

Ocean circulation and the deep sea

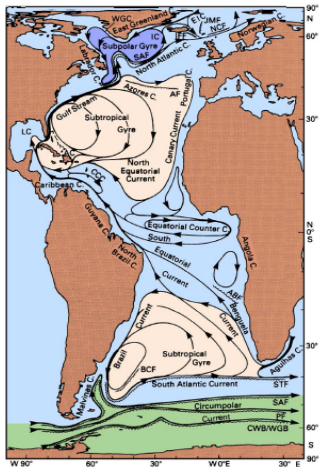
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Encontro Ciência 2010

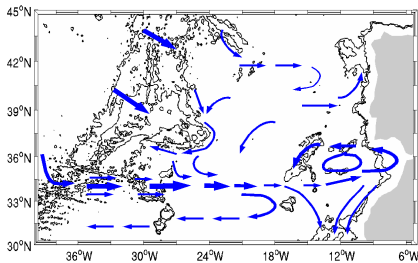


Upper Ocean Circulation

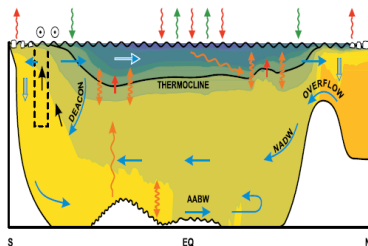
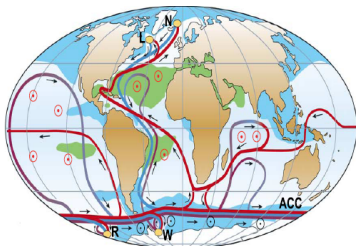


Upper wind driven circulation

- "Short" time-scale gyre circulation
- Details are relatively well known



Meridional Overturning Circulation (MOC)

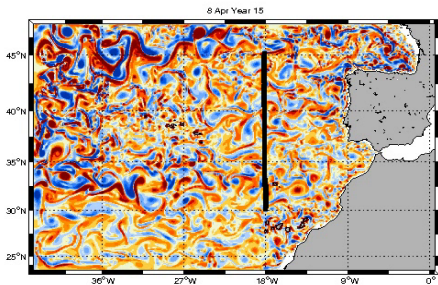


Thermohaline driven circulation

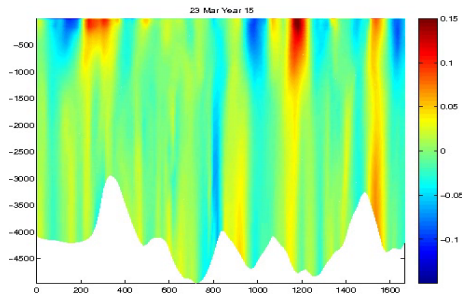
- Decadal to centennial circulation, difficult to measure
- Circulation concentrated on the deeper slopes of the ocean's western boundaries
- Details on the Iberian basin are poorly known

The turbulent ocean: mesoscale

Eddy field

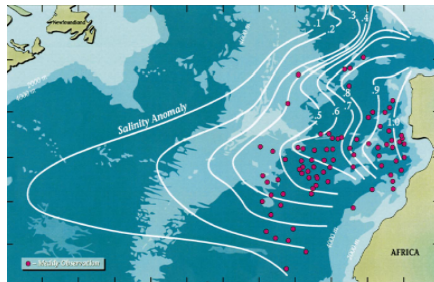
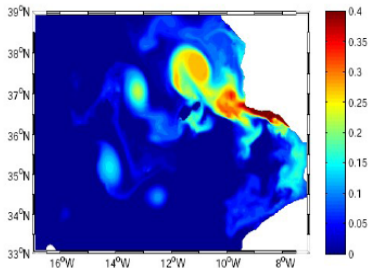


Zonal velocity



- Eddies role on energy transfer to deeper levels
- Eddies as carriers of material to long distances

Eddies at intermediate depths

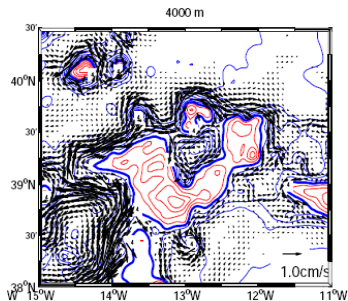


Meddies: a special type of eddies

- Long lived structures that travel great distances
- Determinant for heat and salt diffusion in NA
- Interact with seamounts and ridges

Deep slopes, ridges and seamounts

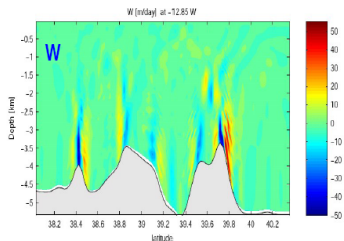
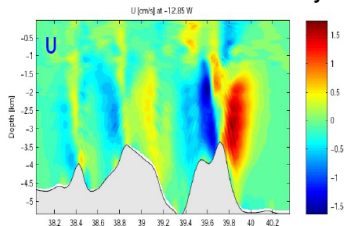
Local processes driving deep flows (e.g. Tore)



Local processes

- Interaction of eddies and currents with seamounts
- Rectification and mixing associated with tides

Zonal and vertical velocity



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Prospects for ocean circulation studies

Up to now, main focus on surface and intermediate layers

Deep sea is the natural follow-up

Topics for future research

- Scales of Meridional Overturning Circulation (MOC)
 - how quickly can it change?
- Mesoscale and submesoscale processes
 - energy transfer across scales and vertically
- Regional studies
 - continental slopes, ridges, seamounts, hydrothermal vents



Research Requirements

- 1 Platforms for deep sea measurements (currents, etc.)
 - Worldwide, only 56 current meters at depths > 4000 m
- 2 National participation in Global Ocean Observing Systems like the ARGO infrastructure
- 3 Increase computational capacity for ocean simulation
- 4 Increase the number of scientists engaged in ocean circulation!

... *The End*



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