New features in ROMS AGRIF v3.1

G. Cambon (a), P. Marchesiello (a), S. Illig (a), R. Benshila (b), E. Gutknecht (a), I. Dadou (a), V. Garcon (a), M. Herrmann (a),

S. Herbette (c), P. Penven (c), L. Debreu (d), F. Lemarié (d)

(a): IRD/LEGOS, Toulouse, France; (b): CNRS/LOCEAN, Paris, France; (c): IRD/LPO, Brest, France;

(d): INRIA/LJK, Grenoble, France

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 : <u>http://www.romsagrif.org</u>

ROMS HOME DOWNLOAD	CHANGE LOG	MENTATION FORUM	LINKS HOW TO CITE	Site map Login 📑 AA AA		
A Regional Oceanic Modeling System with mesh refinement, pre- and post-processing tools Over the last several years, we have developed at UCLA, Rutgers University and IRD a three- dimensional numerical oceanic model intended for simulating currents, ecosystems, biogeochemical cycles, and sediment movement in various coastal regions. It is called the Regional Oceanic Modeling System (ROMS). This IRD version of the code, ROMS_AGRIF, makes use of the AGRIF grid refinement procedure developed at the LJK-IMAG and is accompanied by a powerful toolbox for ROMS pre- and post-processing: ROMSTOOLS. Users are encouraged to register at the roms_agrif users mailing list (Low volume mailing list)		between IRD (Insti Developpement ; P. Cambon), INRIA (In en Informatique et e Laurent Debreu), a	ruit of a collaborative work tut de Recherche pour le Marchesiello, P. Penven, G. stitut National de Recherche n Automatique, LJK-IMAG ; nd UCLA (Department of Oceanic Sciences; J.C.	NEWS : • March2012 : ROMS_AGRIF v2.2 release and ROMSTOOLS v2.2 release Login Username		
				gcambon Password Login Sign up Forgot your password?	 France China Brazil United States Japan 	15,41 % 9,90 % 8,10 % 7,77 % 5,11 %
CONTACTS					6. 💶 India 7. 🏪 Chile	4,96 %
Gildas Cambon	Laurent Debreu	Patrick Marchesiello	Pierrick Penven		8. Spain	4,42 %
IRD - LEGOS 14, Avenue Edouard Belin	INRIA 51, rue des Mathematiques	IRD - LEGOS 14, Avenue Edouard Belin	IRD - LPO Centre IRD de Bretagne	Institut de recherche	9. Portugal	3,55 %
31401 Toulouse Cedex 9 FRANCE gildas.cambon@ird.fr	38041 Grenoble Cedex 9 FRANCE laurent.debreu@inria.fr	31401 Toulouse Cedex 9 FRANCE patrick.marchesiello@ird.fr	B.P. 70 - 29280 Plouzane FRANCE pierrick.penven@ird.fr	Institut de recherche pour le développement	10. Colombia	3,35 %

Ocean-atmosphere coupling

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

Initialization Phase

communicator for ROMS

#2 : grid and partition definition

#3 : definition of the fields to

#4: send SST fields to WRF via

86400 (end

#1 : get MPI local

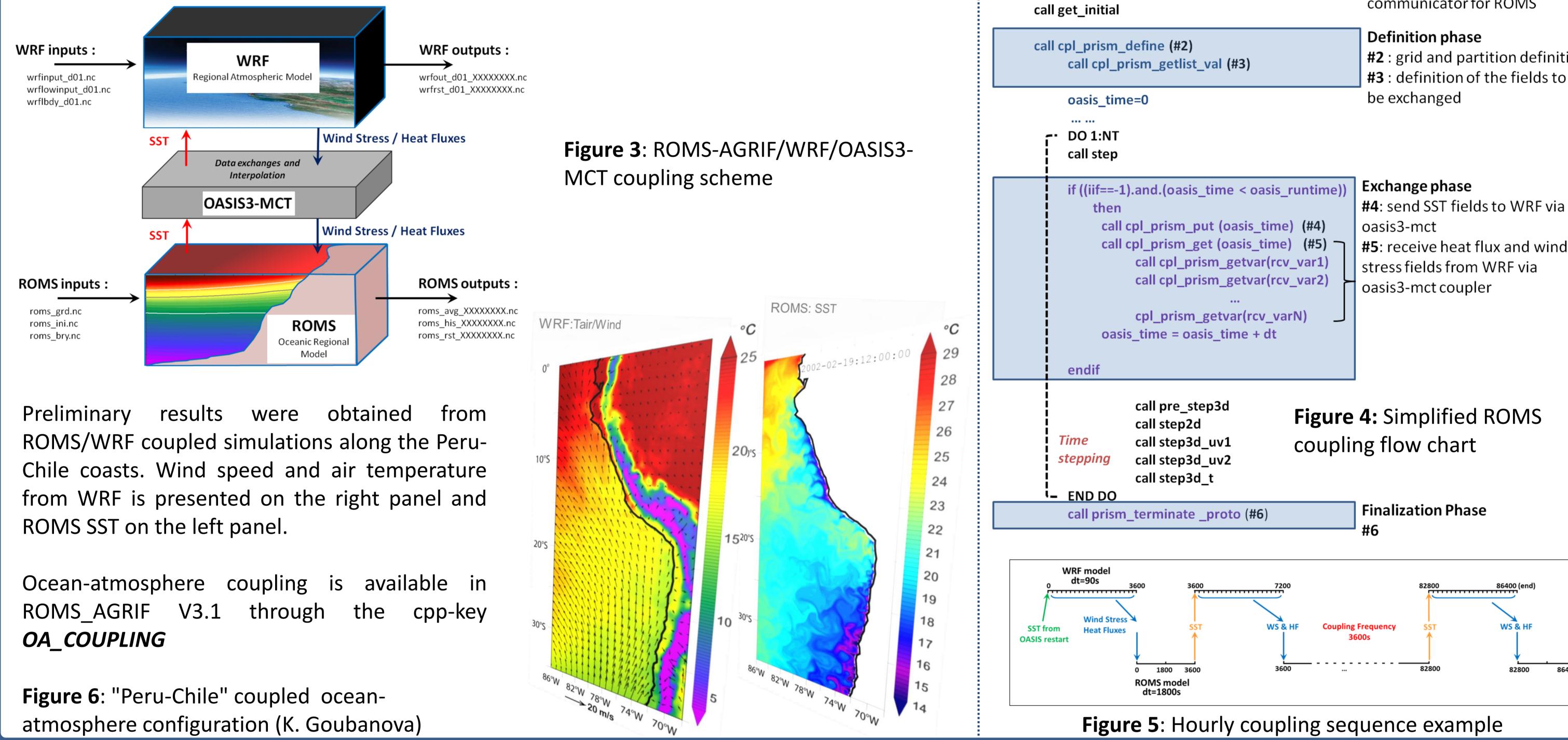
Definition phase

be exchanged

Exchange phase

oasis3-mct coupler

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 (<u>http://wrf-model.org</u>) is now implemented using the **OASIS3-MCT** generic coupler (<u>https://verc.enes.org/oasis</u>). We choose this approach to be coherent with the WRF community and because it provides a non-intrusive solution to couple independent codes.



Main new features in ROMS_AGRIF v3.1

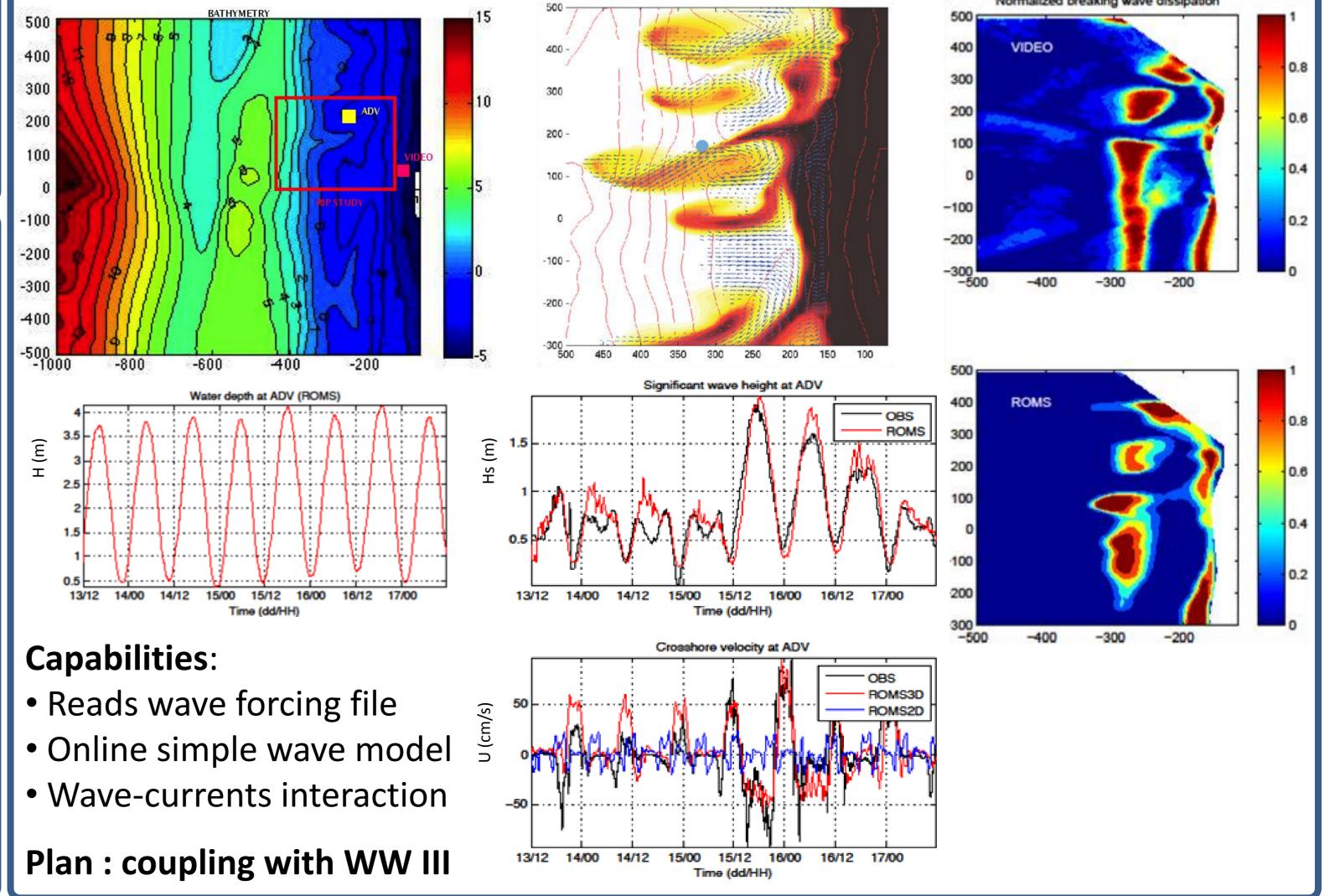
- 2-way nesting
- Ocean-Atmosphere coupling
- Wave-currents coupling
- •GLS vertical mixing closure scheme
- Biogeochemical model BioEBUS
- Bilaplacian isopycnal diffusion (*RSUPS3*)
- Monotonic Tracer advection scheme (WENO5)
- Runoff forcing

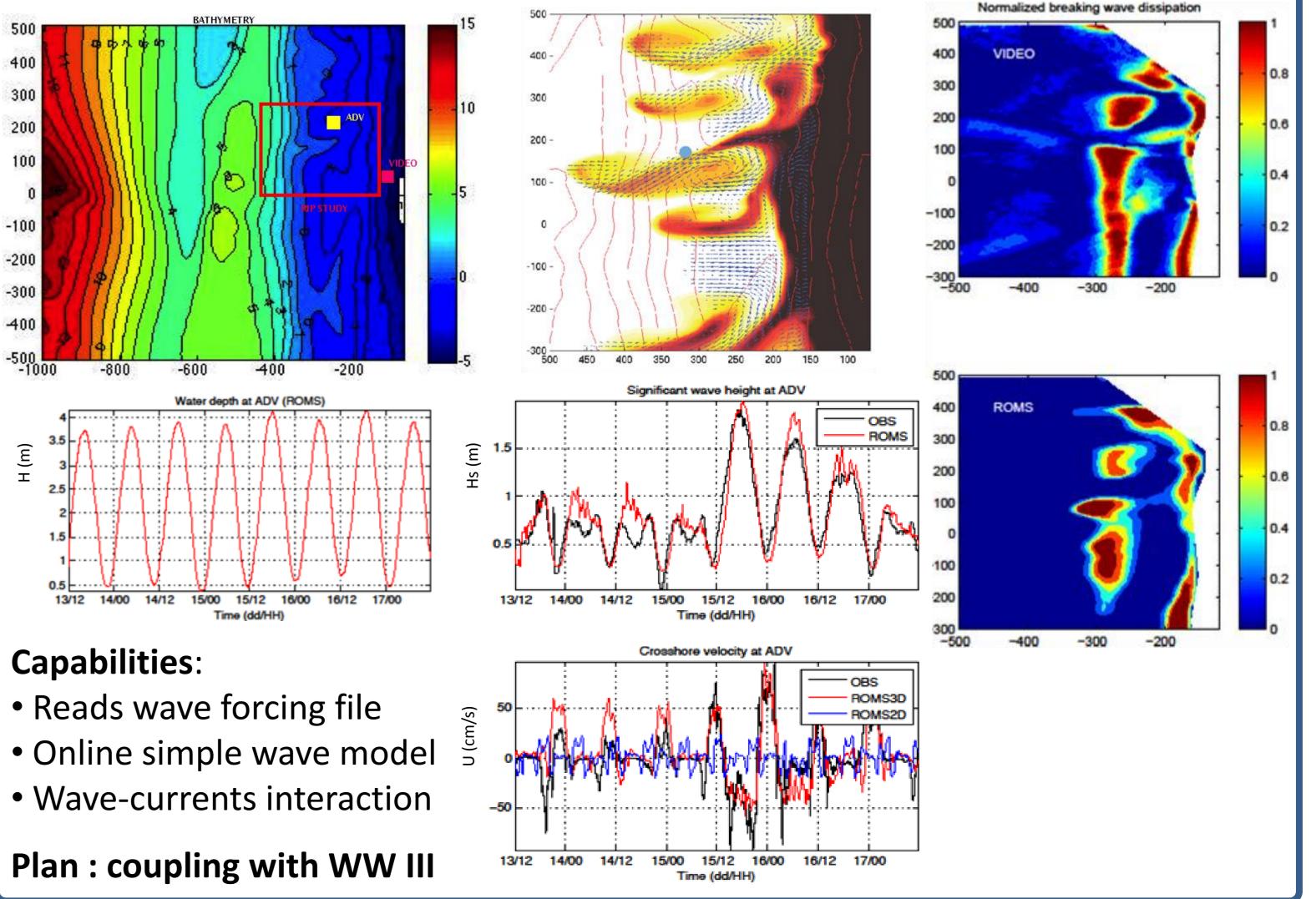
Wave-current interaction

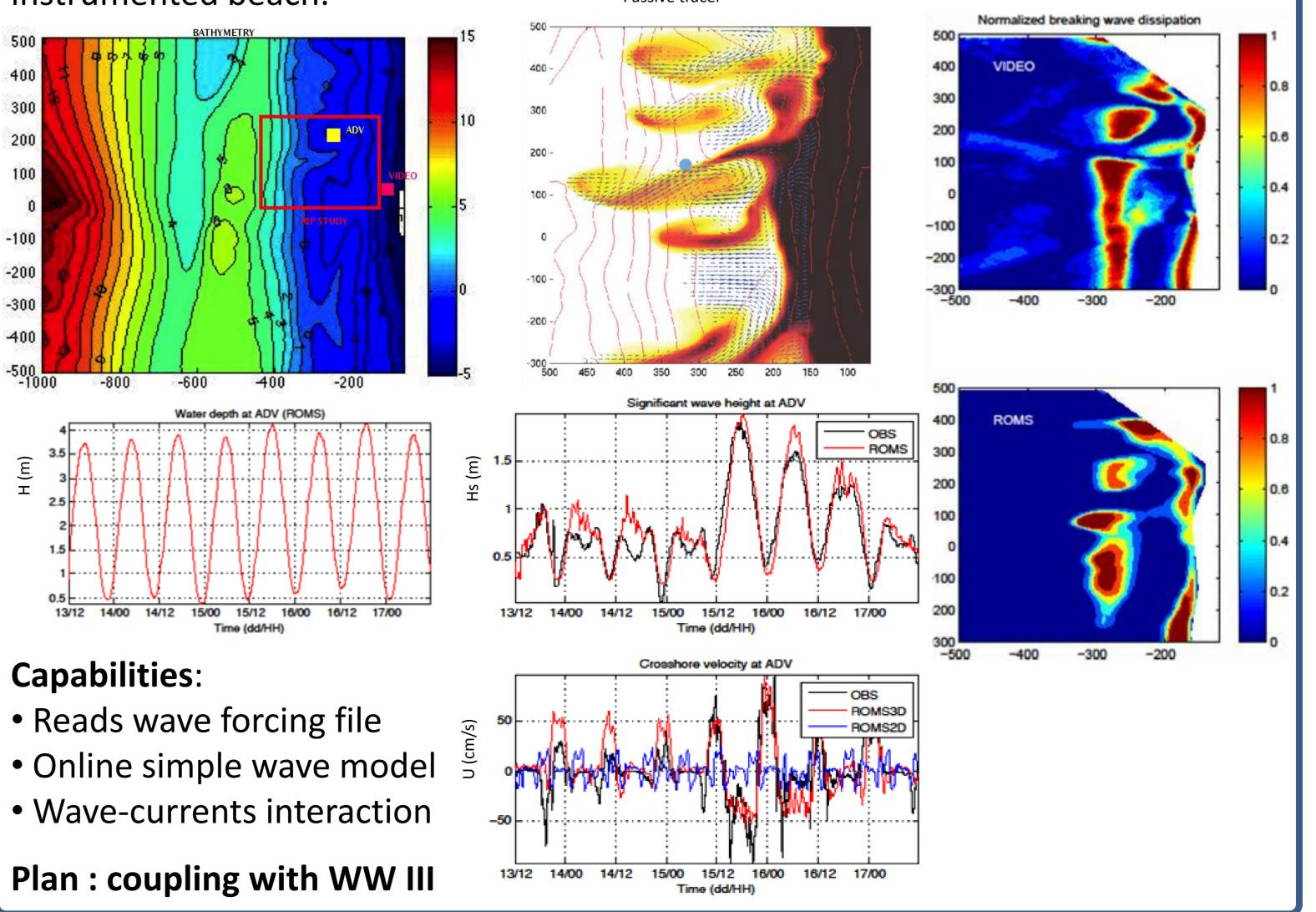
main.F

call cpl_prism_init (#1)

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. Passive tracer







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 splitexplicit ocean models: algorithms, implementation and validation. Ocean Modelling, 49-50, 1-21. 2013.

• Gutknecht, E., Dadou, I., Le Vu, B., Cambon, G., Sudre, J., Garçon, V., Machu, E., Rixen, T., Kock, A., Flohr, A., Paulmier, A., and Lavik, G.: Coupled physical/biogeochemical modeling including O2-dependent processes in the Eastern Boundary Upwelling Systems: application in the Benguela, Biogeosciences, 10, 3559-3591, doi:10.5194/bg-10-3559-2013, 2013

• Penven et al 2006: Evaluation and application of the ROMS 1-way embedding procedure to the central california upwelling system. Ocean Modelling, 12, 157-187.

• 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.