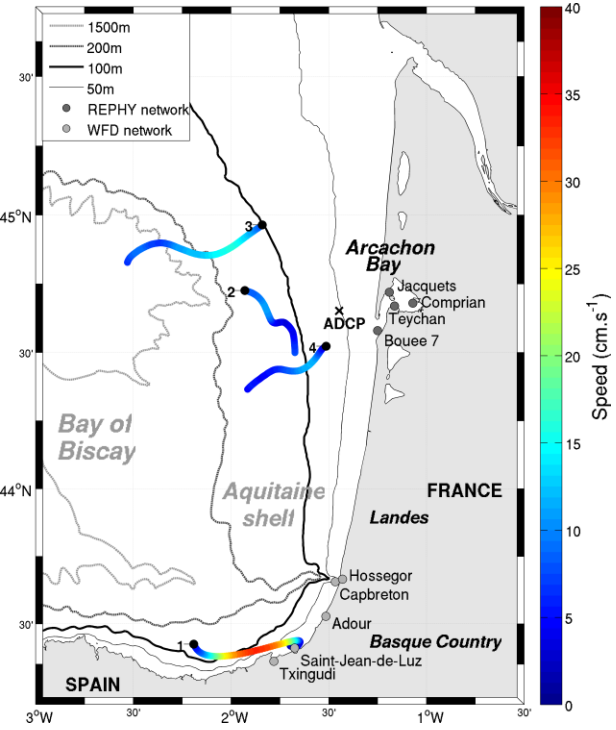
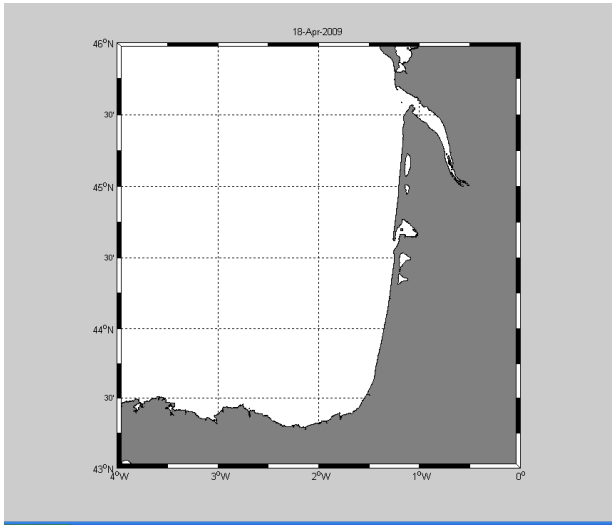
The Landes current

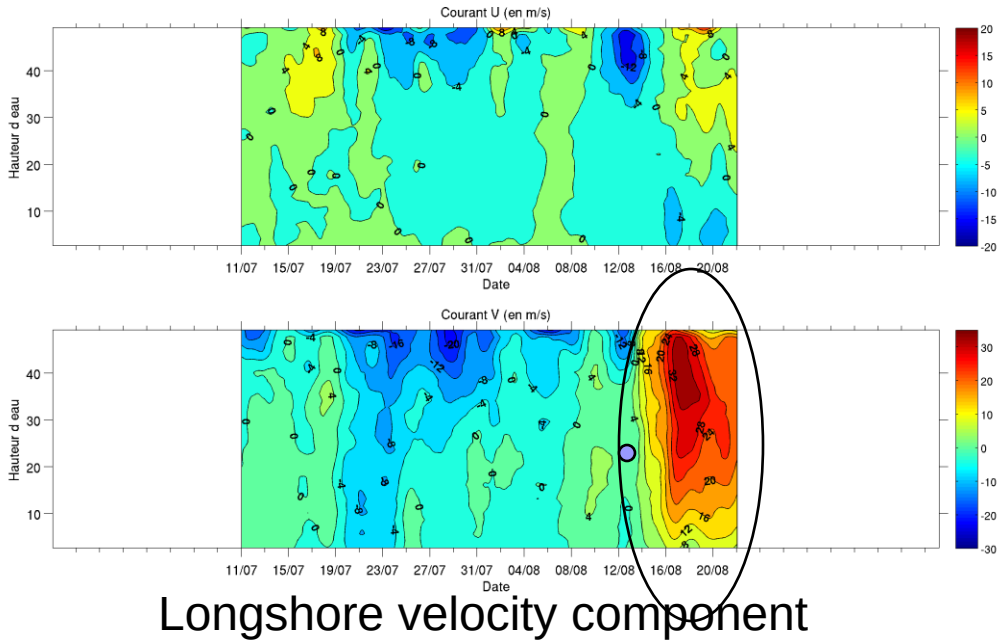
F. Batifoulier, P. Lazure, P. Bonneton



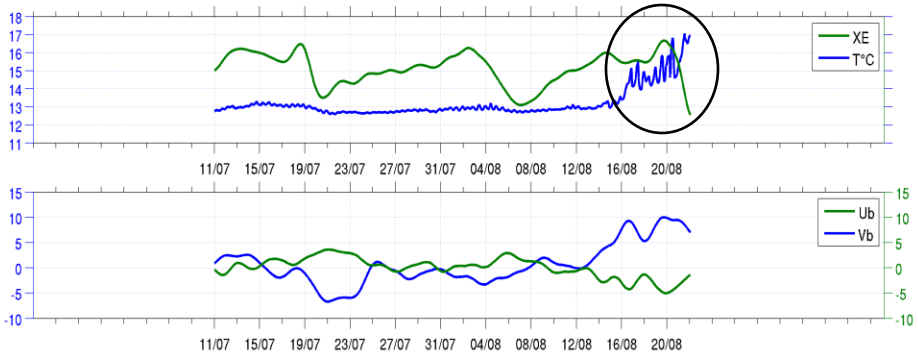
- Observations
- Schematic simulations
  - Base case
  - Straight coastline
- Conclusions
- Next step

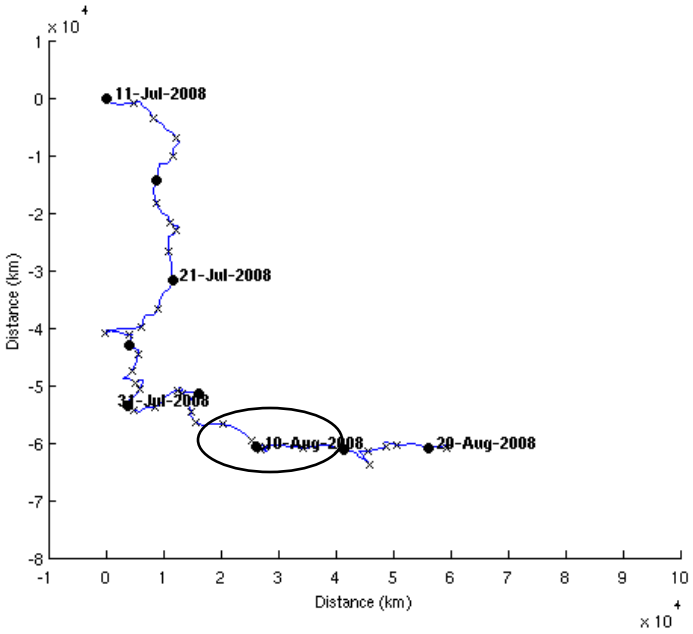


Observations in 2008



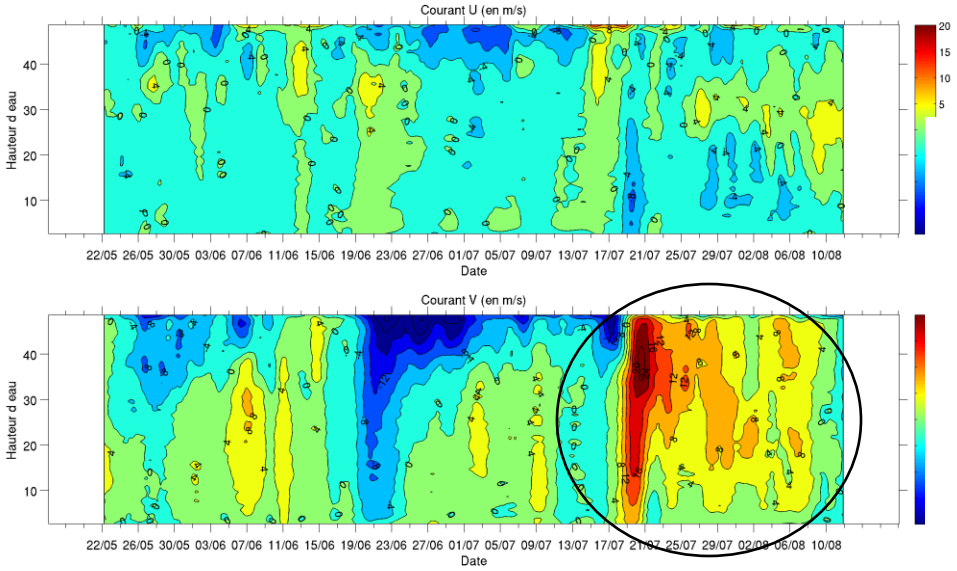
Longshore velocity component



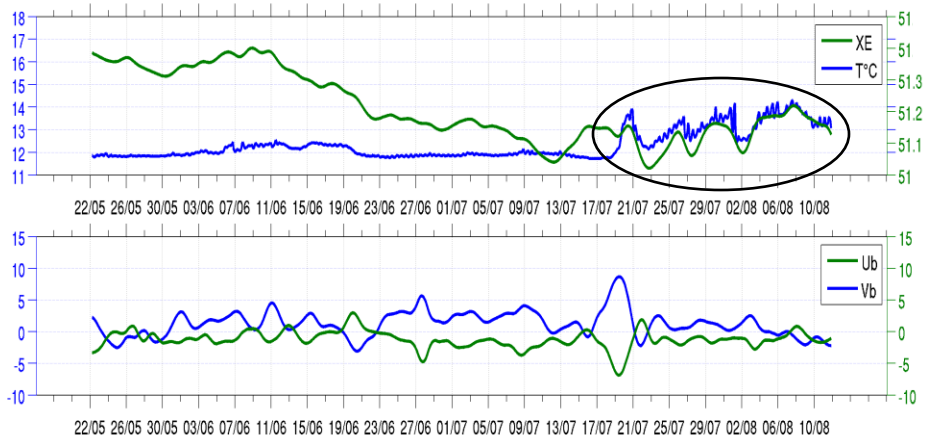


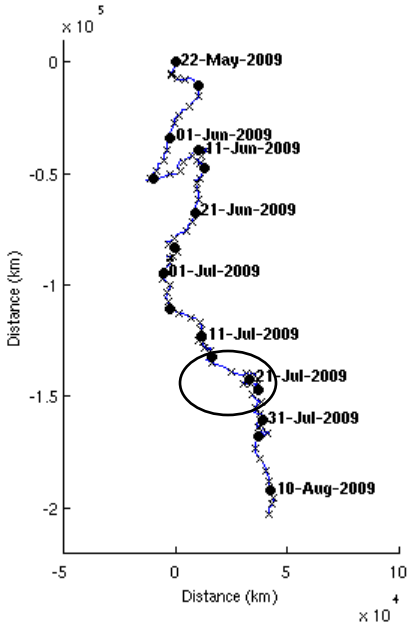
Wind progressive vector diagram

Observations in 2009



Longshore velocity component

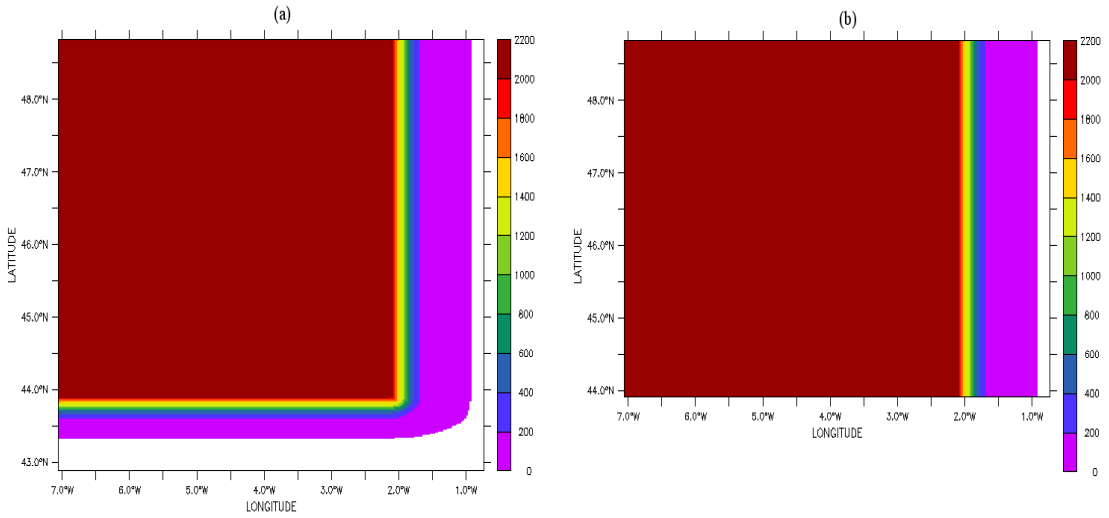




Wind progressive vector diagram

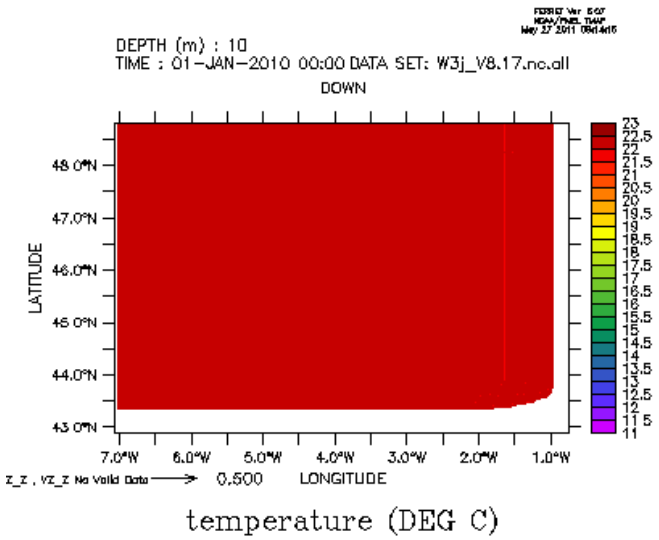
Simulations

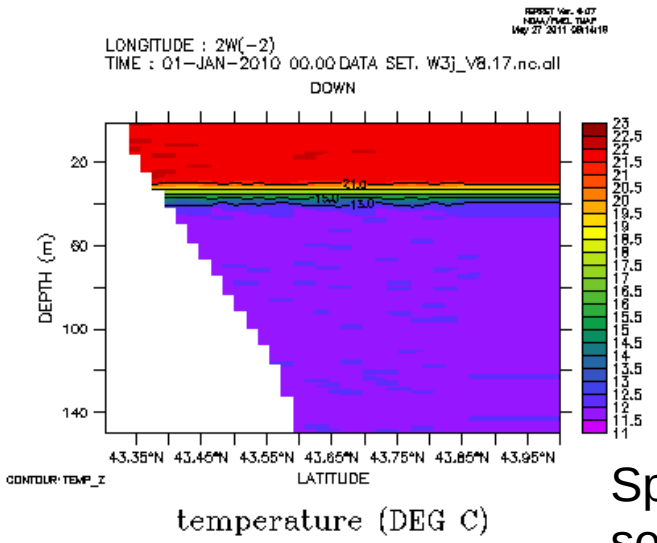
- Mars3D model
- Grid size : 2km, 50 sigma levels
- 2 domains. Continental shelf slopes : 0.44% (spanish coast), 0.22% (french coast)
- Density field : 22°C from surface to 30m, Thermocline of 10m, 12°C below 40m
- Forcing : 3 days of 10m/s westerlies



Base case

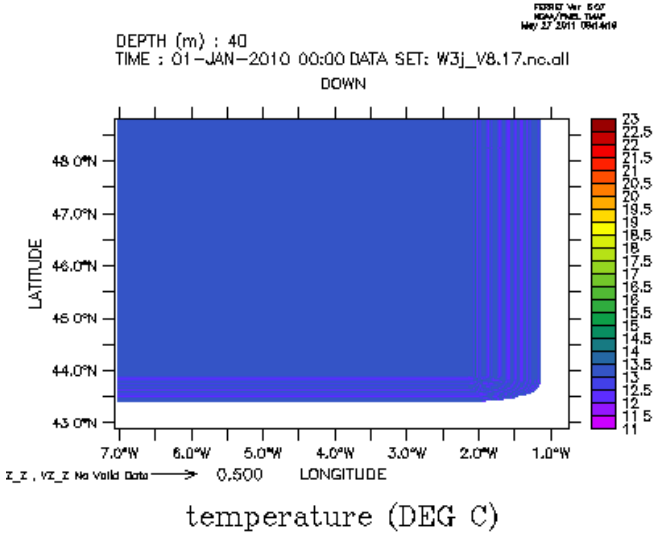
Surface

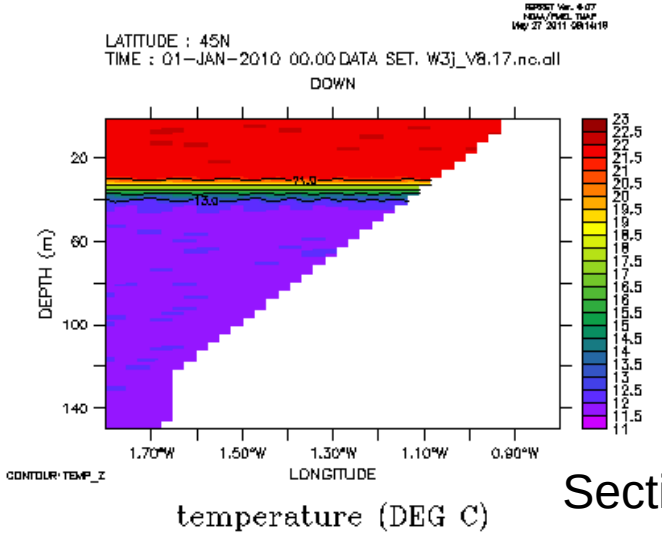




Spanish section(2°W)

40m





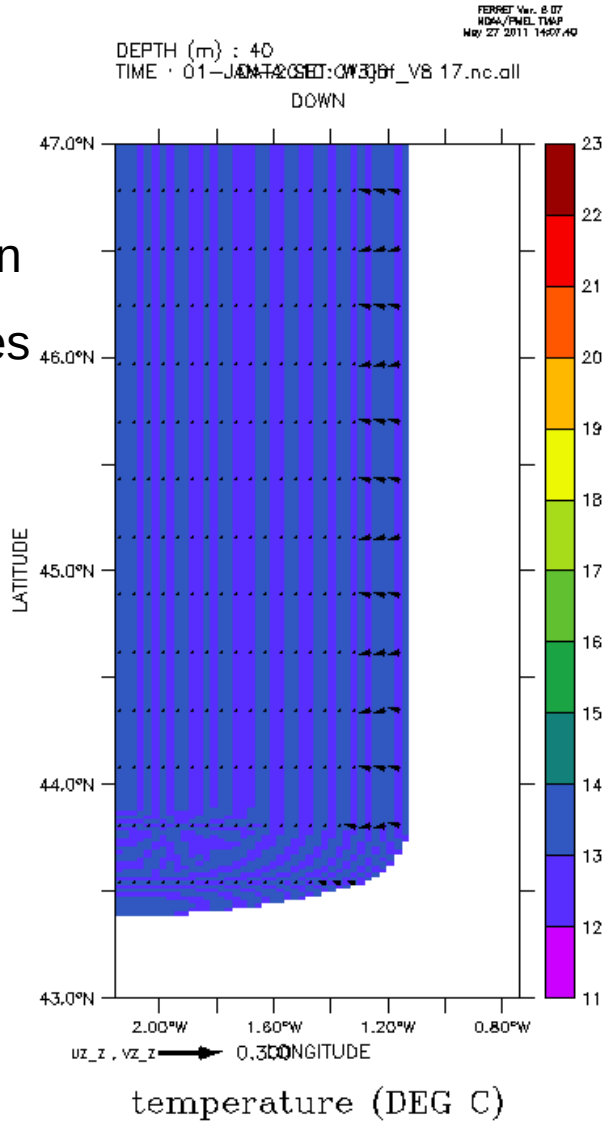
Section at 44.5°N

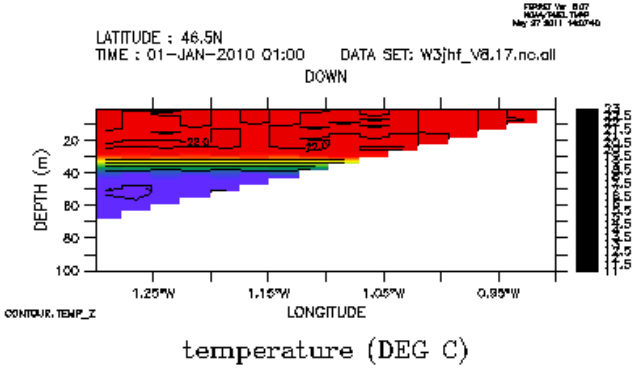
Along the french coast

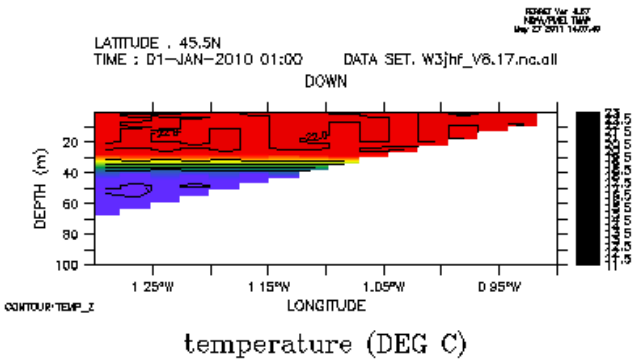
-Downwelling circulation

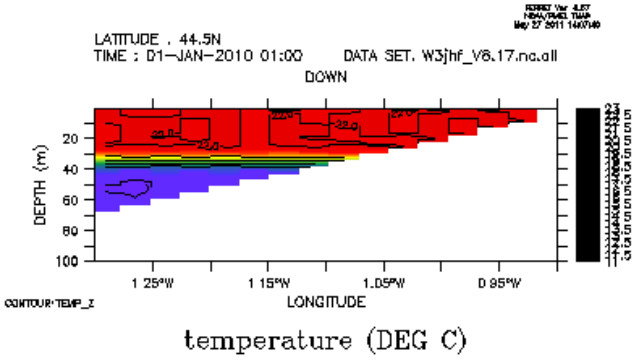
-The bottom front moves downslope

-Strong poleward circulation over the bottom front

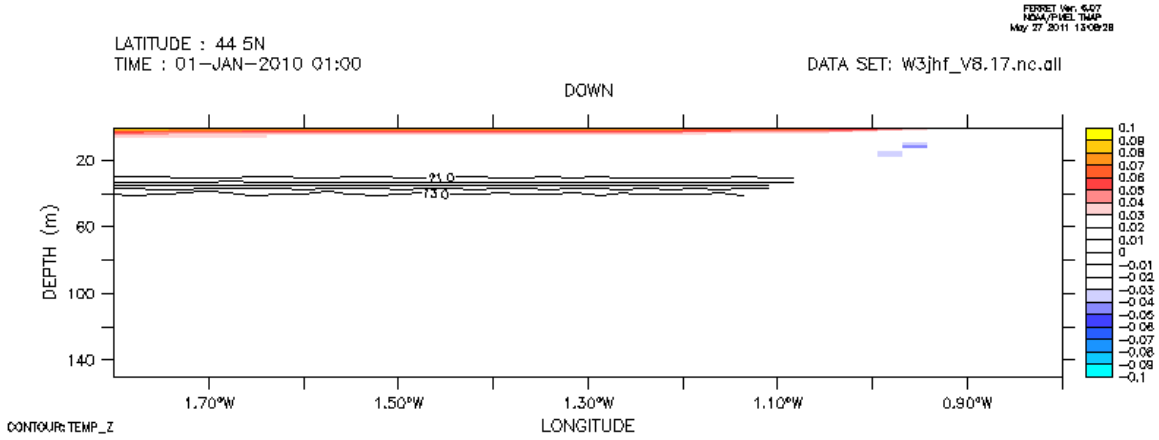




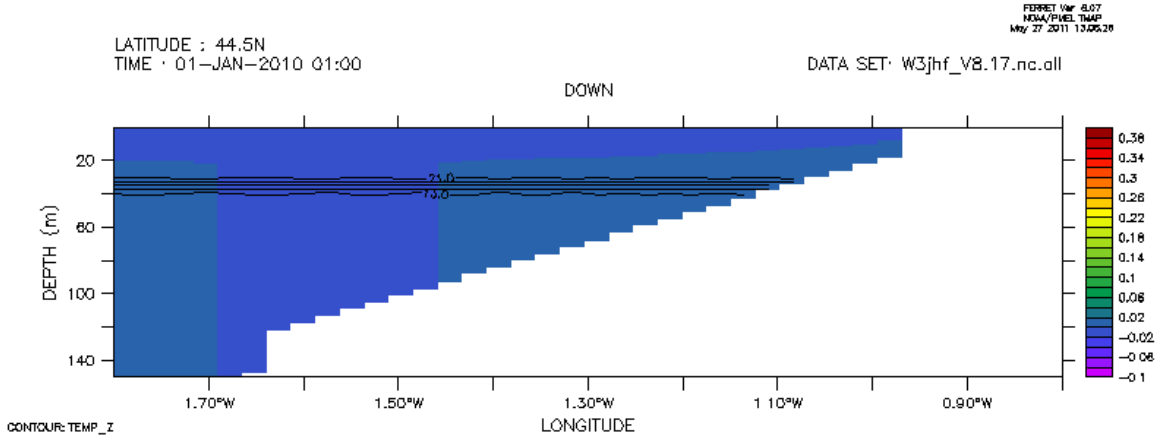




Transect at 44.5°N



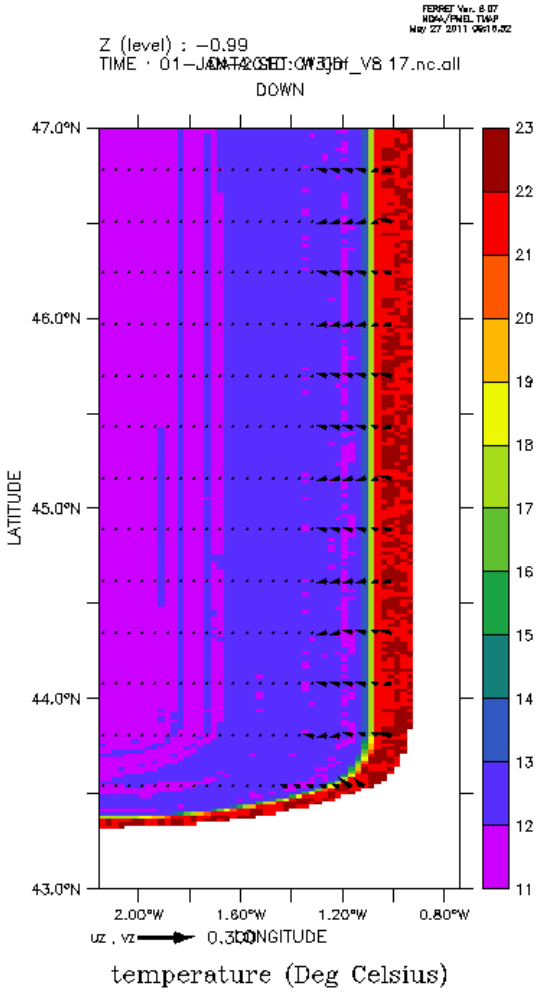
vitesse zonale (M/S)

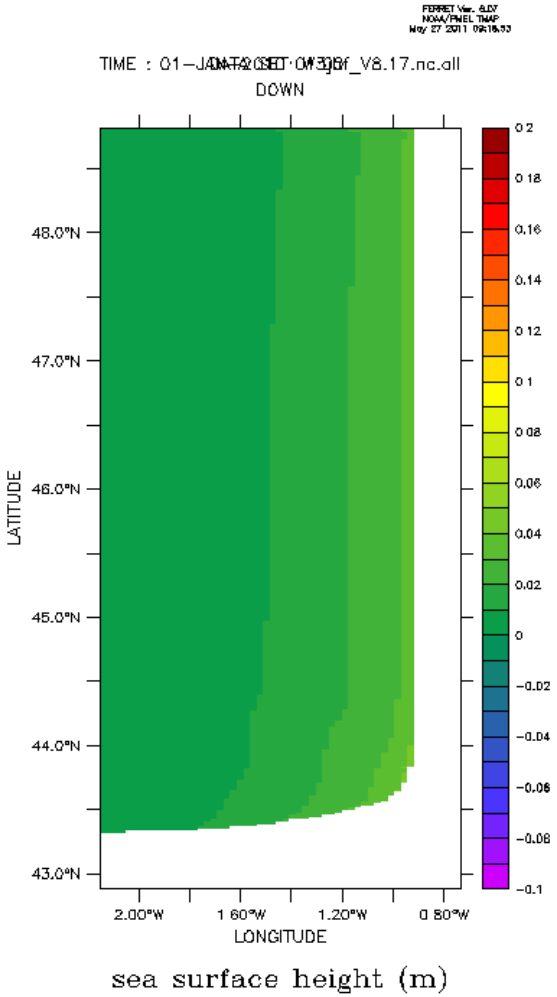


vitesse meridienne (M/S)

Zoom on the Landes coast

Bottom temperature and currents

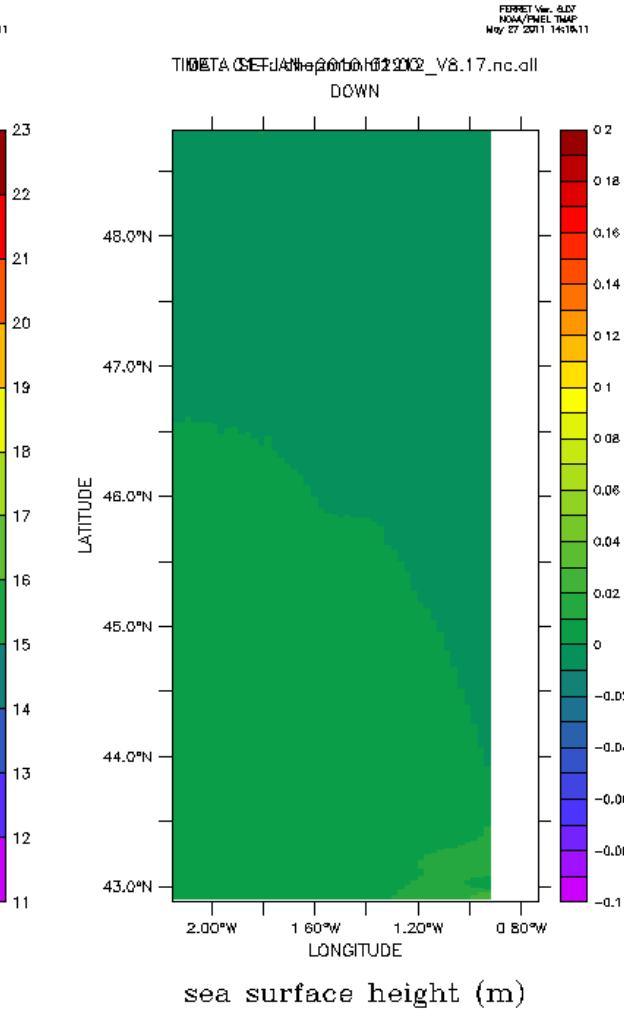




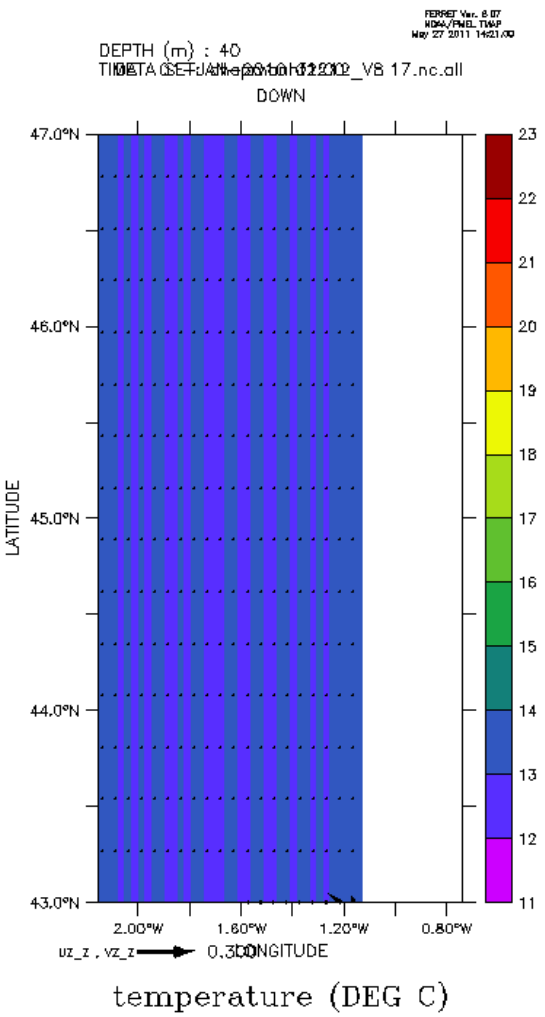
Sea Surface Height

Straight coastline Simulation

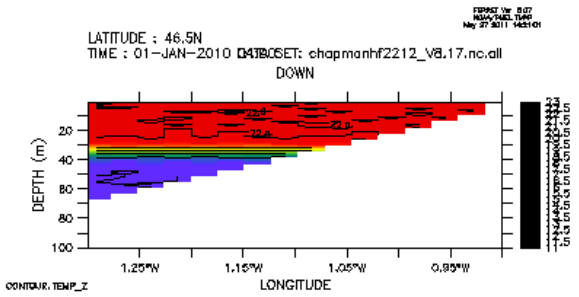
- Bondary conditions :
  - No wind
  - Southern boundary : rise of SSH to 12cm in 3 days and back to 0 cm



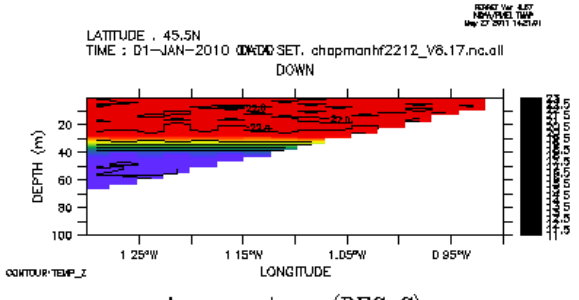
sea surface height (m)



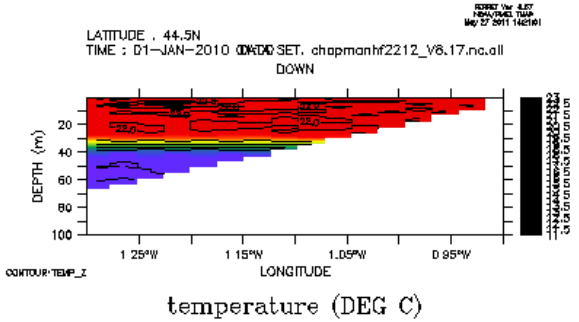
temperature (DEG C)



temperature (DEG C)

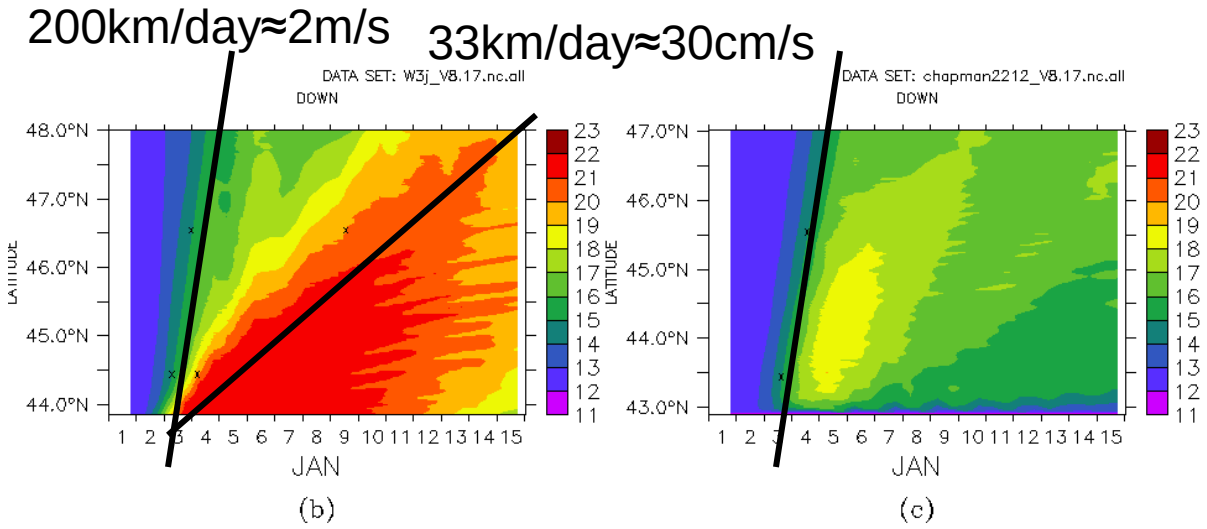


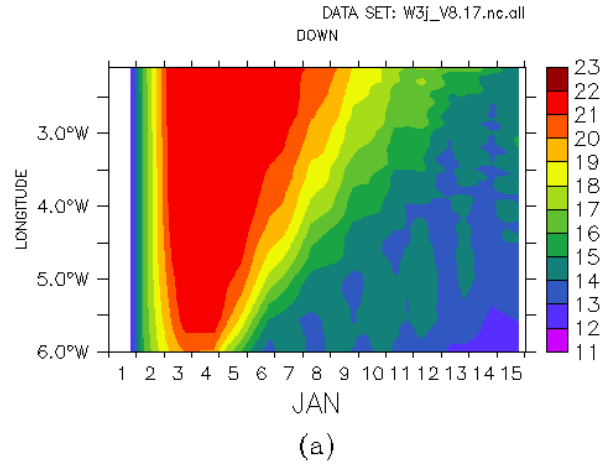
temperature (DEG C)



temperature (DEG C)

Time evolution of bottom temperature along transects





- Diagram of bottom temperature at depth of 50m:

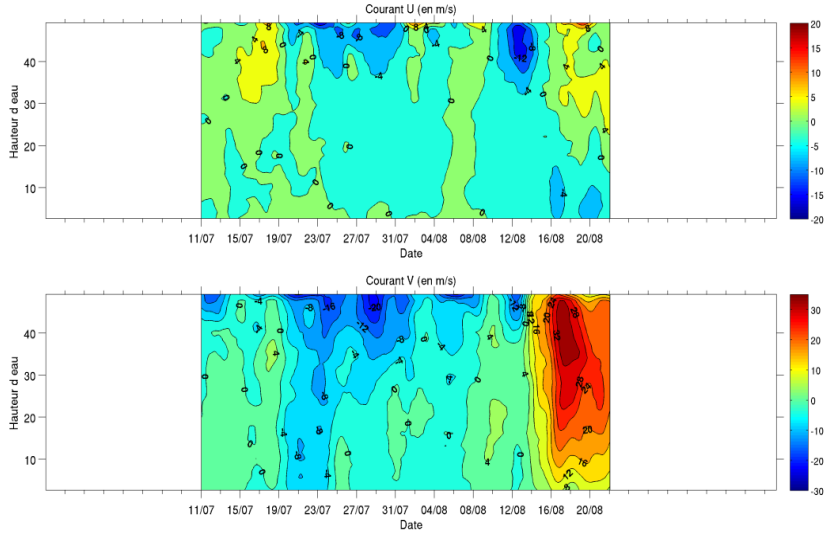
  -a: Base case :along Spanish coast

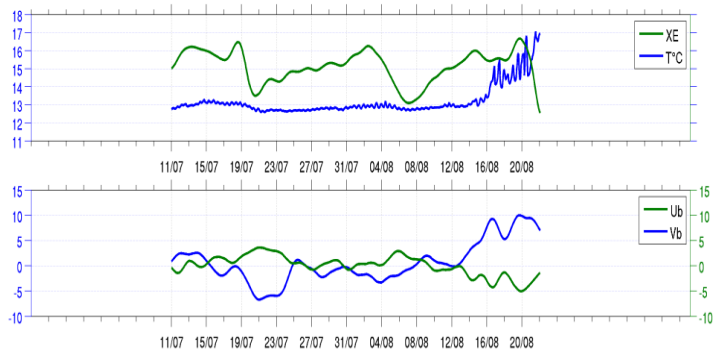
  -b : Base case : along Landes coast

  -c : Straight coastline

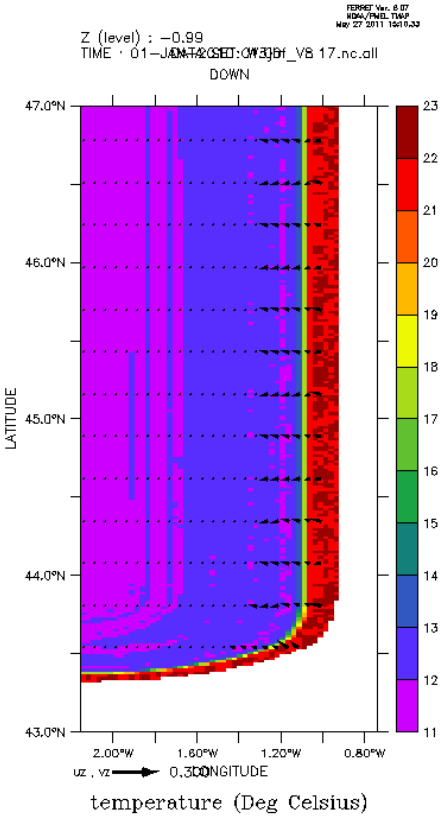
Conclusions

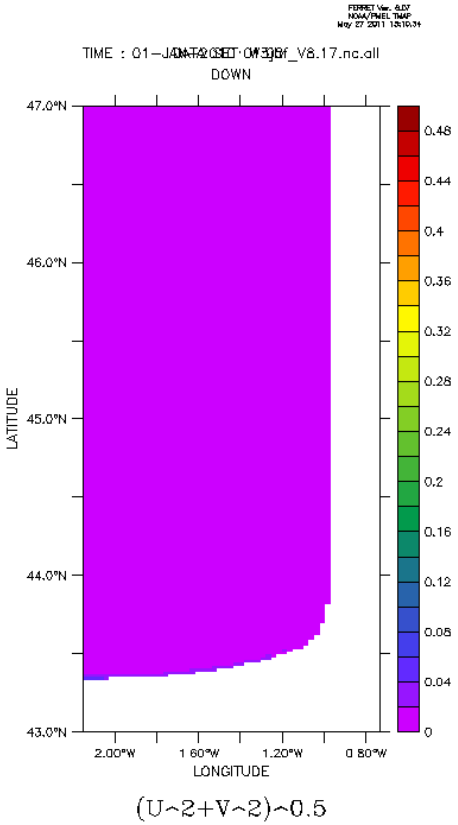
- Few days of westerlies => Downwelling circulation along the spanish coast
- Rise of SSH, maximum of 15cm in the SE corner
- Downwelling like circulation along the coast of Landes => offshore displacement of bottom front and rise of bottom temperature
- Advection of warm water from South
- Sensitivity analysis (wind duration and direction, stratification,…)

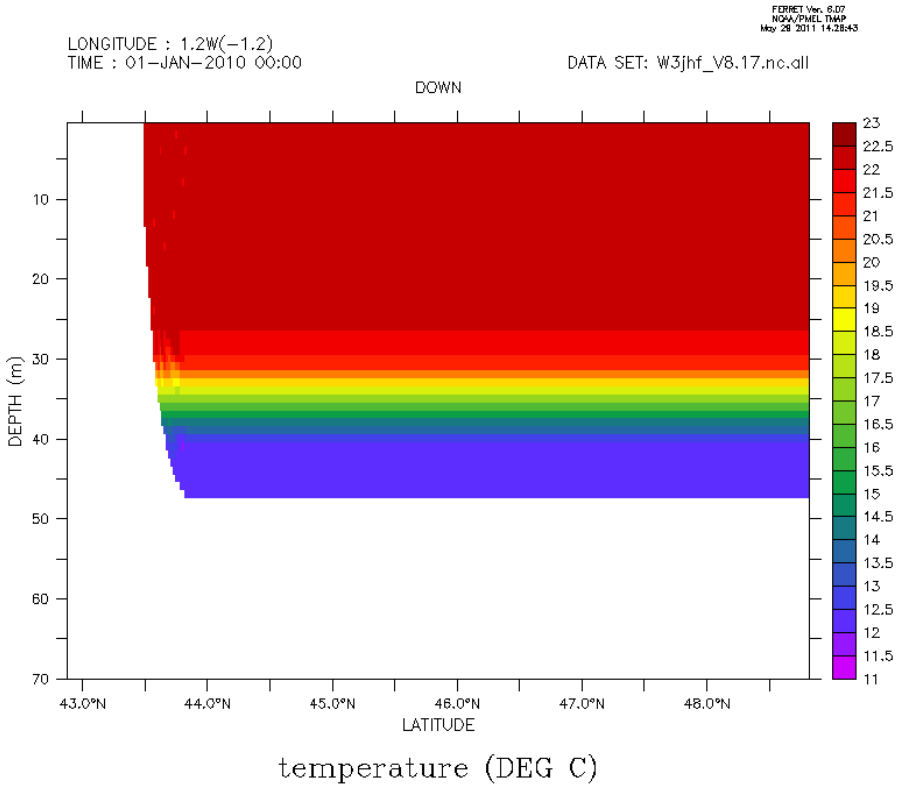




Next step : Assessment of the advection of warm bottom water





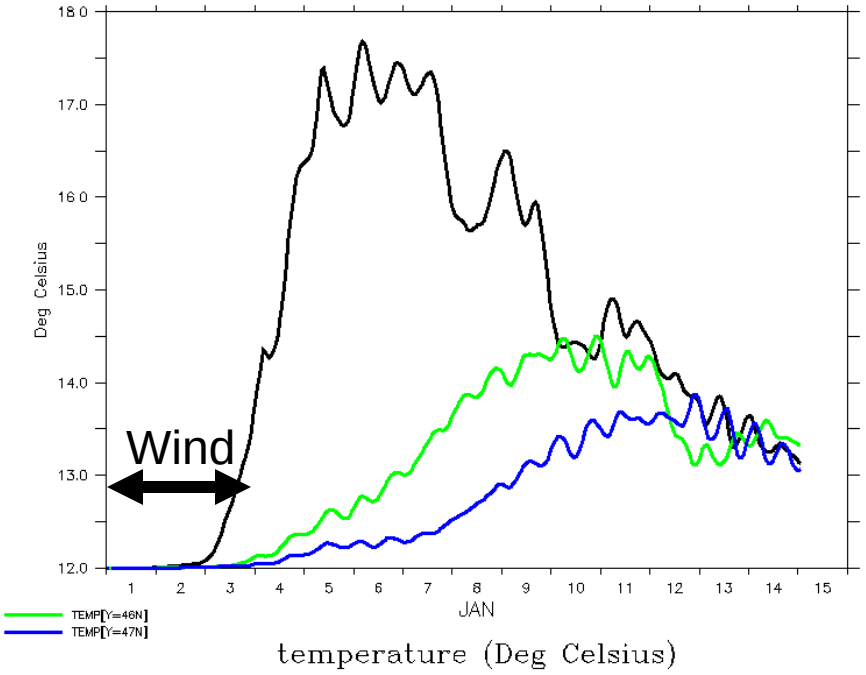


Bottom temperature

Barotropic current

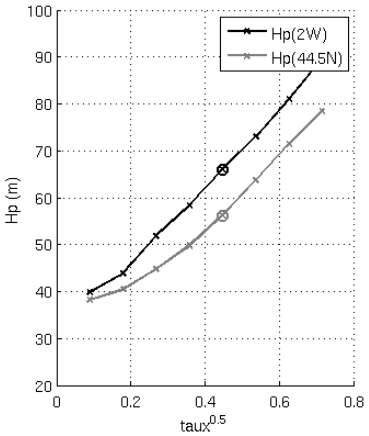
Temperature along a S-N transect

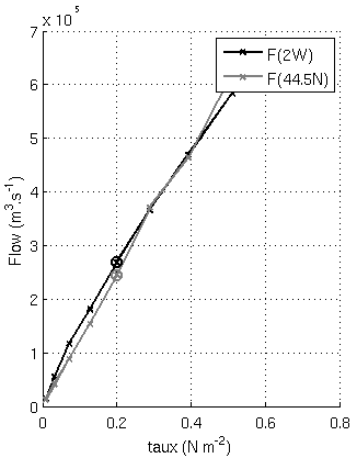
Next step : Assessment of the advection of warm bottom water

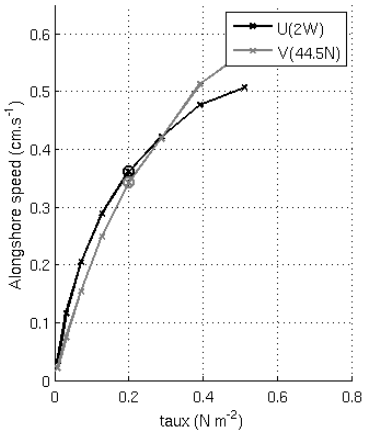


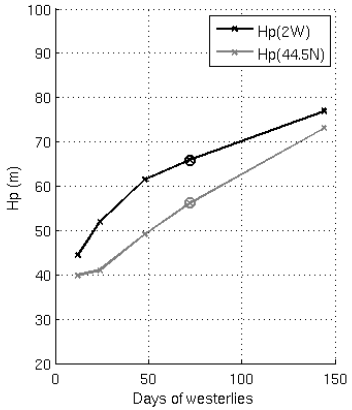
Evolution of bottom temperature at 44.5°N, 46°N and 47°N

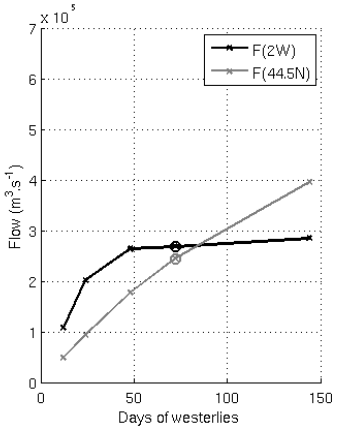
- Need to be assessed :
  - Role of the frictionnal effects of tides
  - Widening of the shelf
- Realistic simulations of Aspex observed episodes

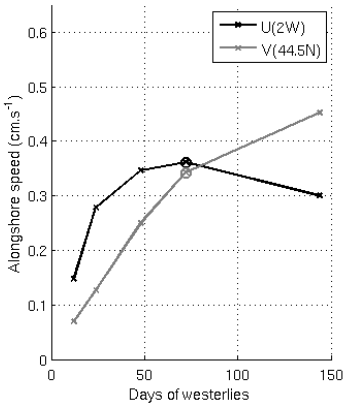

Hp(2W)
Hp(44.5N)
Hp (m)
taux^0.5

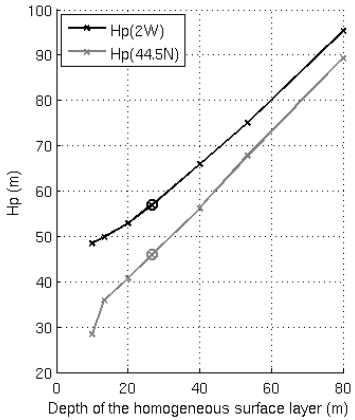

x 10^5
F(2W)
F(44.5N)
Flow (m^3.s^-1)
taux (N m^-2)

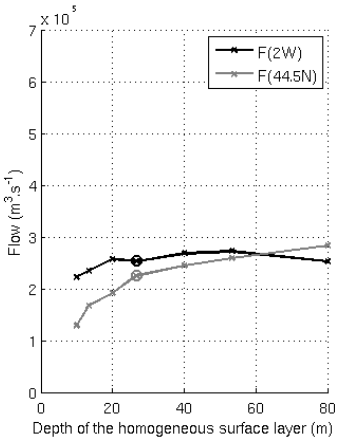

U(2W)
V(44.5N)
Alongshore speed (cm.s^-1)
taux (N m^-2)

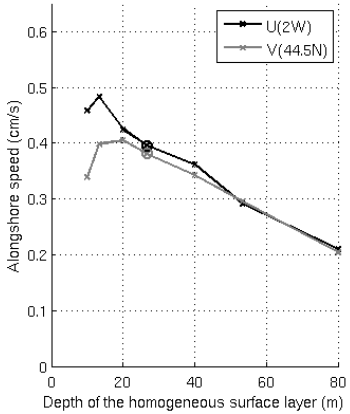

Hp(2W)
Hp(44.5N)
Hp (m)
Days of westerlies


x 10^5
F(2W)
F(44.5N)
Flow (m^3.s^-1)
Days of westerlies


U(2W)
V(44.5N)
Alongshore speed (cm.s^-1)
Days of westerlies


Hp(2W)
Hp(44.5N)
Hp (m)
Depth of the homogeneous surface layer (m)


x 10^5
F(2W)
F(44.5N)
Flow (m^3.s^-1)
Depth of the homogeneous surface layer (m)


U(2W)
V(44.5N)
Alongshore speed (cm/s)
Depth of the homogeneous surface layer (m)