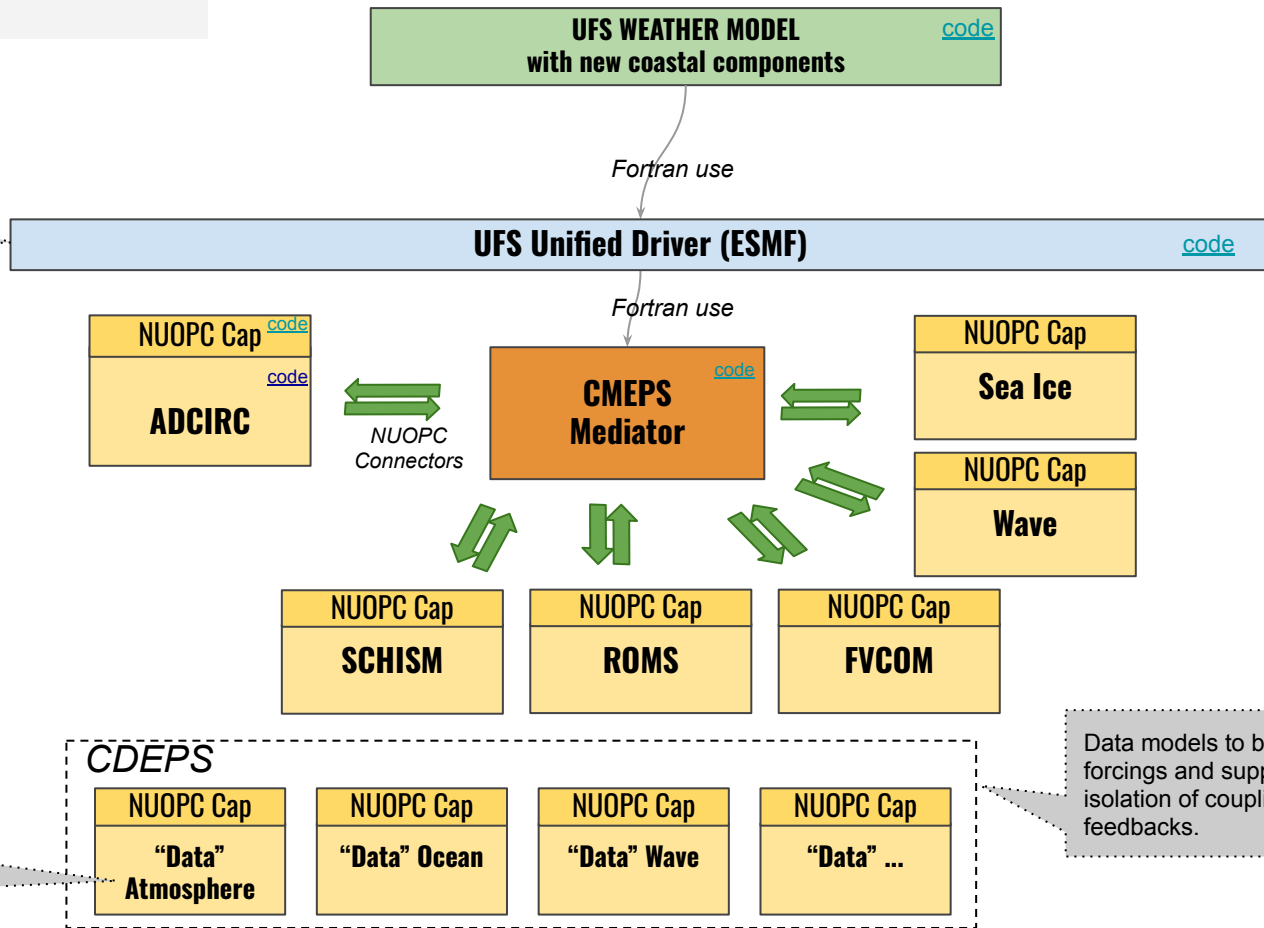
Source: [UFS-Coastal-JongKim-2024](#)
presentation/training from Jong Kim with EPIC

[Additional resource from EPIC on use of Git Submodules in UFS applications](#)

Diagram Modified from:

UFS System Architecture: Sub-system: **Forecast Models**
Contributors: Rocky Dunlap, Rahul Mahajan, Dom Heinzeller,
Mike Barlage, Ben Cash

Actual model components included in any given application and run sequence are configurable.



"Data" component can substitute for the above active components to bring in forcings from file.

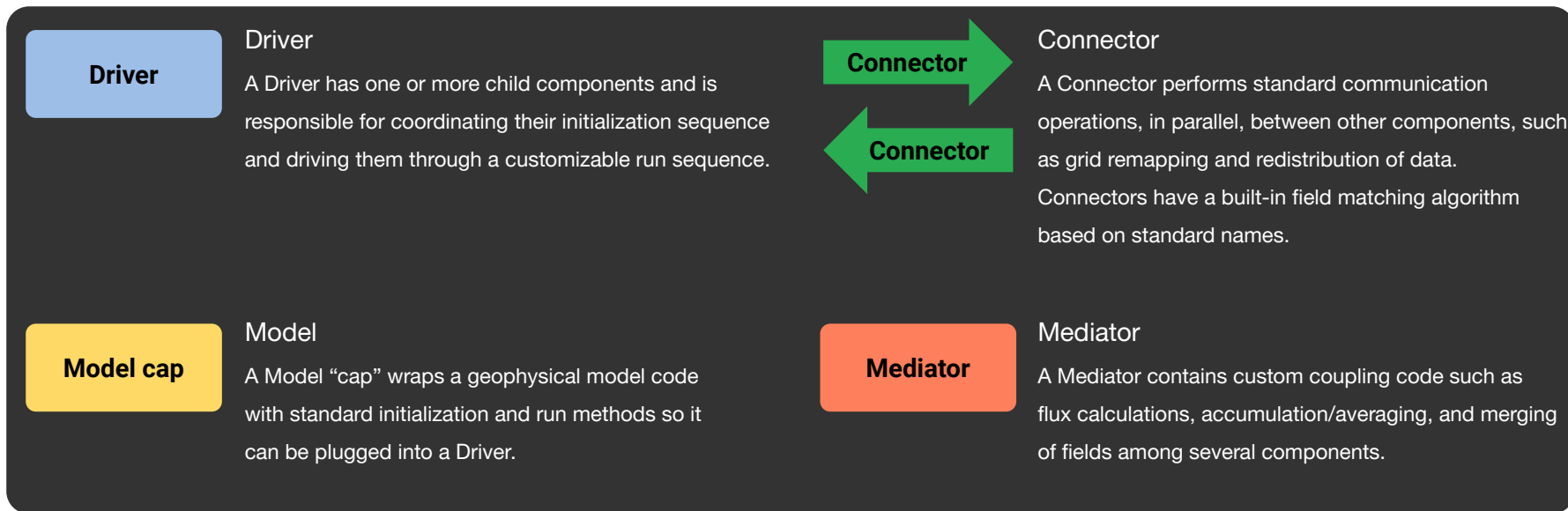
Data models to bring in forcings and support isolation of coupling feedbacks.

UFS Essentials: *Introduction to NUOPC Layer*

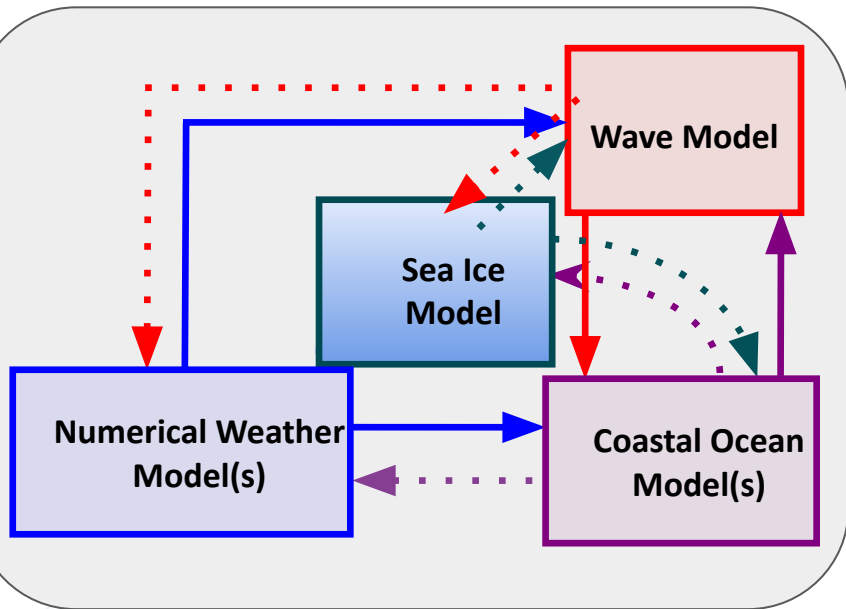
The **N**ational **U**nified **O**perational **P**rediction **C**apability (NUOPC) is a software layer on top of ESMF that provides “out of the box” capabilities for constructing coupled models

NUOPC generic components

A NUOPC component is an ESMF component with specified rules of behavior depending on the component’s role in the coupled system



Spack-Stack Based System



Status

- Implemented*
- In development/testing or future capability*

Preprocessing

Control/Configuration Files

Boundary & Initial Conditions

CURRENT IMPLEMENTATION: user is responsible to configure each model component present in the application

- Navigation support
- Disaster mitigation
- Water Quality
- Sediment Transport

Product
End
User

- *NUOPC/ESMF based Coupled Models*
- *1-way/2-way Model Coupling*
- *Development in Collaboration Between Federal and Non-Federal Partners*

The components highlighted in red are tested and functional

| Atmosphere | Ocean | Wave |
|---|--|--|
| FV3⁹ <i>(implemented)</i> | ADCIRC² <i>(implemented)</i> | WW3³ <i>(implemented)</i> |
| PAHM¹ <i>(implemented)</i> | SCHISM^{4,5} <i>(implemented)</i> | Other |
| Data/Mediator | FVCOM⁶ <i>(implemented)</i> | CICE⁹ <i>(implemented)</i> |
| CDEPS⁹ <i>(implemented)</i> | ROMS⁸ <i>(implemented)</i> | |
| CMEPS⁹ <i>(implemented)</i> | | |

1 NOAA/CSDL/CMMB

2 U. of Notre Dame

3 NOAA/NCEP/EMC

4 Virginia Institute of Marine Science

5 Helmholtz-Zentrum Hereon

6 University of Massachusetts – Dartmouth

7 Cooperative Institute for Great Lakes Research

8 RuTGERS Department of Marine & Coastal Sciences

9 UFS Weather Model