

Coupled wave – current predictions in the NW Med

A.S.-Arcilla, Dr. R. Bolanos,
Dr. B. Jorda & M. Espino

Coupled wave-current modelling off the Catalan coast

Dr. A.S.-Arcilla, Dr. R. Bolanos, Dr. B. Jorda

OUTLINE

Introduction

Wave climate and spectra (NW Med)

Circulation patterns (NW Med)

Coupled current-wave predictions

Preliminary results

Way ahead



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Venice, April 23-27, 2006



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Mestral

128 storms

The NW Med



Llevant
118 storms

Migjorn 45 storms



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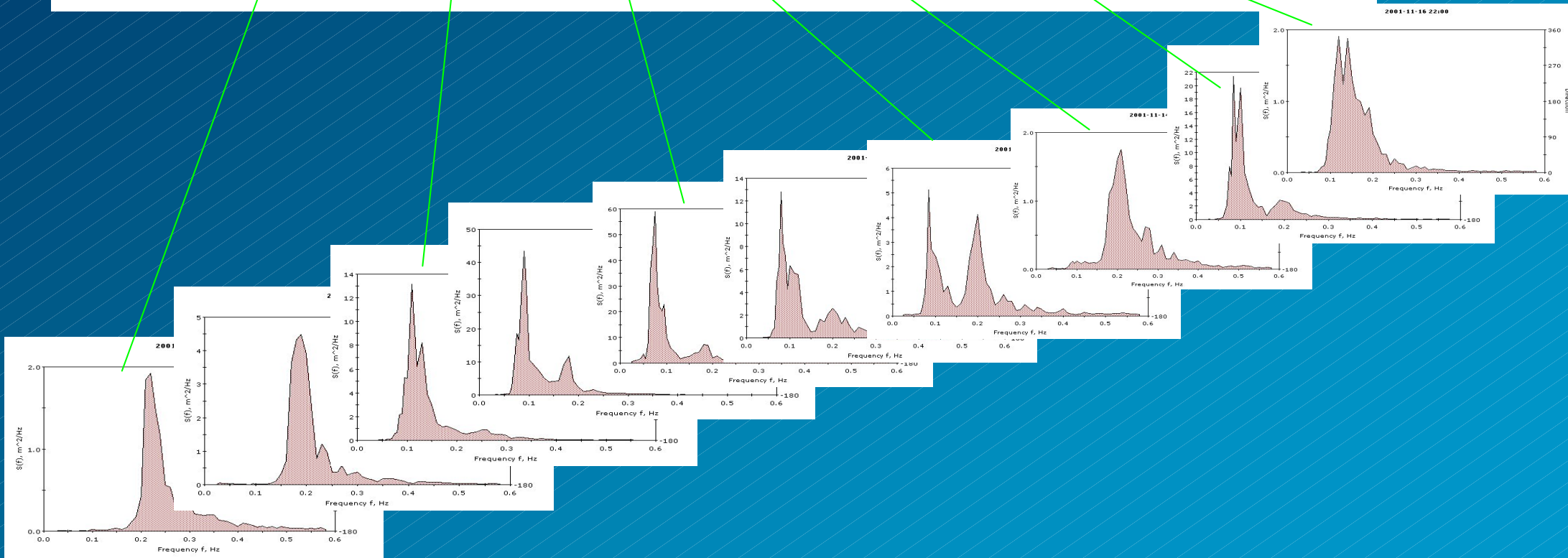
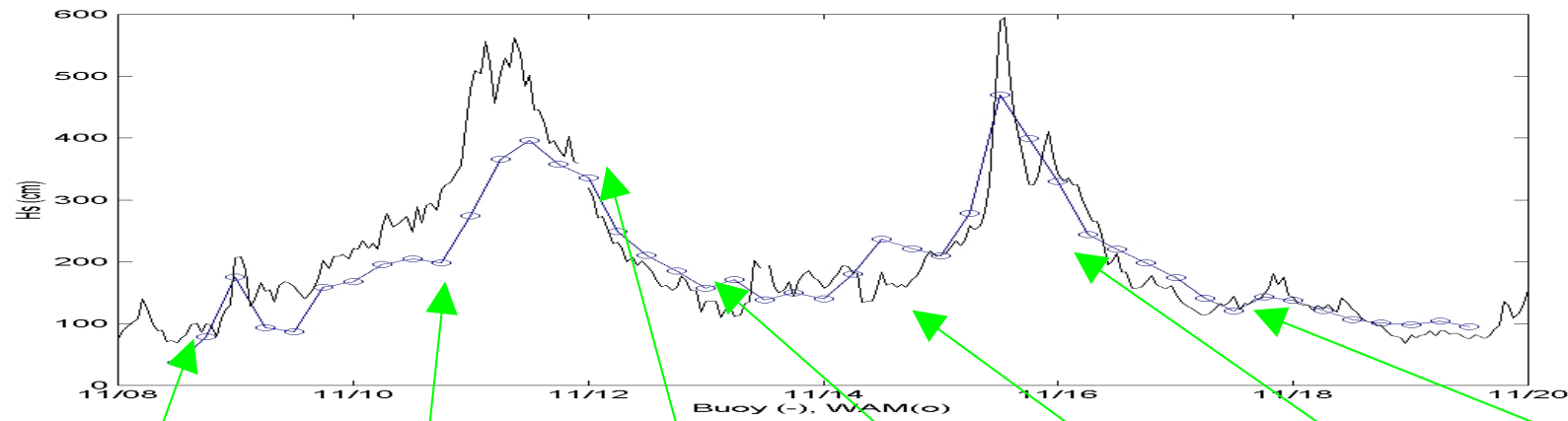
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Symphonie Model *MFSTEP configuration*

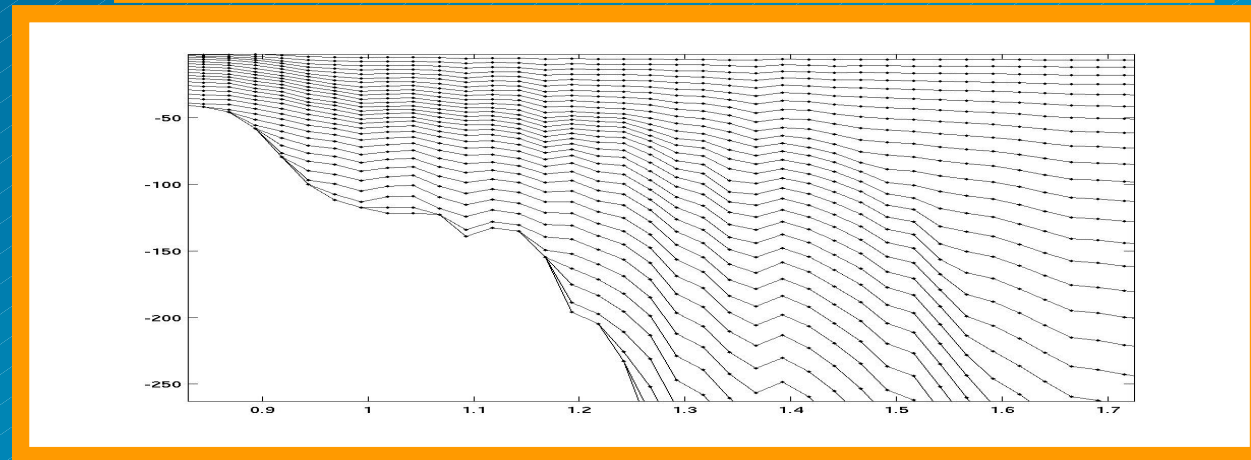
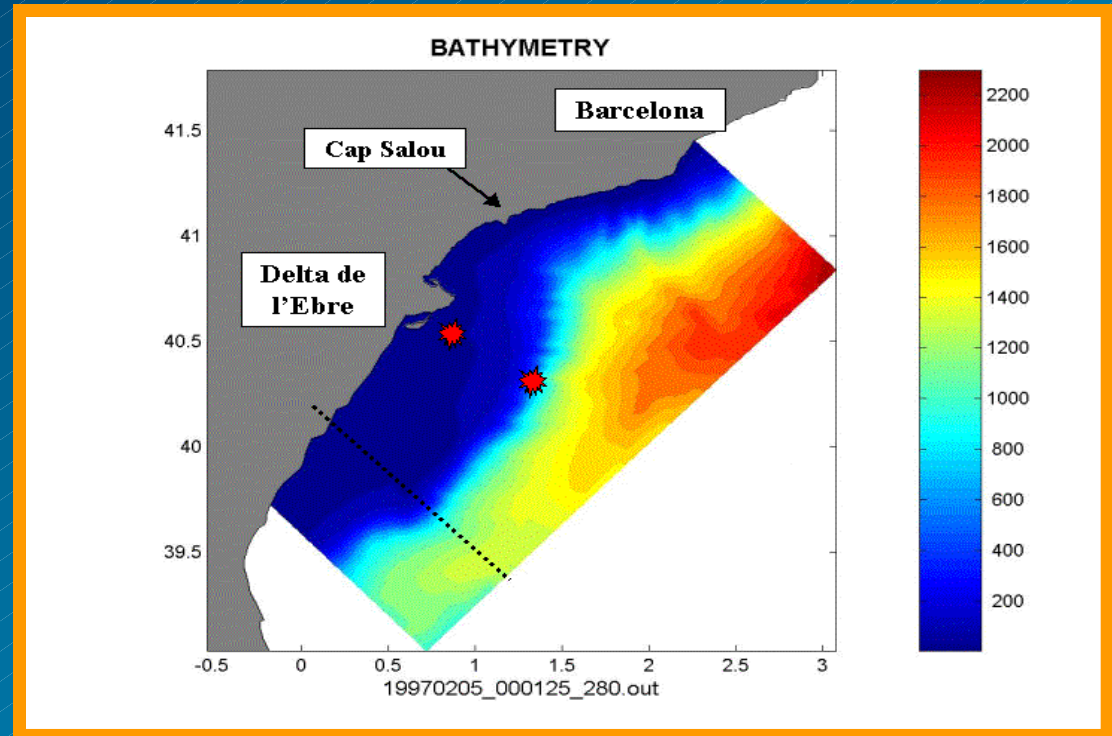
3D hydrostatic primitive eqns
model with free surface

1km horizontal resolution
(280x150)

Iterative bulk formulaes for the
air sea coupling-
ALADIN fields

Hybrid vertical coordinate
system

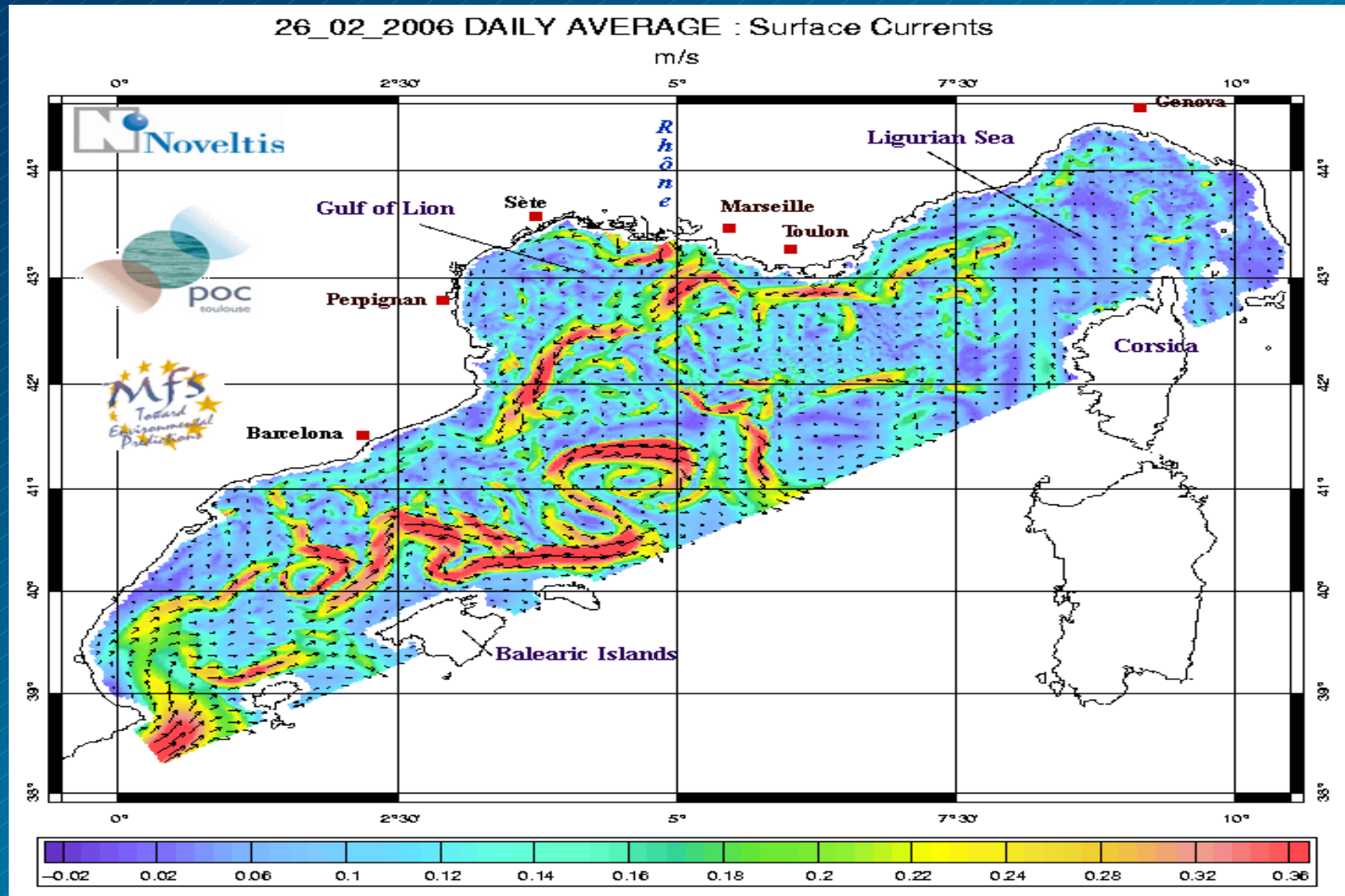
One way nested into the
MFSTEP OGCM (OPA)



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Circulation



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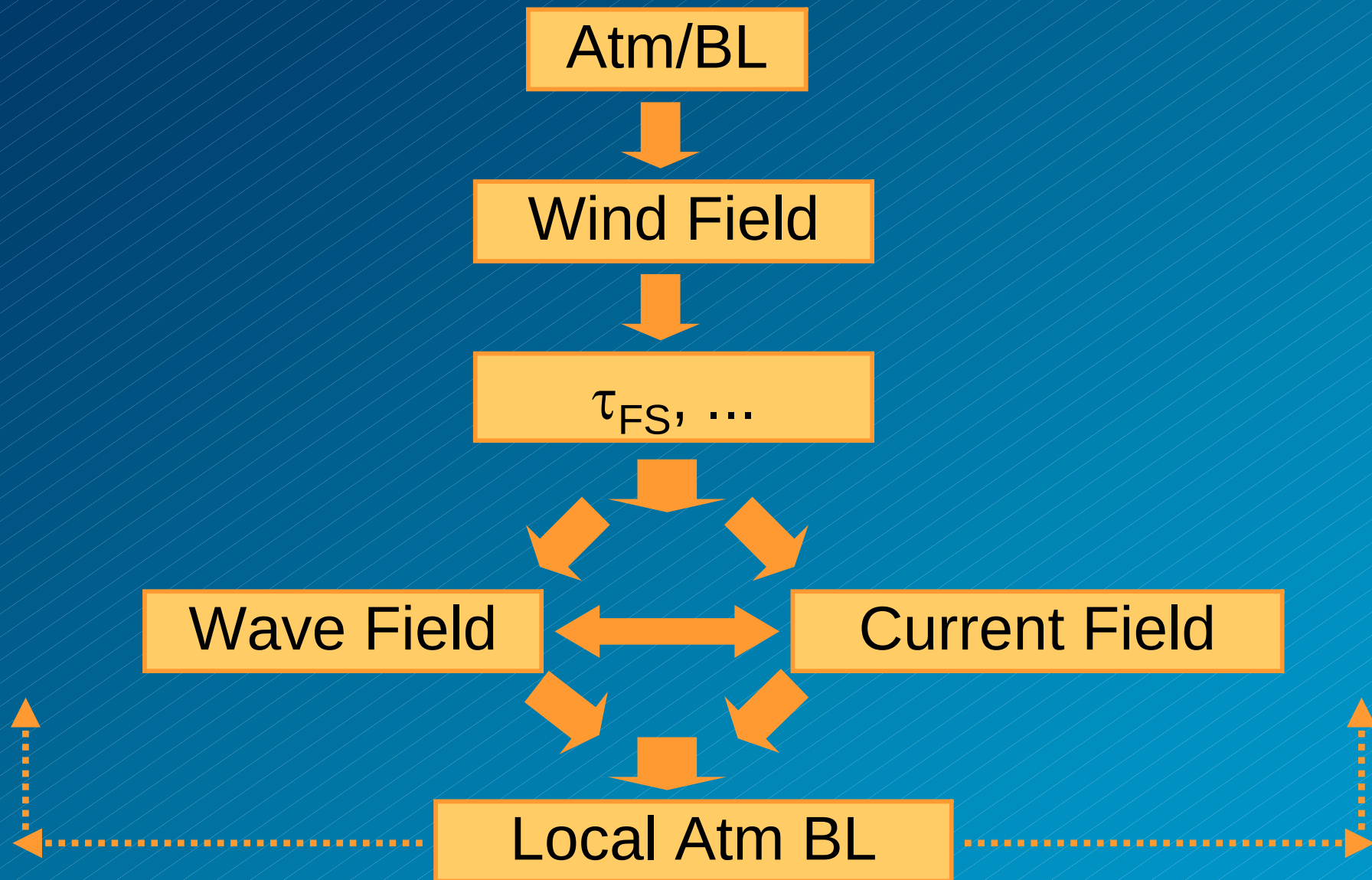
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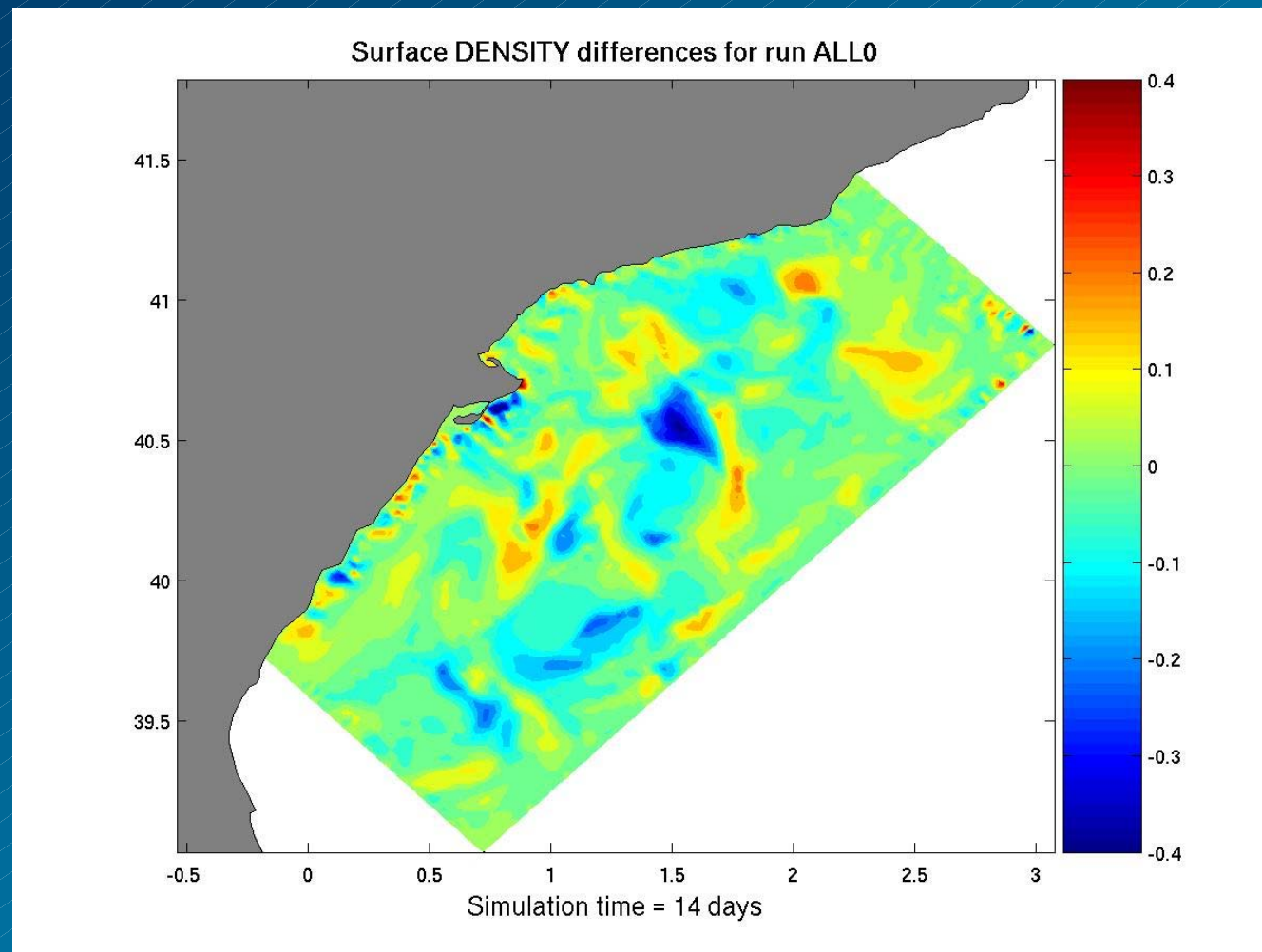


Fig. Diff. [Control (uncoupled) - Coupled (all 3 mechn.)]

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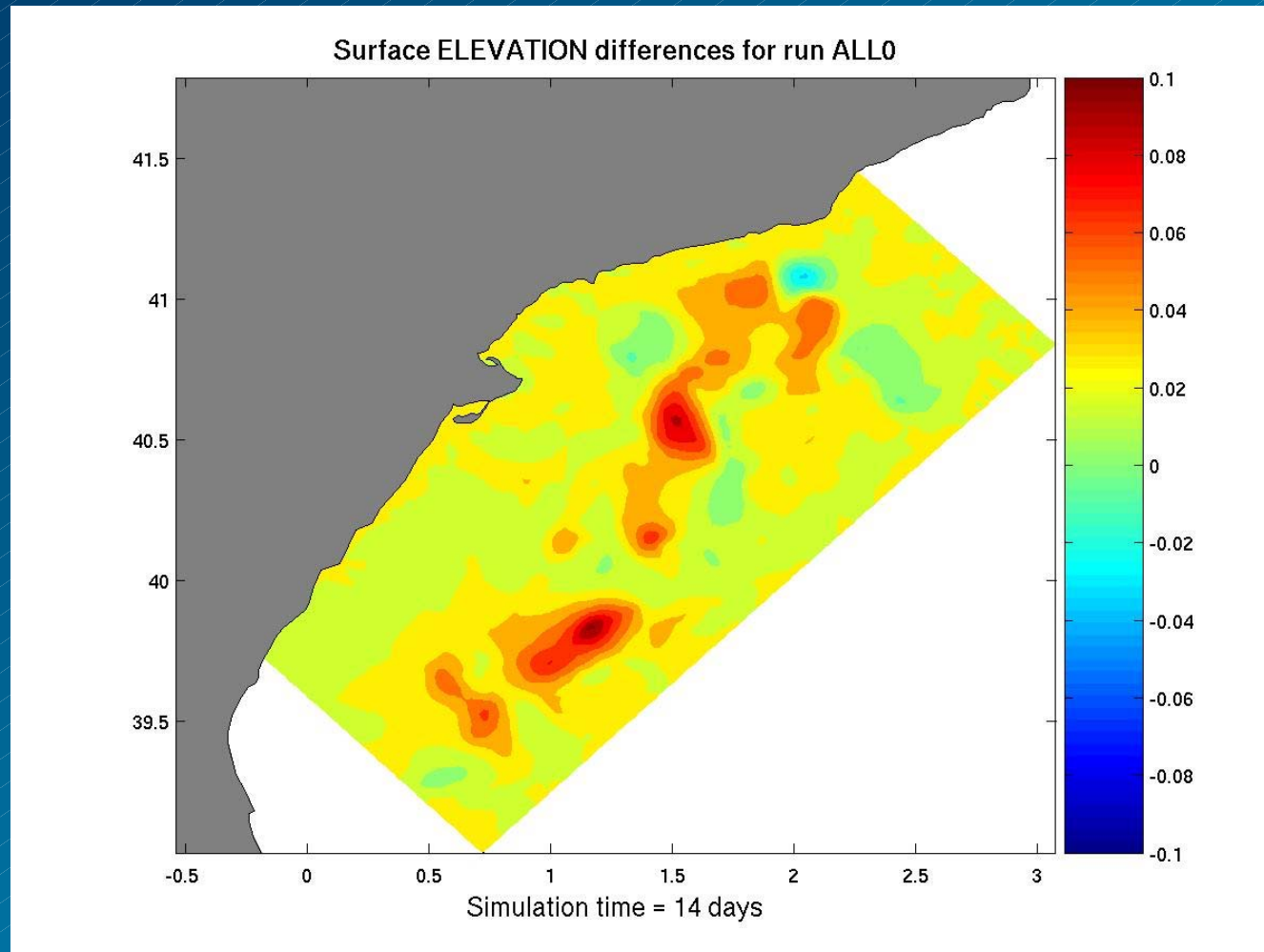


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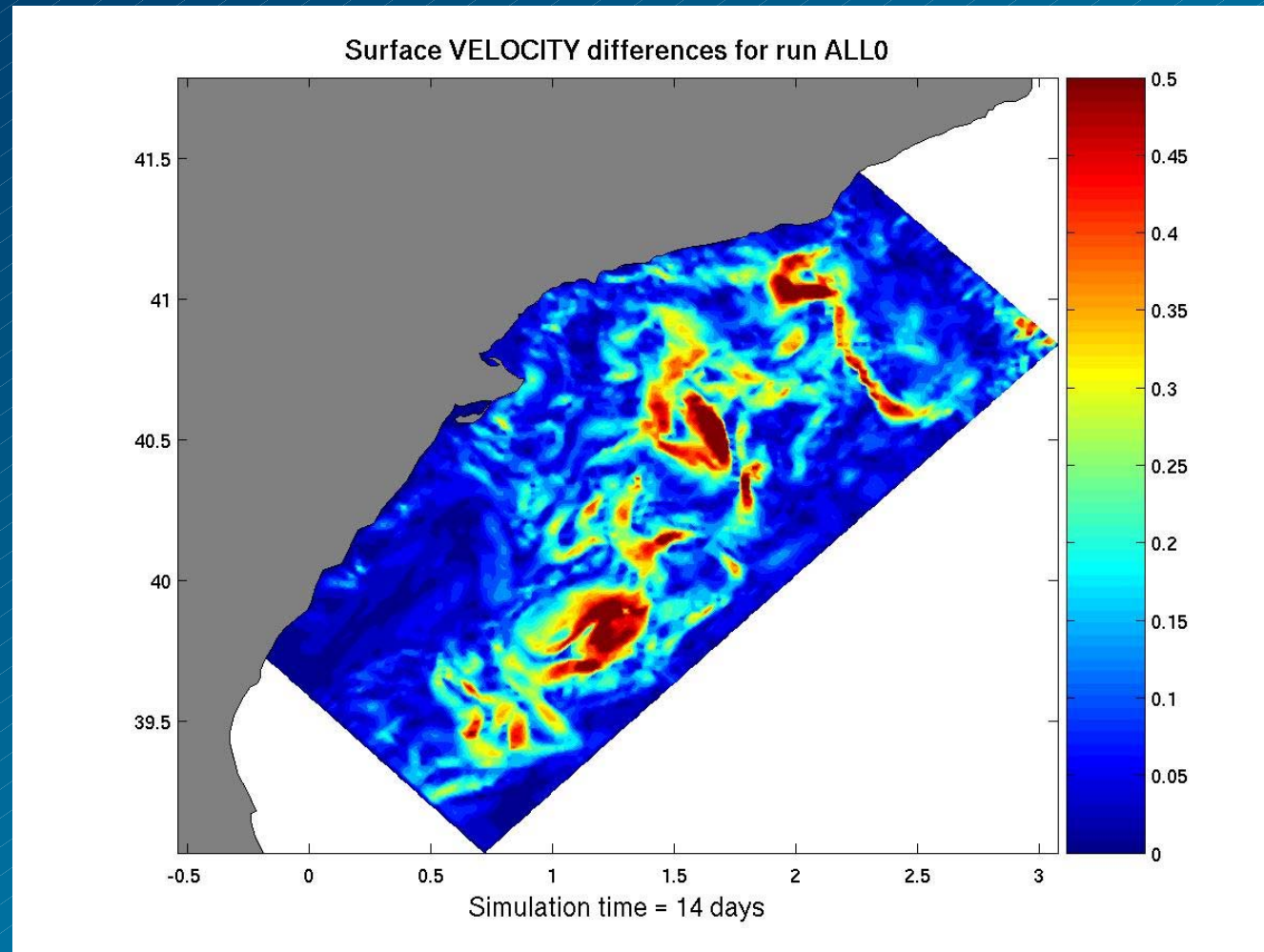


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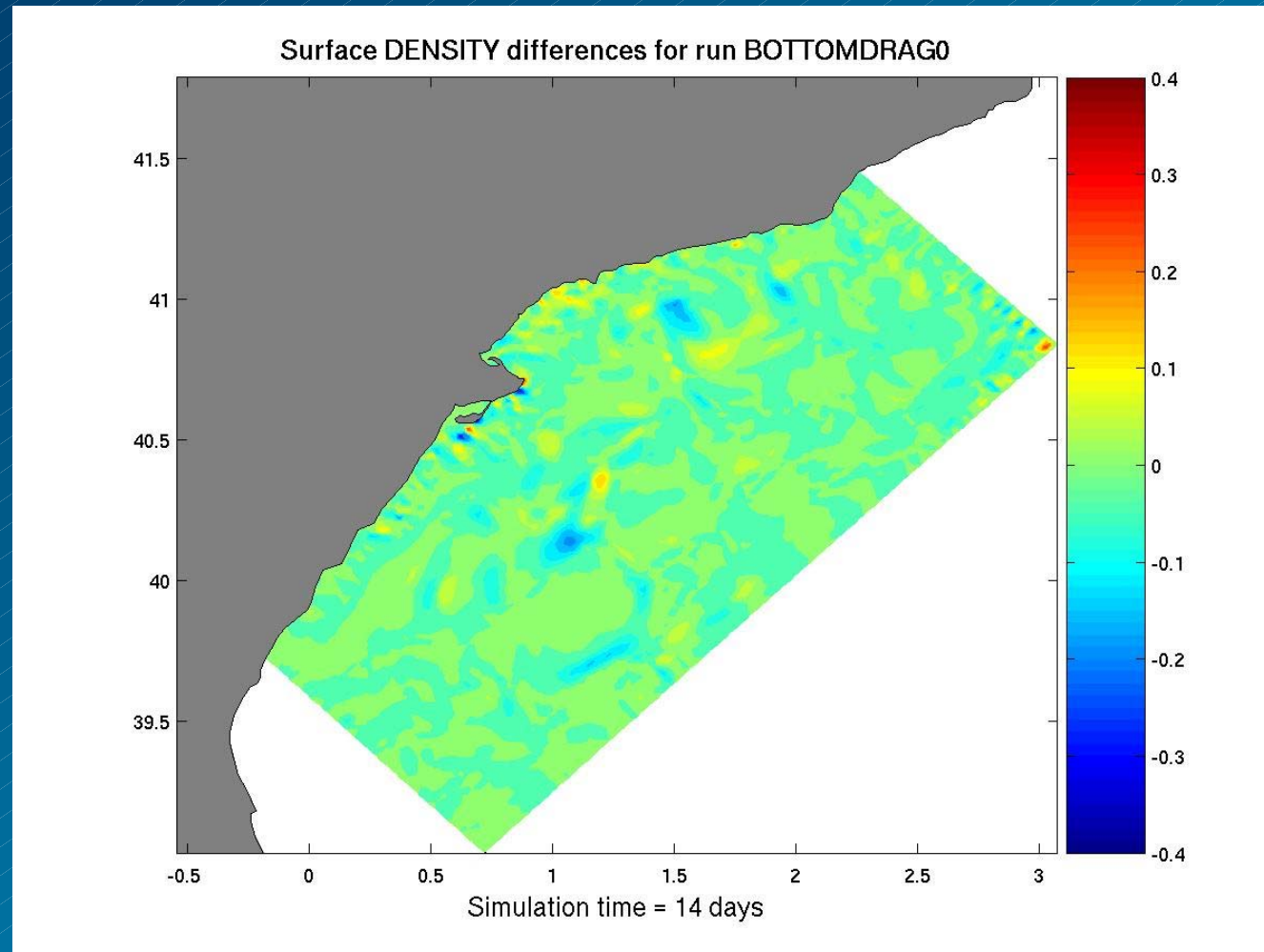


Fig. Diff. [Control (uncoupled) - Coupled (only bottom drag)]

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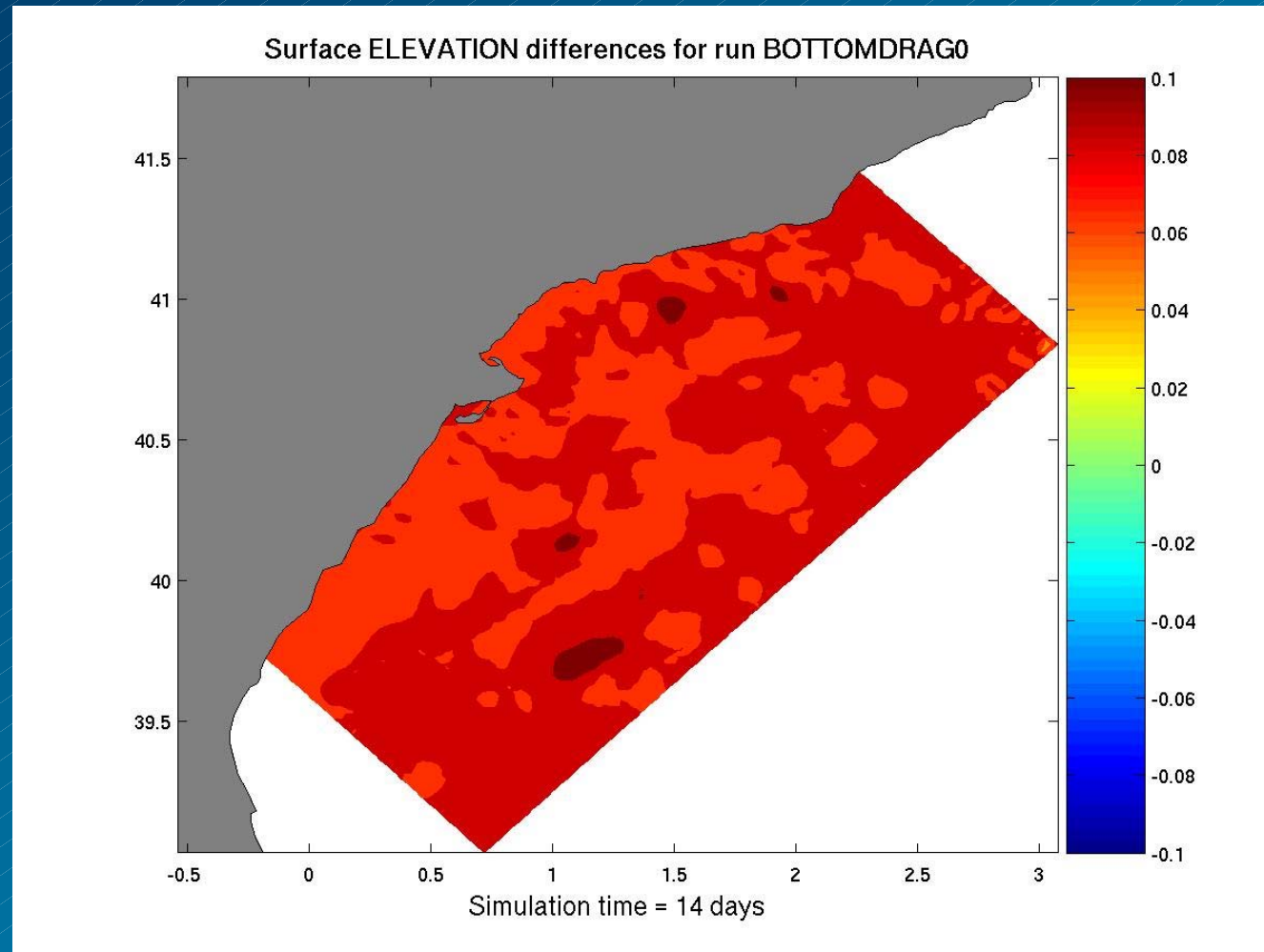


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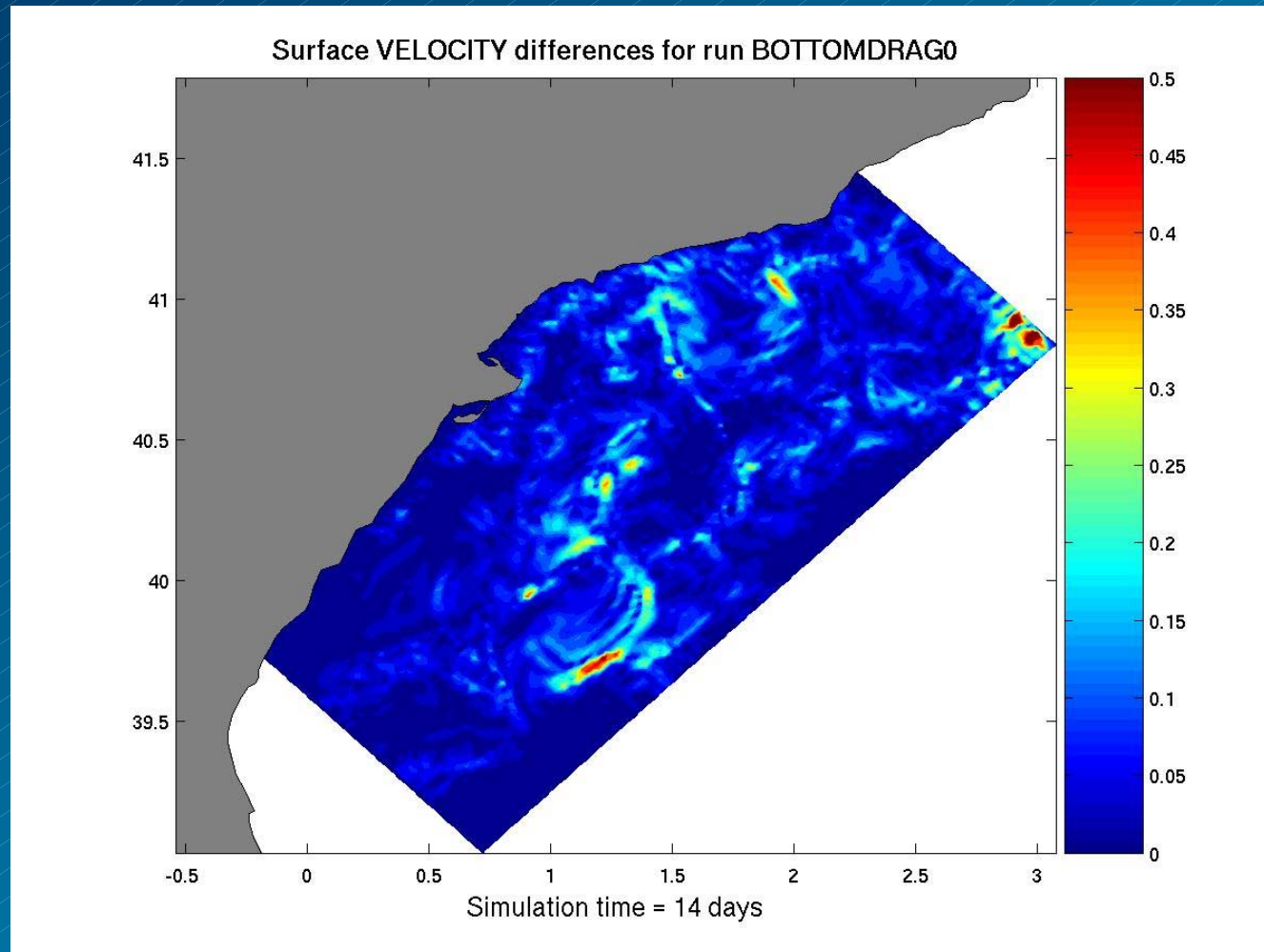


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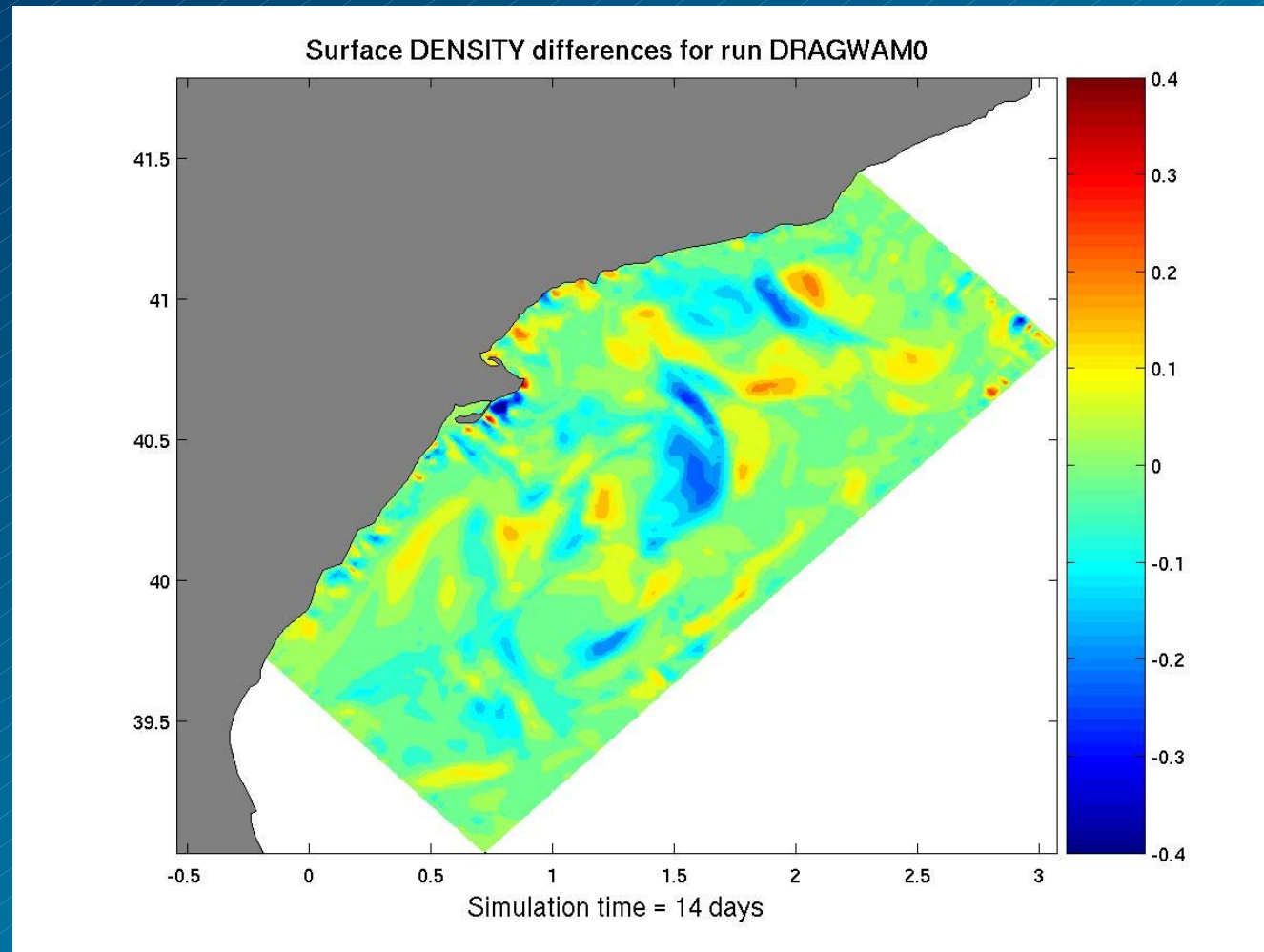


Fig. Diff. [Control (uncoupled) - Coupled (only wind drag)]

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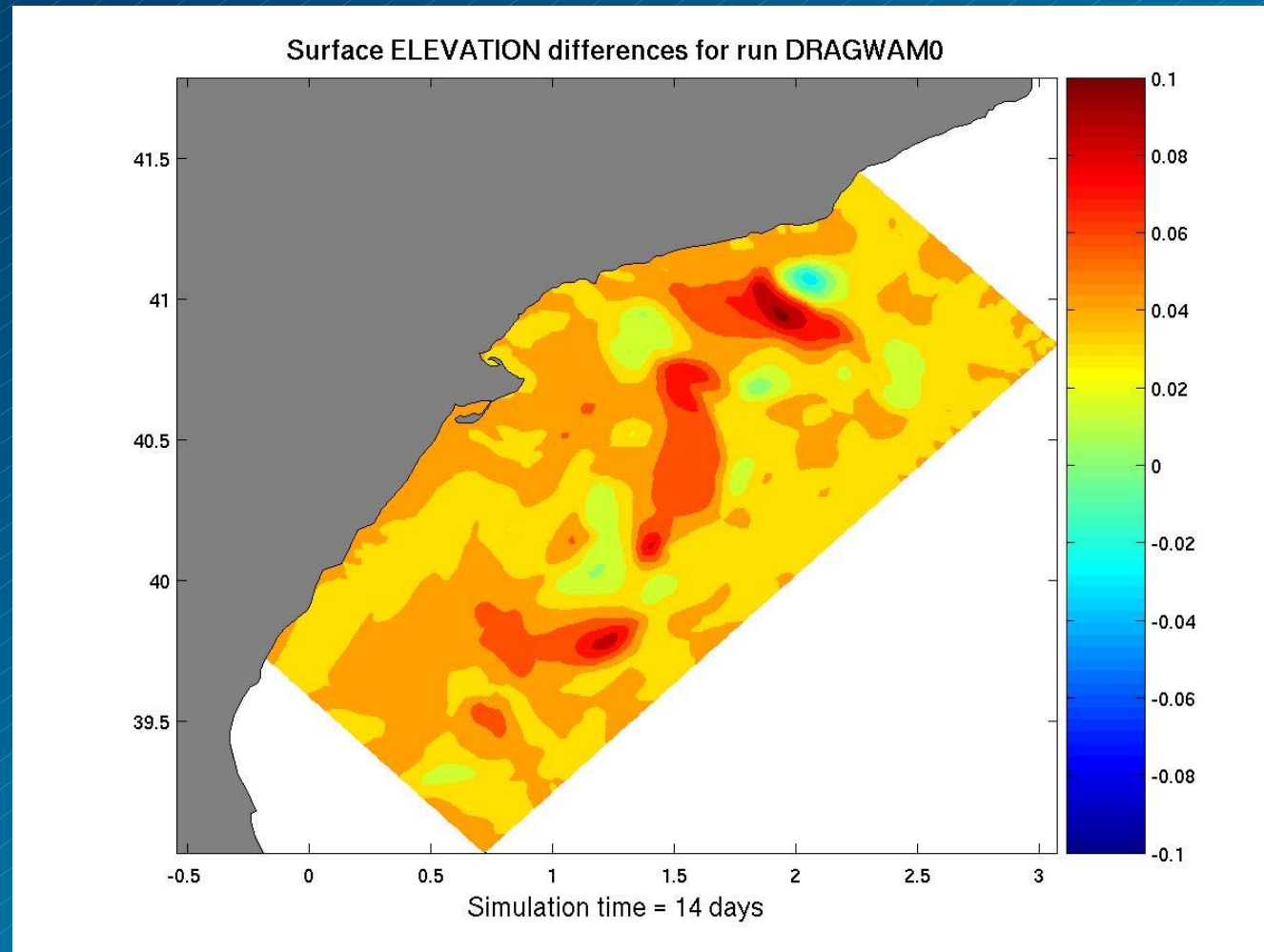


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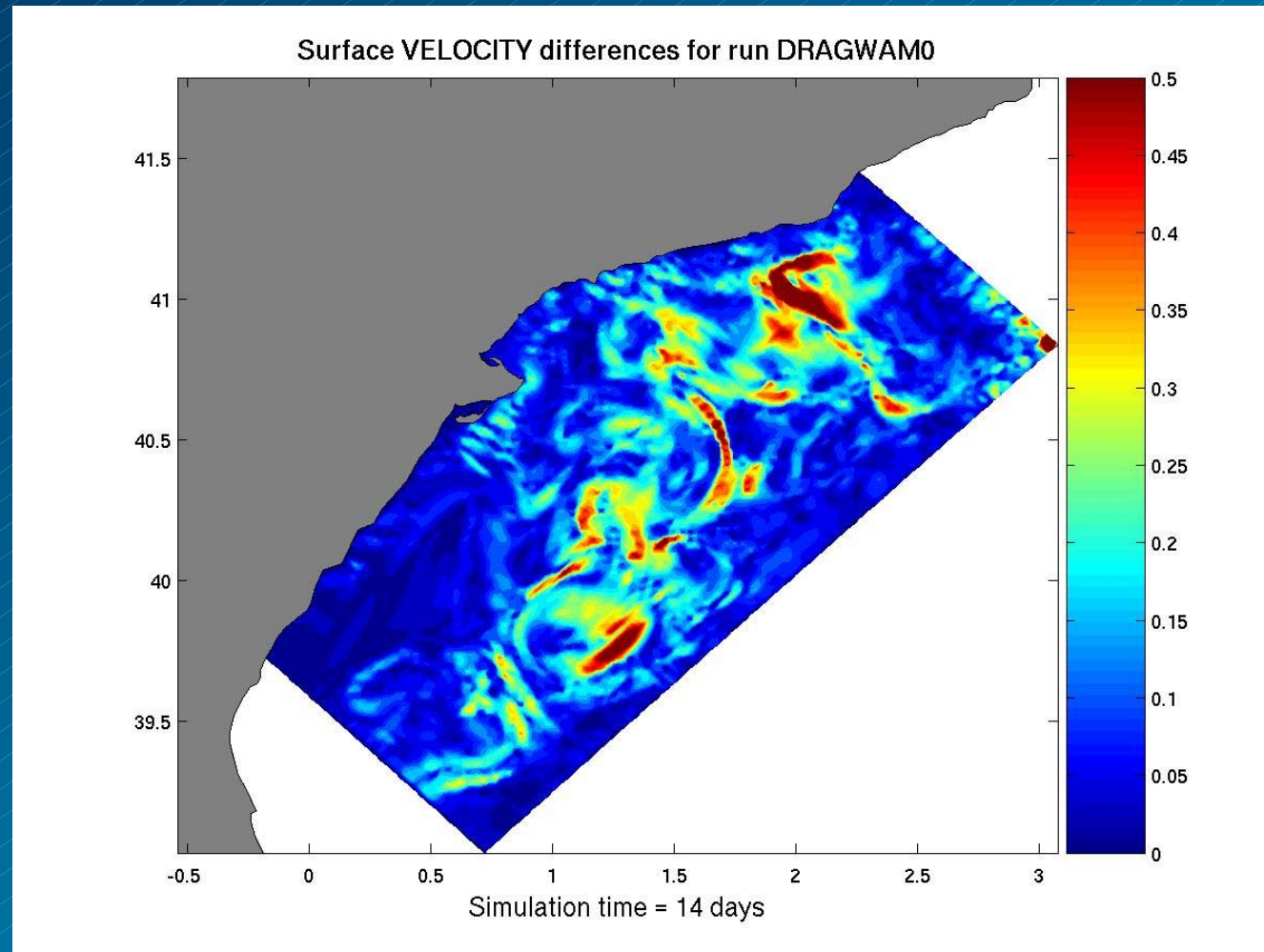


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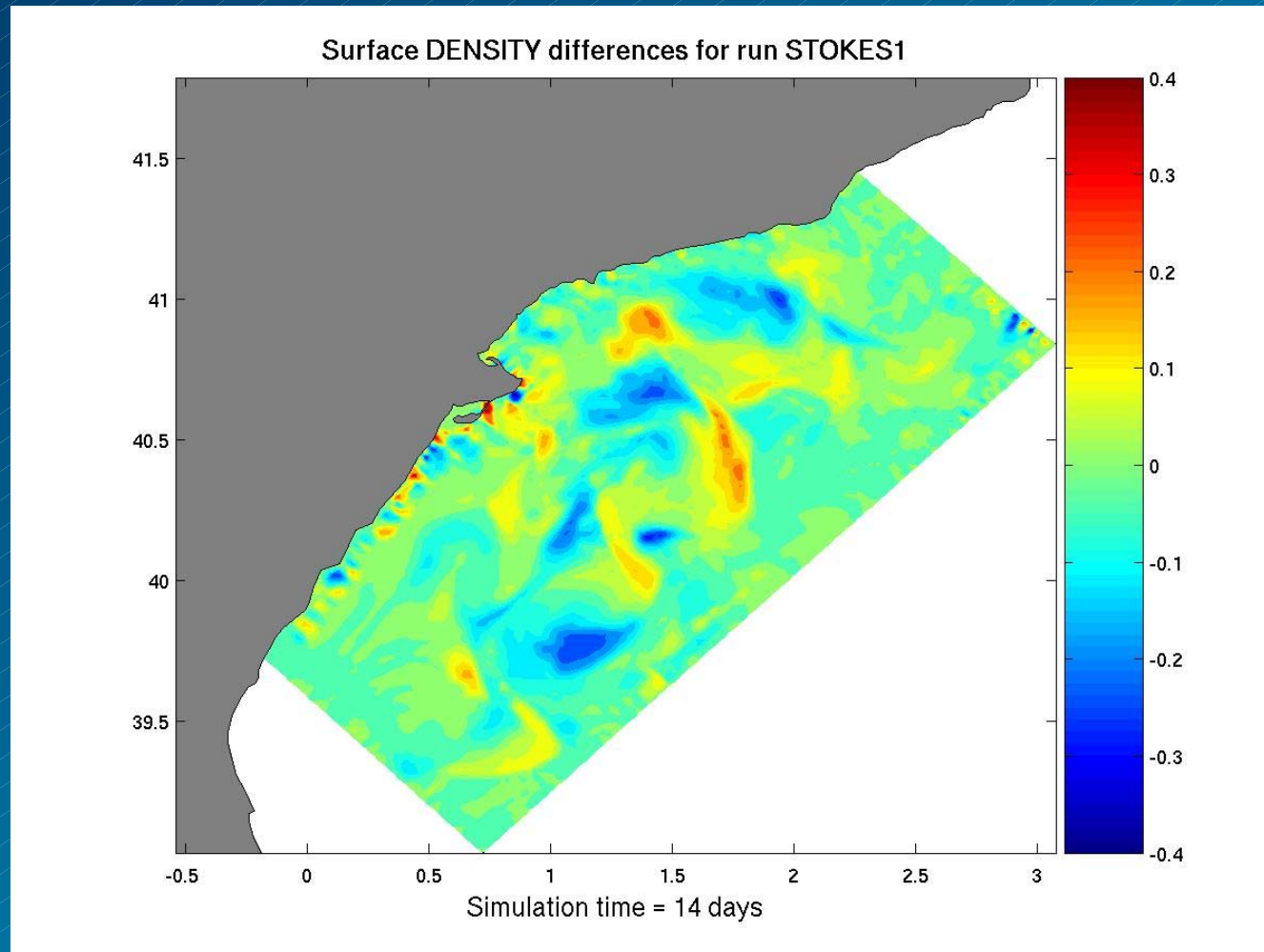


Fig. Diff. [Control (uncoupled) - Coupled (only Stokes drift)]



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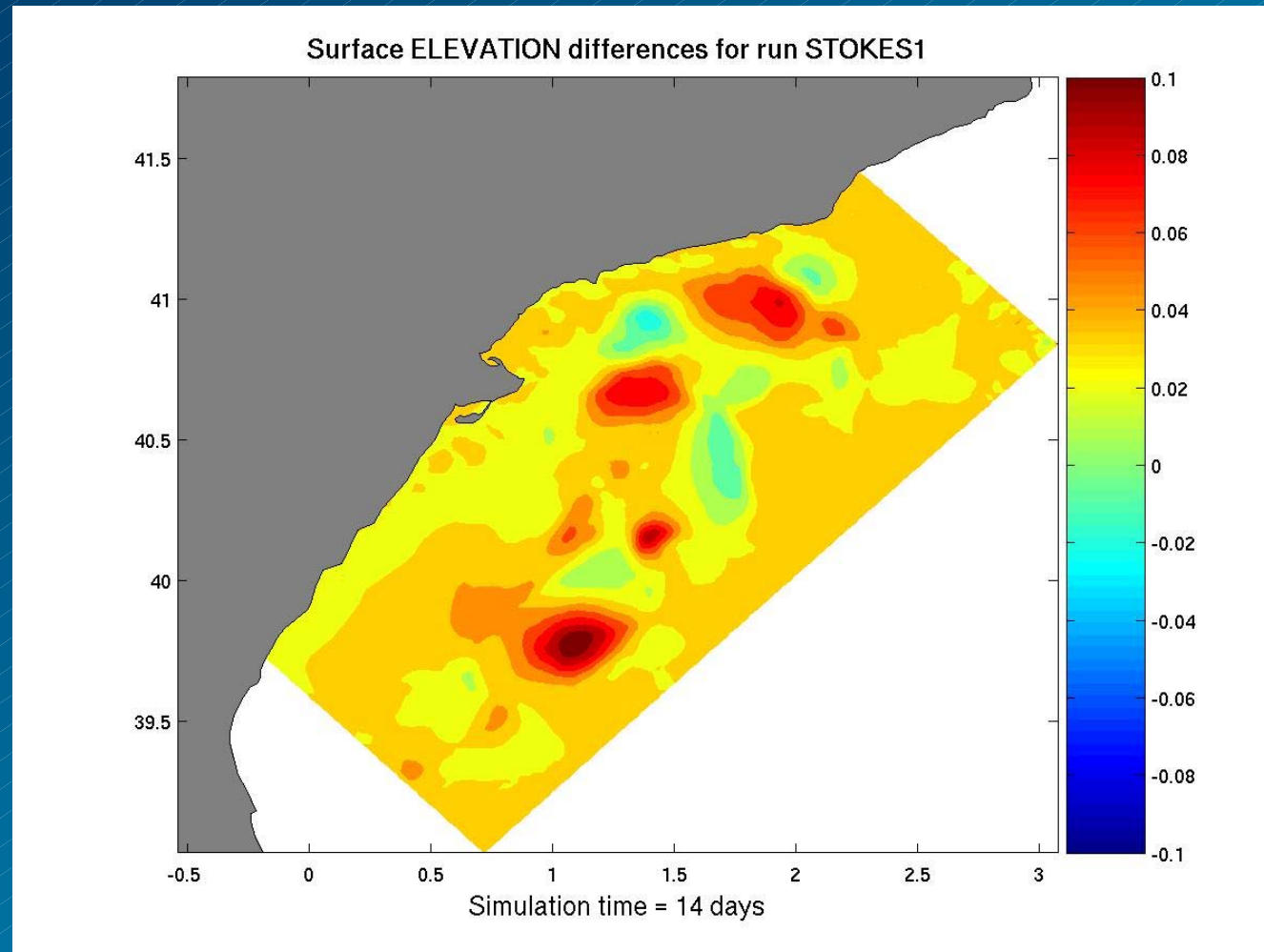


Fig. Diff. [Control (uncoupled) - Coupled (only Stokes drift)]

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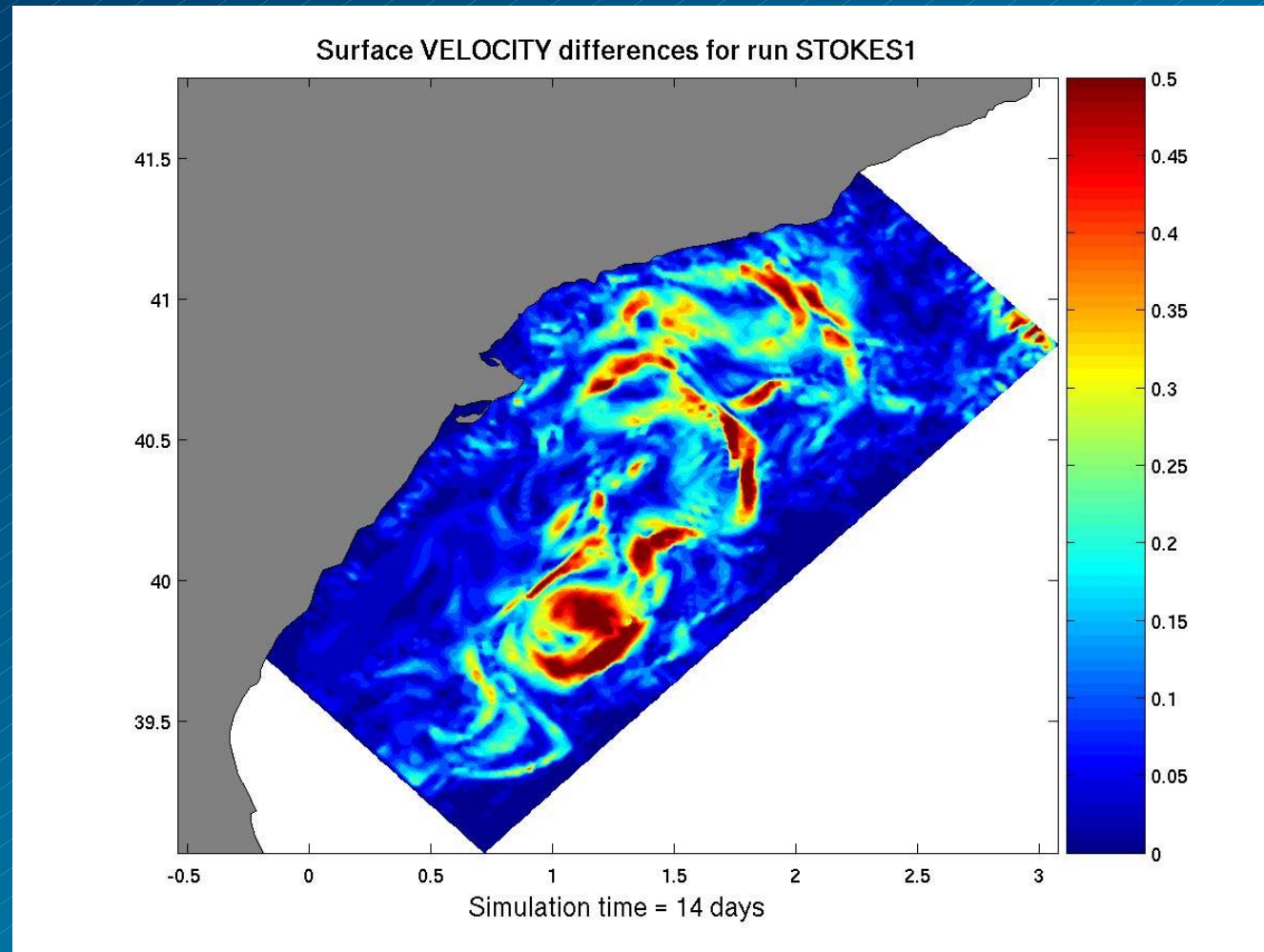


Fig. Diff. [Control (uncoupled) - Coupled (only Stokes drift)]

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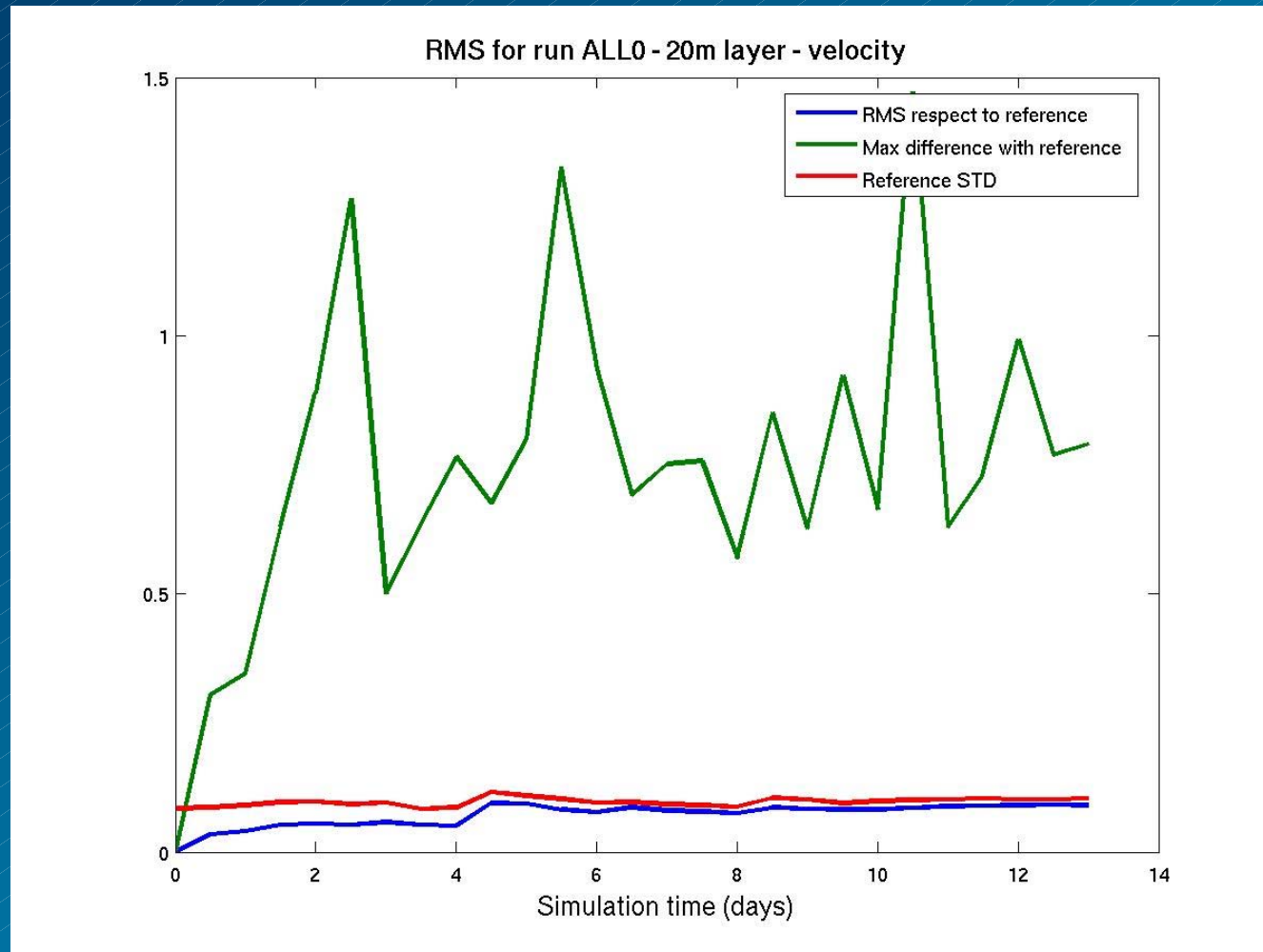


Fig. RMS Diff. [Control (uncoupled) in red - Coupled (all 3 mechn.)]

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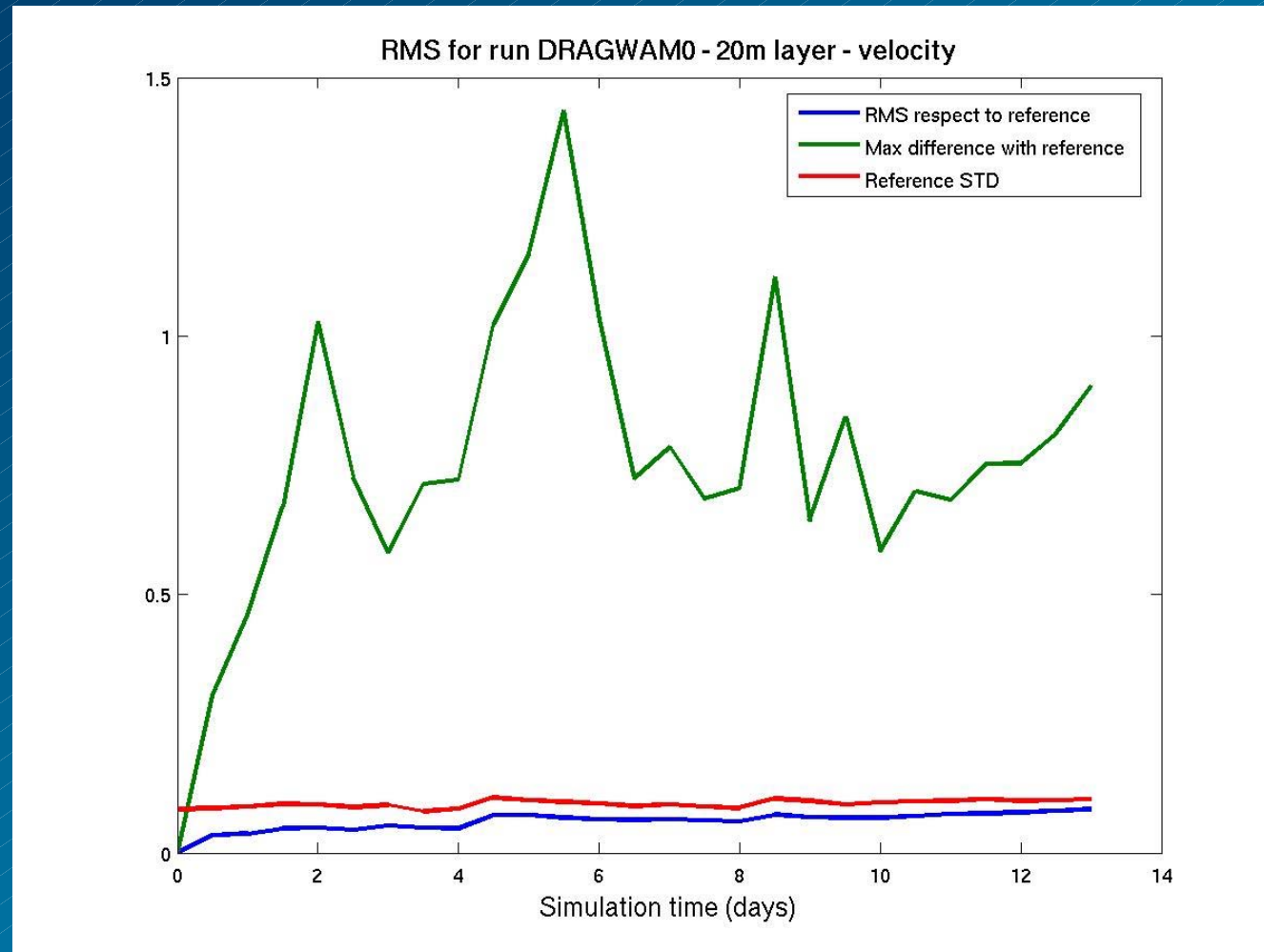
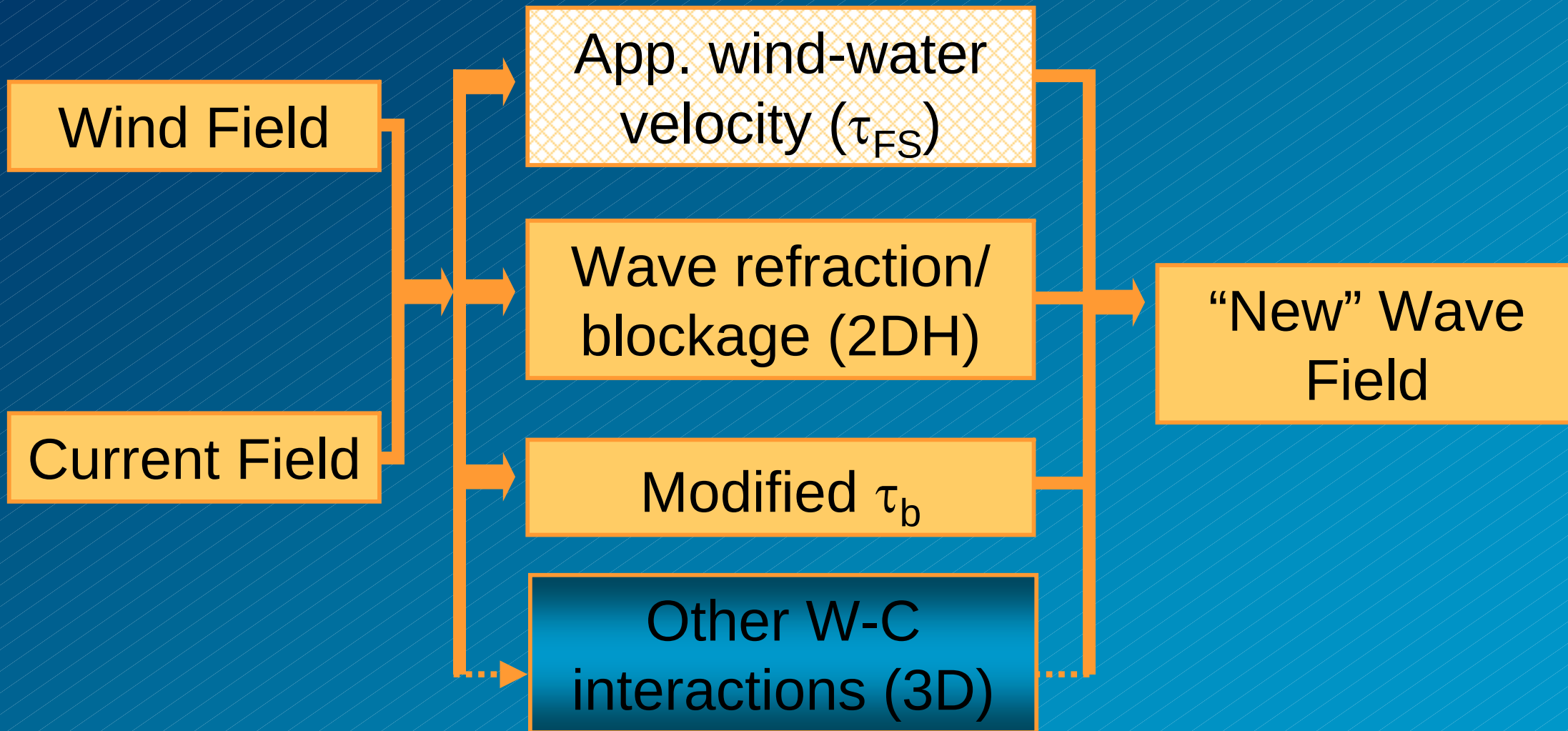


Fig. RMS Diff. [Control (uncoupled) in red - Coupled (wind drag)]

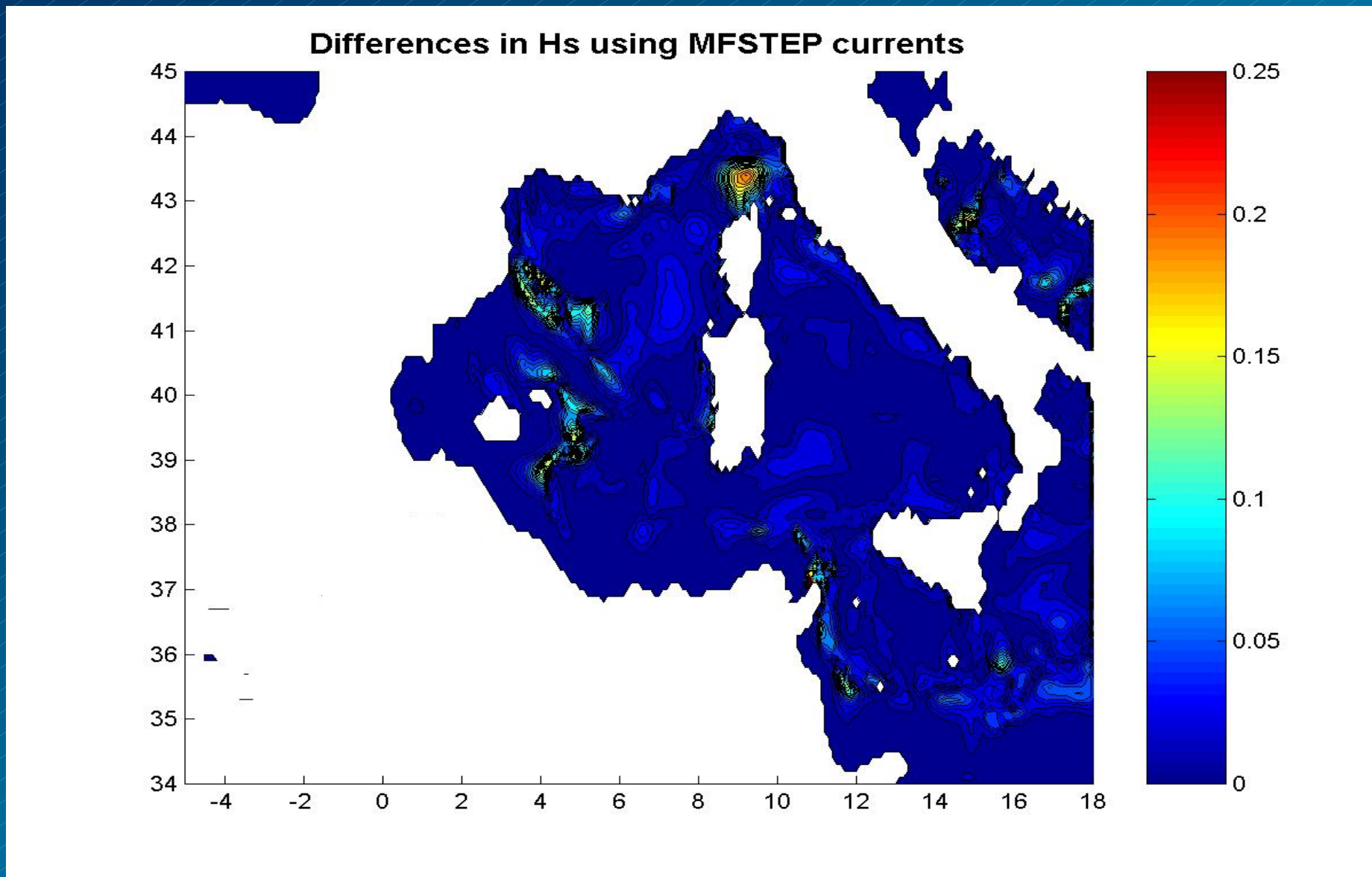
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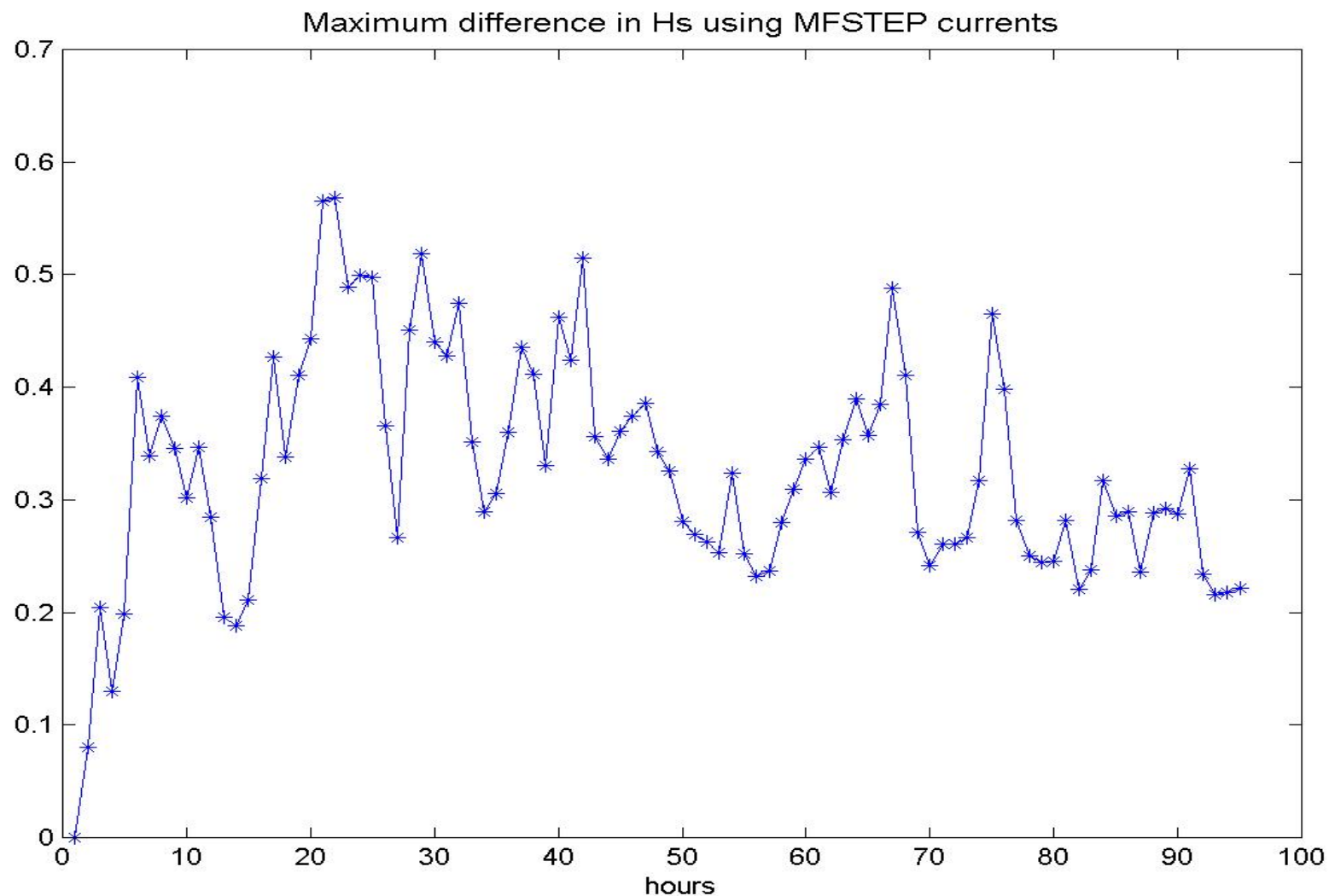
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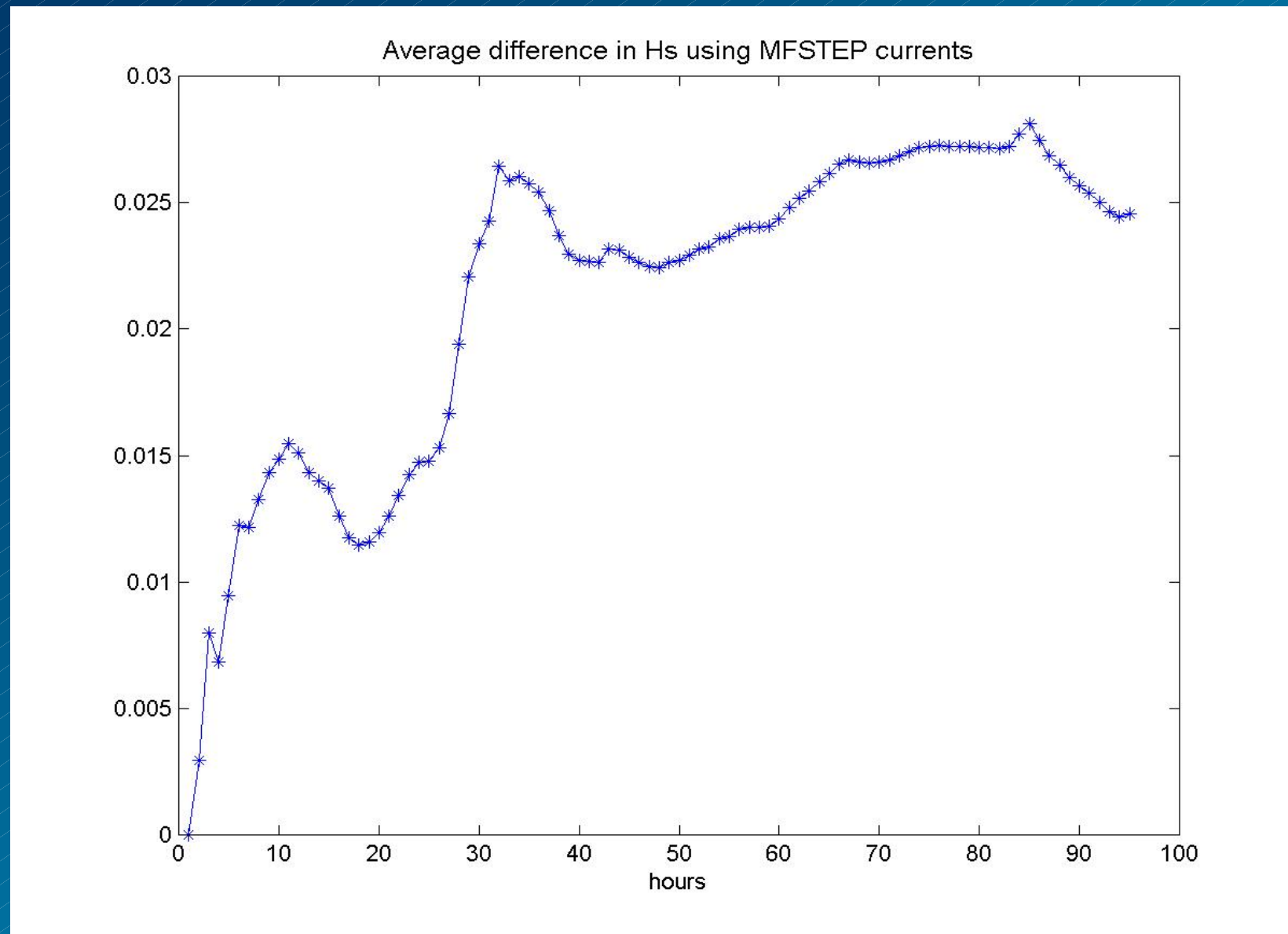
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Initial ranking of coupling mechanisms tested

For the Current Field (Wa $\rightarrow$ Cu)

Rank	Mechanisms	Remark
1-	Stokes Drift (Mf non-breaking)	▪ Cumulative effect ▪ Whole domain
2-	Modified wind-drag ($f(H/L)$)	▪ Steady effect (in simulated interval) ▪ Local
3-	Enhanced τ_b	▪ Requires enough spatial extent ▪ Local

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Initial ranking of coupling mechanisms tested

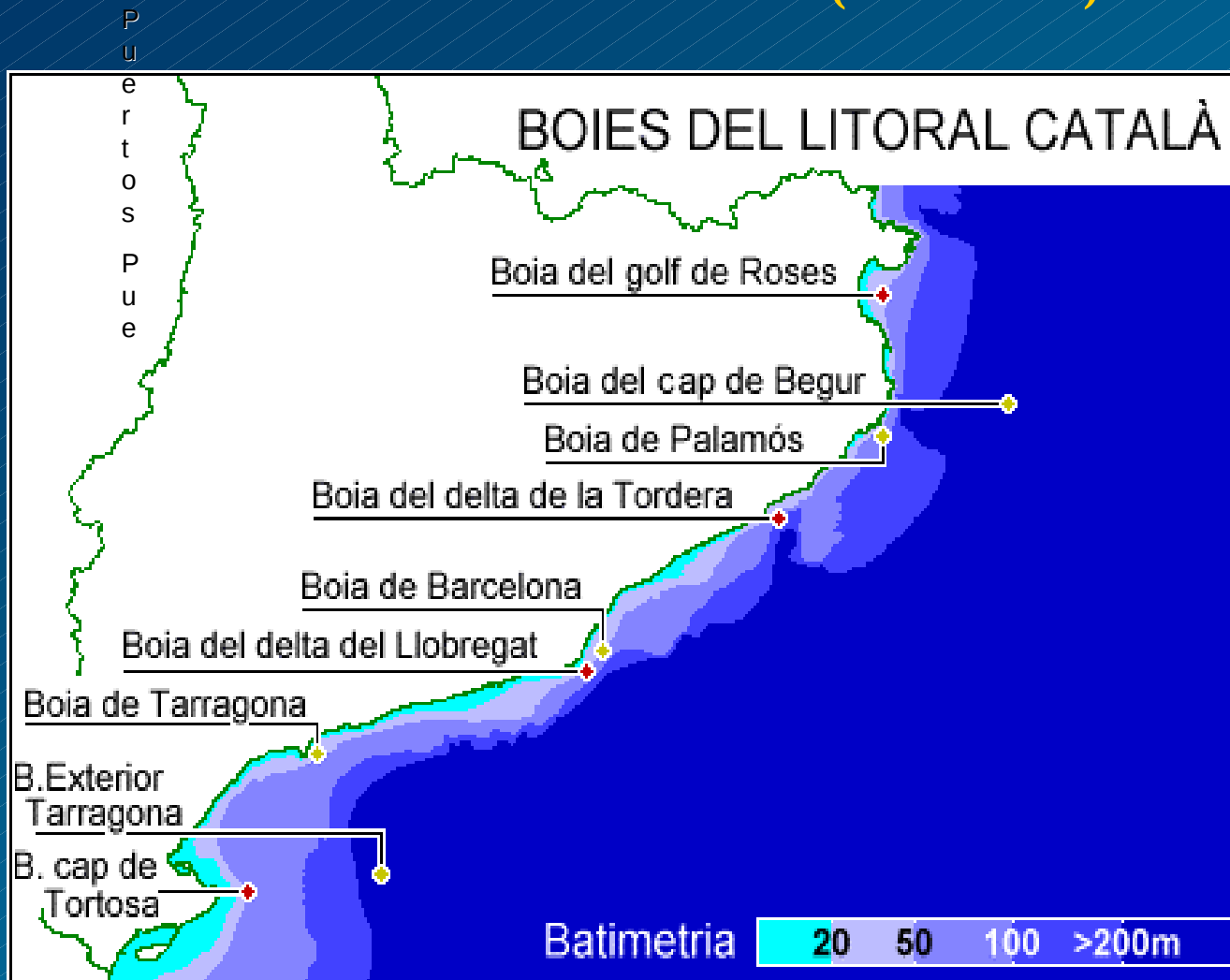
For the Wave Field (Cu $\rightarrow$ Wa)

Rank	Mechanisms	Remark
1-	Wave refraction	▪ Whole domain
2-	Modified bottom-drag	▪ Local ▪ Requires enough spatial extent

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Puertos del Estado + XIOM (Generalitat)



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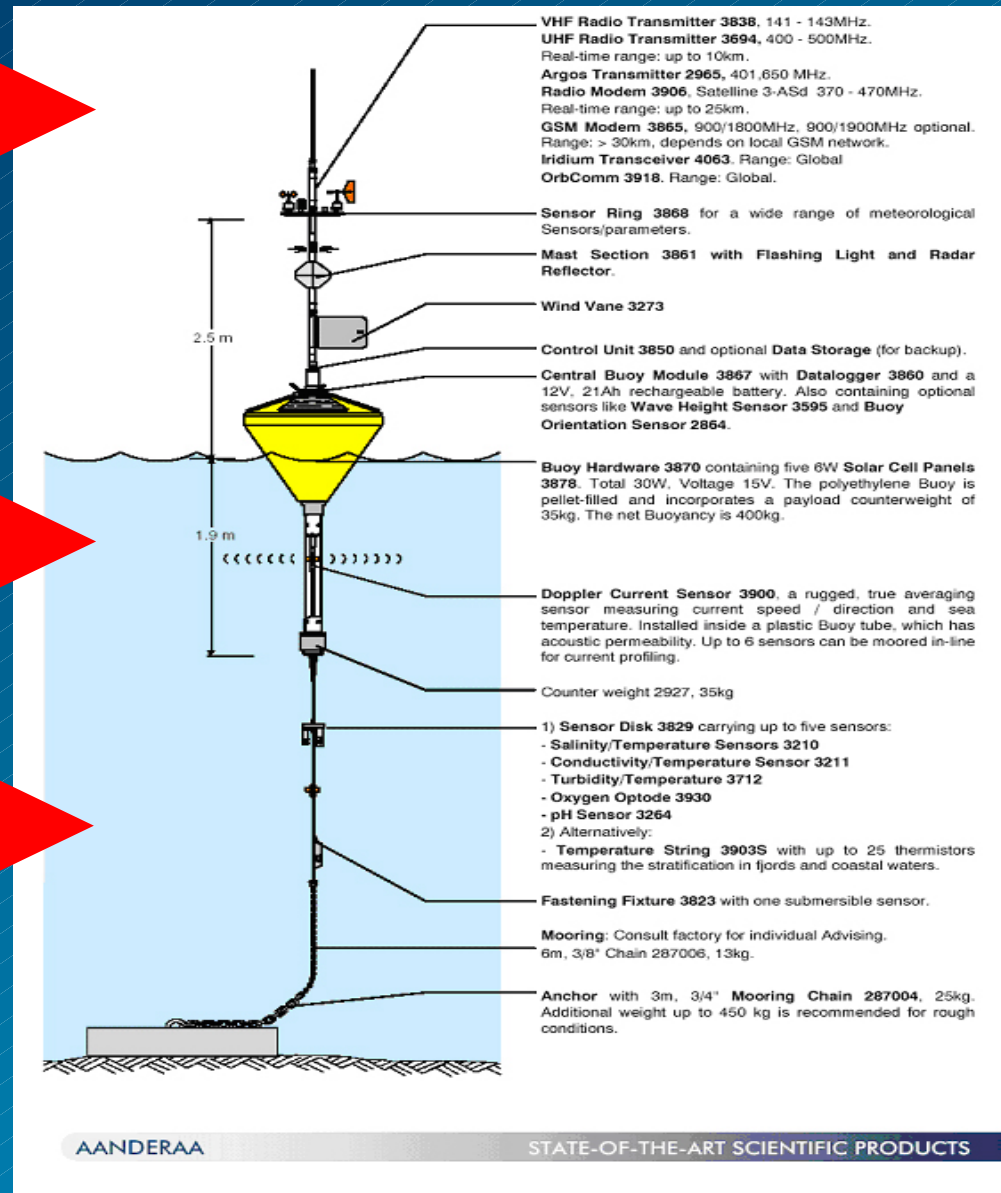
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VENT (3m) →

CURRENT

1.5m →

15m →



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