New features in ROMS_AGRIF v3.1

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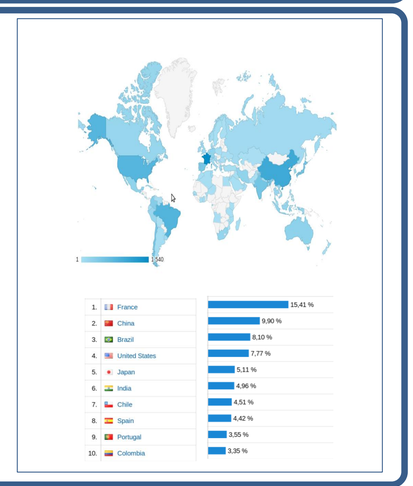
Introduction

ROMS_AGRIF (*Penven et al, 2006, Debreu et al, 2012*) is a branch of ROMS developed in **France by IRD and INRIA**. It's main particularity is its **online nesting capability** based on the AGRIF library (*Debreu et al, 2008)*. This branch of ROMS is developed as part of IRD's tasks to work with developing countries. This community modeling system is delivered with a **powerful pre- and post- processing set of tools: the ROMSTOOLS matlab toolbox** *(Penven et al, 2008)*. In addition, a user's guide describing ROMS_AGRIF and ROMSTOOLS functionalities can be found on our website : http://www.romsagrif.org



Ocean-atmosphere coupling

In recent years, large efforts were devoted to develop ocean-atmosphere coupling. For computational efficiency and extended capabilities (e.g., nesting), coupling of ROMS_AGRIF with the atmospheric model WRF (http://wrf-model.org) is now implemented using the **OASIS3-MCT generic coupler** (https://verc.enes.org/oasis). We choose this approach to be coherent with the WRF community and because it provides a non-intrusive solution to couple independent codes.

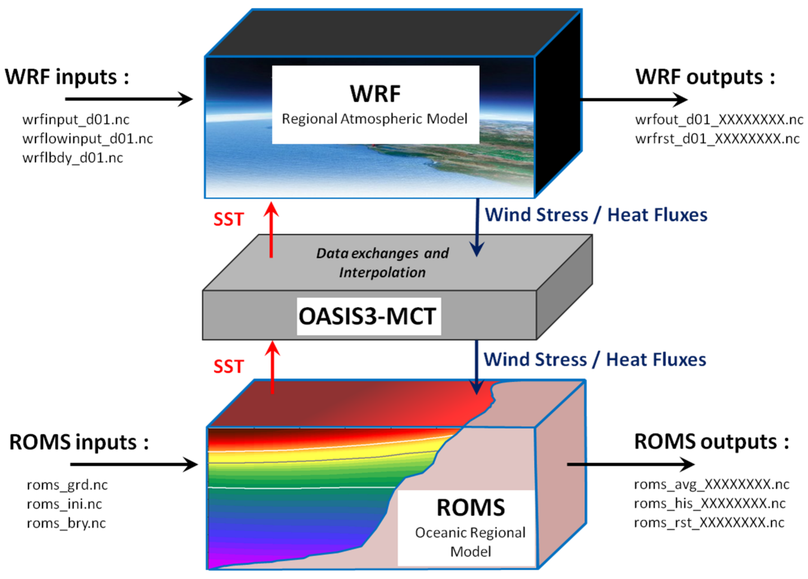


Figure 3: ROMS-AGRIF/WRF/OASIS3-MCT coupling scheme

Preliminary results were obtained from ROMS/WRF coupled simulations along the Peru-Chile coasts. Wind speed and air temperature from WRF is presented on the right panel and ROMS SST on the left panel.

Ocean-atmosphere coupling is available in ROMS_AGRIF V3.1 through the cpp-key ***OA_COUPLING***

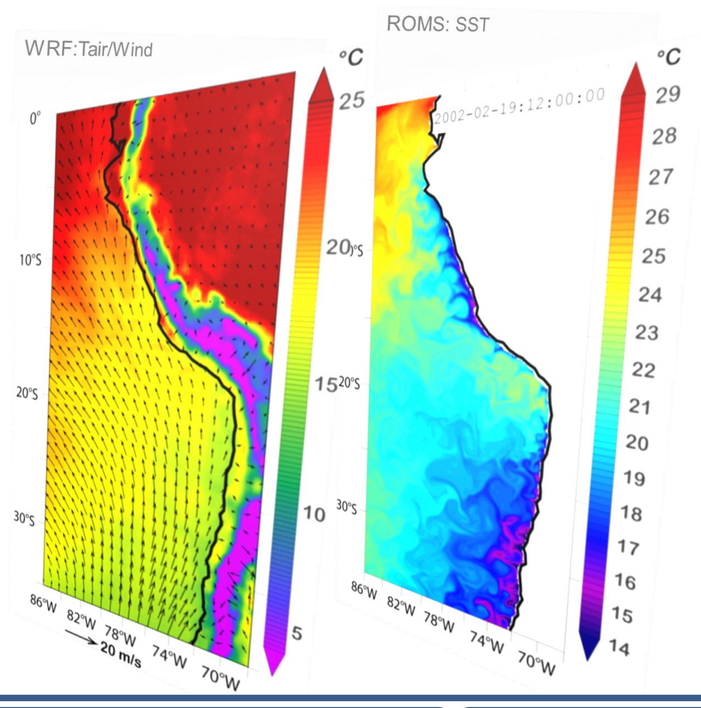


Figure 6: "Peru-Chile" coupled ocean-atmosphere configuration (K. Goubanova)

The OASIS3-MCT coupler provides several functions for coupling various models. These functions characterize four phases: **Initialization, Definition, Exchange and Finalization Phases.**

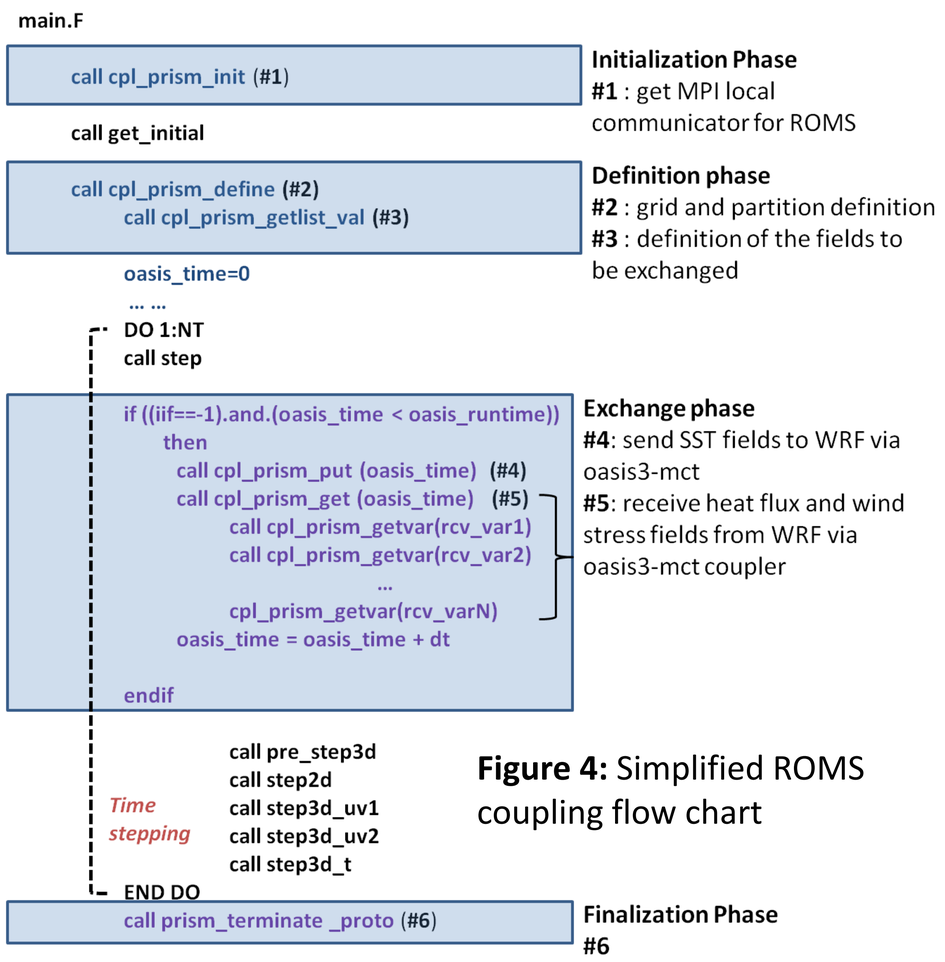


Figure 4: Simplified ROMS coupling flow chart

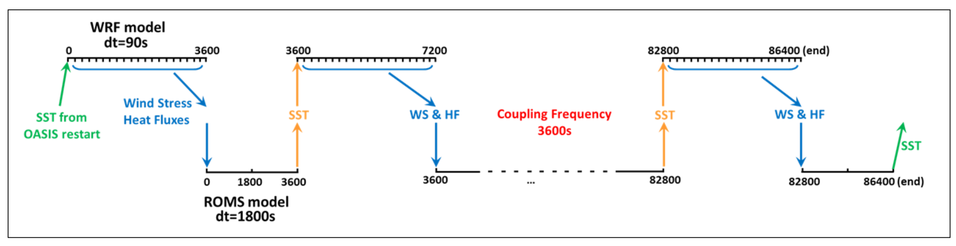


Figure 5: Hourly coupling sequence example

Main new features in ROMS_AGRIF v3.1

- 2-way nesting
- Ocean-Atmosphere coupling
- Wave-currents coupling
- ***GLS*** vertical mixing closure scheme
- Biogeochemical model ***BioEBUS***
- Bilaplacian isopycnal diffusion (***RSUPS3***)
- Monotonic Tracer advection scheme (***WENO5***)
- Runoff forcing

References :

• Debreu et al, 2008 : AGRIF: Adaptive Grid, Refinement In Fortran. *Comput Geosci 34(1) 8–13*
• Debreu, L., P. Marchesiello, P. Penven, and G. Cambon, 2012 : Two-way nesting in split-explicit ocean models: algorithms, implementation and validation. *Ocean Modelling*, 49-50, 1-21. 2013.
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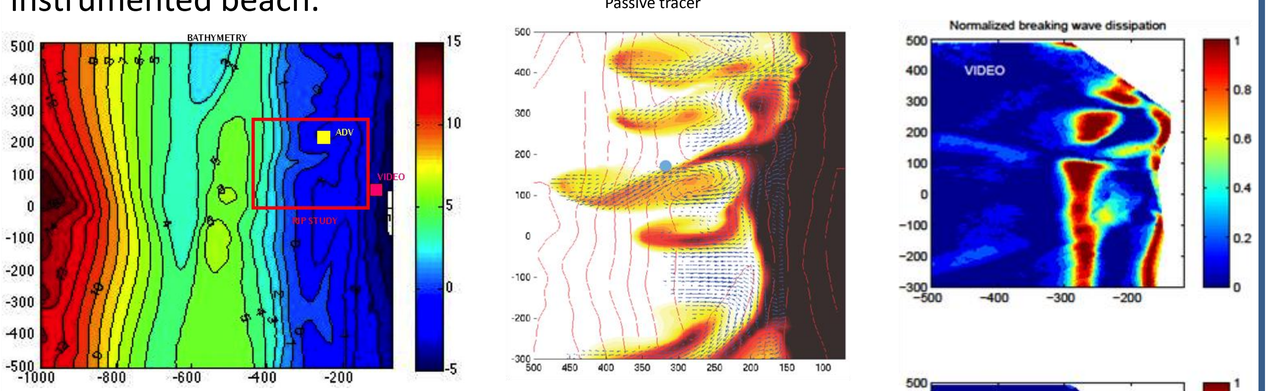
• Uchiyama, Y., James C. McWilliams, Alexander F. Shchepetkin : Wave–current interaction in an oceanic circulation model with a vortex-force formalism: Application to the surf zone. *Ocean Modelling,* 34 (2010) 16–35
• Valcke, S., T. Craig, L. Coquart. *OASIS3-MCT User Guide oasis3-MCT_2.0, CERFACS/CNRS URA No1875.* May 2013.

Wave-current interaction

The 3D interactions between surface gravity waves and currents using the vortex force formalism based on the asymptotic theory of McWilliams et al. (2004) has been implemented in ROMS-AGRIF (thus adding mesh refinement capability). Instability of rip currents are currently being investigated on Biscarosse instrumented beach.



Capabilities:
- Reads wave forcing file
- Online simple wave model
- Wave-currents interaction

Plan : coupling with WW III