Integration of HOPS and ROMS
during and beyond the 2003 August AOSN-II experiment
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The integration of HOPS and ROMS will be carried out in progressive stages. These stages are listed and outlined below. Even though the list is ordered, we expect that research will start at different levels in each of the stages. We also expect that several iterations will occur within and across most stages.

1. Stage 1: Comparisons of HOPS and ROMS

Carrying out such comparisons is important because it will establish a basis for the software needed to integrate HOPS and ROMS. Such software include codes for:
-   Skill measures (data-model comparisons)
-   Interpolations of model fields to common grids
-   Comparisons of model fields (model-model difference measures)
-   Identification of ``major'' issues within each model.

Note that there are different types of comparisons:
-   Comparisons of systems' outputs, independently of inputs/parameters
-   Comparisons with similar/identical inputs (IC, forcings, assimilation)
-   Comparisons with similar/identical inputs and parameters

1.1 First comparison based on the 2000 summer data

HOPS simulations for July-August 2000 are available. They aim to reproduce the ICON simulations. The plan is to provide one of these HOPS simulations (about a month duration) to the modeling community. ROMS will provide a similar simulation. The ROMS, HOPS and ICON simulations will then be compared to each other and to available data, especially mooring data.

1. 2 Second comparison based on July simulations

These HOPS and ROMS simulations will be carried-out in July, and will involve physical biological fields.

1.3 Final comparisons to occur during MB-03

Stage II: Super-ensembles between HOPS and ROMS

We propose the following three options with increasing degree of difficulty and effort.

II.1: Simple ensemble mean of HOPS and ROMS

-   Interpolate both HOPS and ROMS on a common grid
-   Compute the ensemble mean and the associated standard deviations

- Make both individual ensemble members and mean/std available to the AOSN community (e.g., Live Access Server or something similar)

II.2: A weighted average of HOPS and ROMS

During later stage of the experiment, one can accumulate some experiences about the skills of HOPS and ROMS. Based on subjective analyses, one can empirically determine appropriate weights for HOPS and ROMS. Even this is challenging to do, such decisions already often occur when a single forecast is empirically selected from a set of model simulations with different numerical set-ups or physical parameters. Another special case is to use only HOPS (or ROMS) for a specific region or process during a short portion of the experiment.

II.3: An objective combination of HOPS and ROMS according to their error covariances

This would be a long-term goal. The most challenging task here is to objectively determine error covariances for HOPS and ROMS.

Stage III: Apply FORMS to HOPS and ROMS

An independent option to integrate HOPS and ROMS is through the Feature Oriented Regional Modeling System (FORMS). Since Avijit's proposal was funded, it is anticipated that HOPS and ROMS can be initialized using the FORMS framework and also subsequently compared within the FORMS framework. The first step is to identify models for the relevant features. For the later, software is needed to extract these features from model simulations.

Stage IV: Development of subsystem modules for HOPS and ROMS in support of an AOSN OSSE engine

A long-term goal for further developments of HOPS and ROMS should focus on separating HOPS and ROMS into individual sub-system modules that can be eventually integrated into a super HOPS-ROMS system. This system will take advantage of the individual components from HOPS and ROMS with advanced capabilities.