Stream 1 – Hurricane model advancements

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Stream 1- HURRICANE SYSTEM ADVANCEMENTS

- **1A Data assimilation/Vortex Initialization – critical effort**

- Compare & evaluate various DA techniques for initialization of the hurricane core (and environment?) Candidates are: EnKF, 4-D var, a hybrid.

- Evaluate in-situ and remote based observations with specific emphasis on hurricane scale initialization. Observations should include aircraft, UAV's (LL) with particular focus on the use of satellite obs (to include plans for GOES-R and NPOES) to initialize storm core.

- Develop a plan and determine optimal mix of observations (OSE's, OSSE's) and potential targeting strategies.

- **1B. Develop physics suite for high(er) resolution*** **critical effort**

  - Air-Sea fluxes
  - PBL
  - Representation of deep convection
  - Microphysics
  - Radiation

  Evaluate and test *necessary* and *affordable* complexity for microphysics, sea spray, etc.

  What resolution is required for explicitly resolving all clouds?

*** For stream 1 it is highly desirable to be able to run a 3-4km. HWRF inner nest in ops within 2 years (2012) and <1km. 201?**

- **2. Diagnostics – critical effort (support of 1A and 1B)**

  - **Develop diagnostic techniques and evaluate *analyses and forecasts* of the hurricane core and larger scale environment. This should include:**

    - **Evolution of vortex surface wind field distribution and 3-D Vortex structure – kinematics, thermodynamics**

    - **Large scale flow – many levels, e.g . 10m, 850mb, 700mb, 500mb, 200mb**

    - **Identify systematic errors/biases on both scales, e.g. weaker shear than observed in environment; ability of model to maintain semi-permanent synoptic flow features – (subtropical high over ATL, High over Mexican plateau, mid-oceanic trough, weak trade wind circulation…..)**

    - **Identify sources of error(s) – initialization? physics? Both? Dynamics?**

- **Close collaboration with w/observations team is necessary to support this effort.**

3. Regional Hurricane Ensembles for structure/intensity

Determine optimal strategy for regional ensembles for structure/intensity forecasts, e.g. Multi-model ensembles (as in DEMO this season) or single model? MME may contain both

What is optimal Configuration? Resolution? Members? Coupling w/ocean?

Develop ensemble based guidance products w/NHC forecasters

What is the value of very hi-resolution deterministic fcsts vs. ensembles? Trade-offs?

4. Ocean Complexity

Demonstrate importance of increased complexity in ocean data assimilation/Initialization, increased resolution, physics for the next 1-4 years

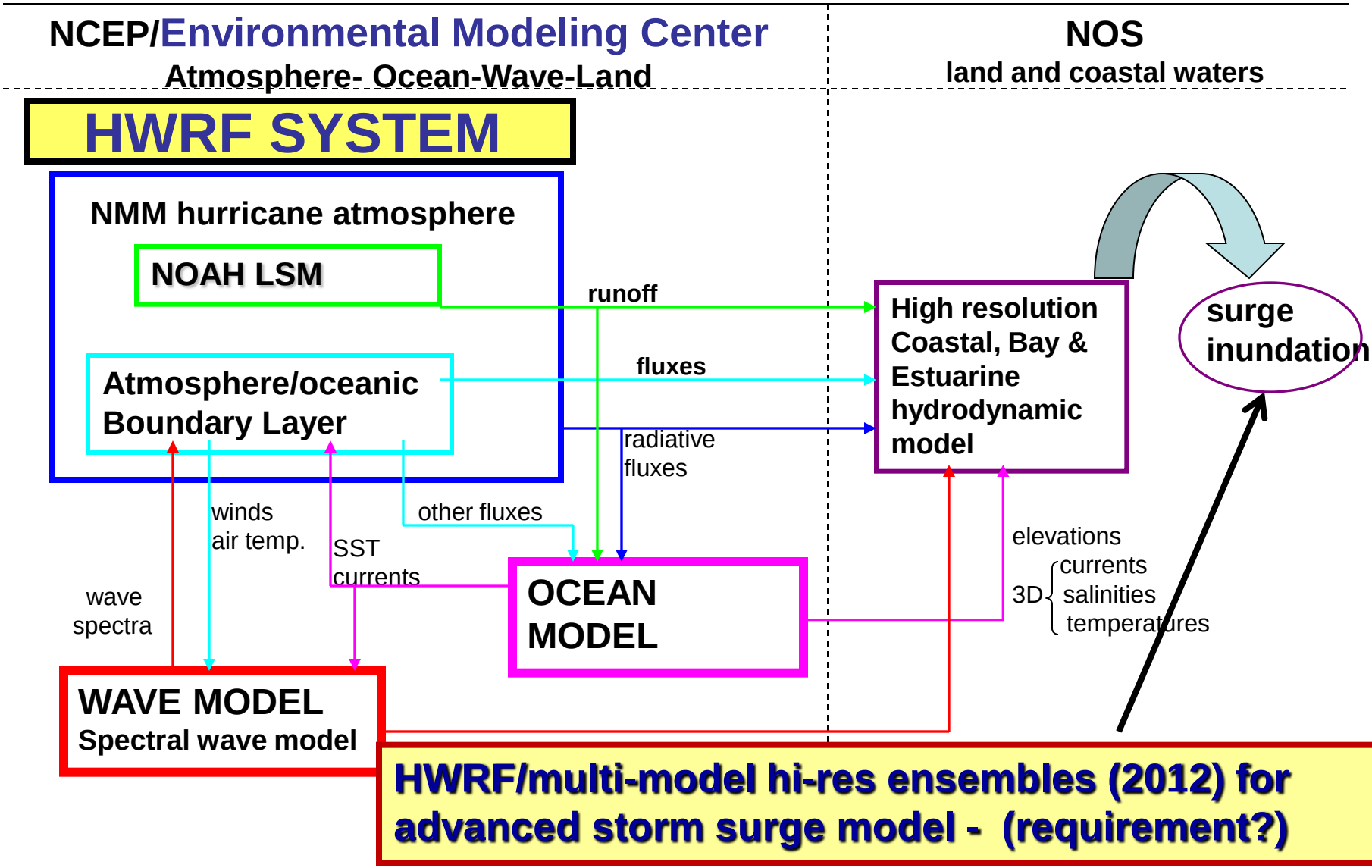
Within the next 1-4 years do we need a complex 3-D ocean model everywhere?

- **Coupling to land surface model**

  Advance Sfc. Physics for improved rainfall forecasts at landfall. Important input to hydrology and streamflow models to address inland flooding.

ALL hurricane model physics and model upgrades dependent on allowable resolution, e.g. affordable complexity of microphysics, sea spray, explicit representation of all clouds.

Hurricane-Wave-Ocean-Surge-Inundation Coupled Models



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Weather, Ocean, Land & Climate Forecast Systems

6 hour cycle 4 times/day