EPIGRAM Meeting 1st June 2011

ASPEX 2009-2010: Statistics on the Bay of Biscay Circulation

Arnaud Le Boyer
Pascal Lazure Louis Marié
Guillaume Charia Bernard Le Cann

Work : 18 months Post-Doc at Ifremer

Start : December 2010 **End** : May 2012

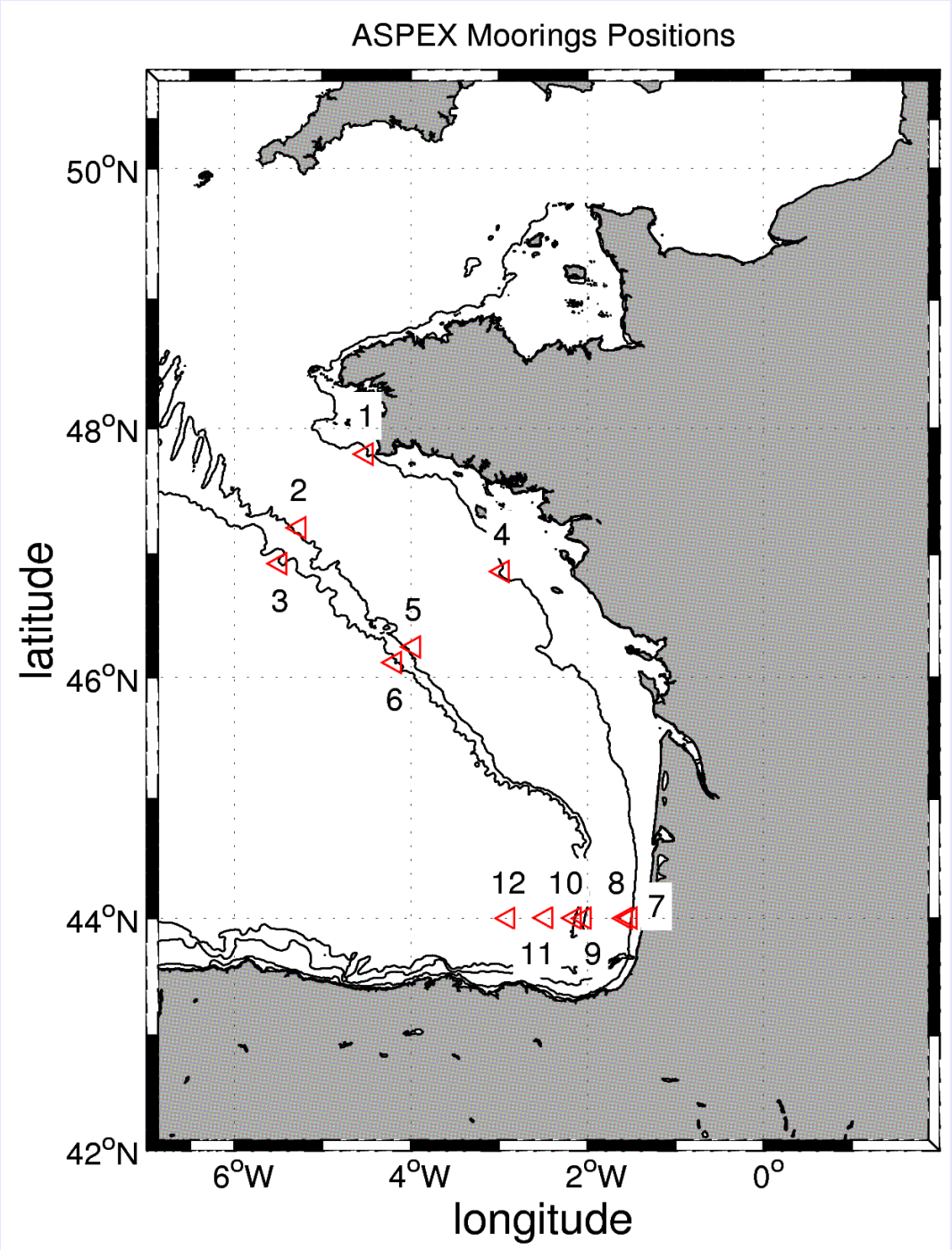
Interest : Deep – Coastal Seas Exchanges dynamics

ASPEX Observations

3 sections : Penmarc'h, Loire, and South

Penmarc'h / Loire sections: 3 ADCP mounted on frame with microcat at 60, 150 and 450 meters depth

South section : 4 ADCP mounted on frame with microcat at 60, 80, 150 and 450 meters depth + 2 mooring at 1000 and 1500 meters depth



I. Bay of Biscay Circulation : Previous Studies

II. ASPEX Observations : tides, mean current, Extreme events

III. Basin Mode

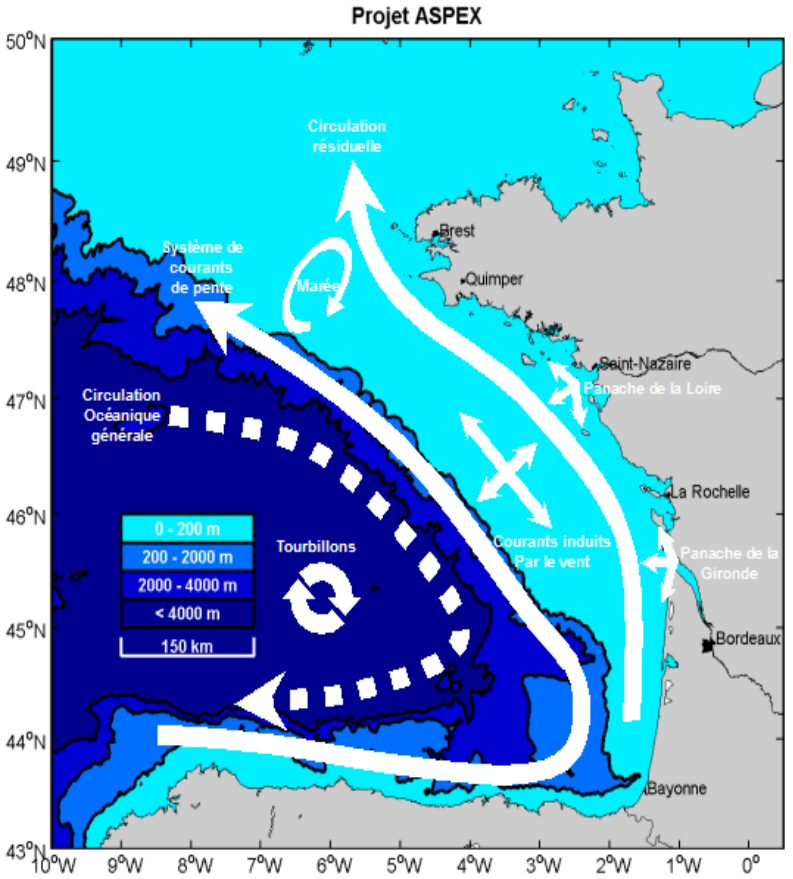
IV. Dynamical Approach

V. Conclusion / Prospect

Bay of Biscay Circulation

Mainly Northward
Strong Tides
Inflows

Seasonal events
Strong Variability on the shelf



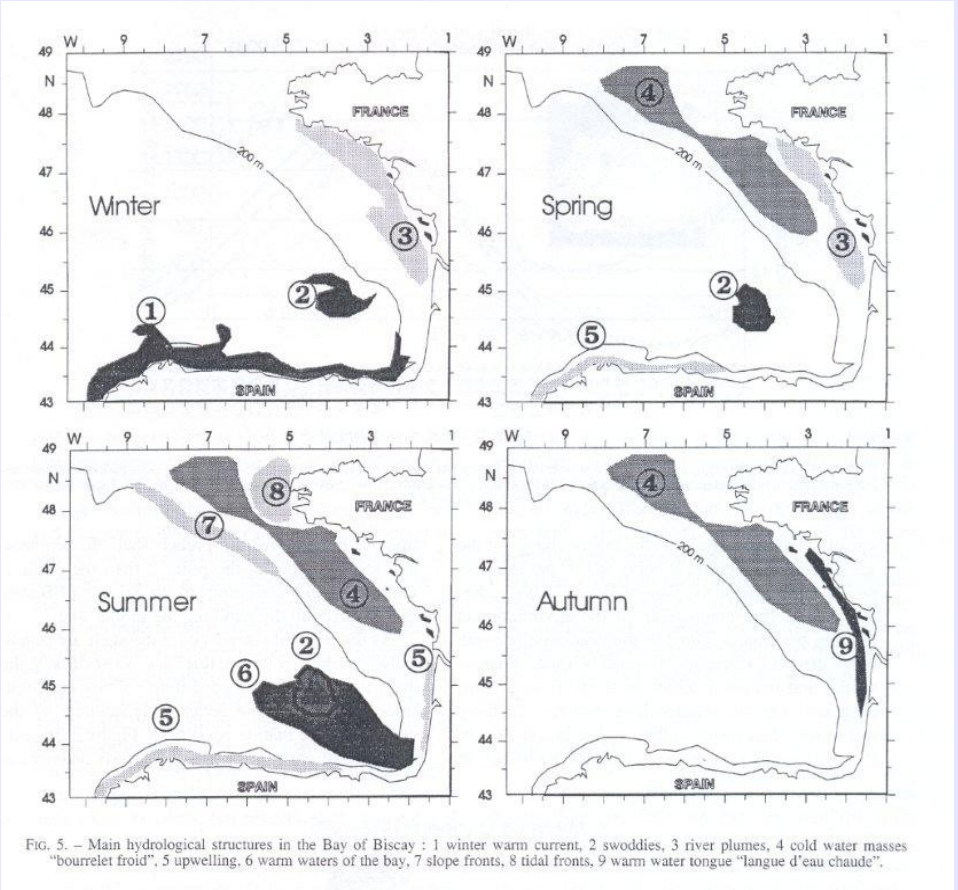


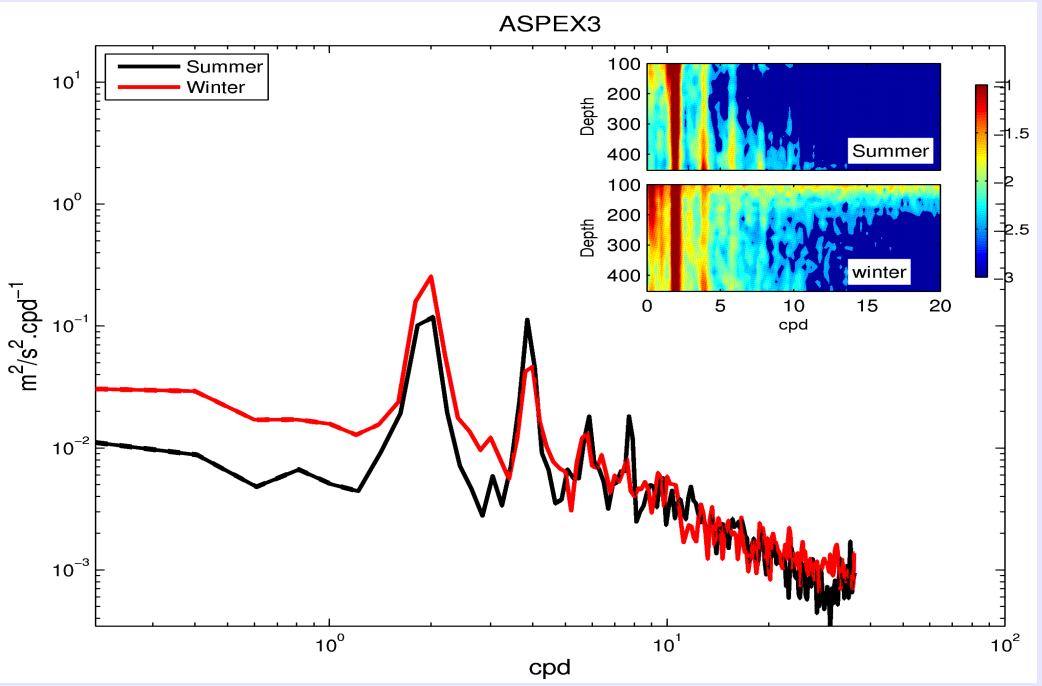
FIG. 5. – Main hydrological structures in the Bay of Biscay : 1 winter warm current, 2 swoddies, 3 river plumes, 4 cold water masses "bourrelet froid", 5 upwelling, 6 warm waters of the bay, 7 slope fronts, 8 tidal fronts, 9 warm water tongue "langue d'eau chaude".

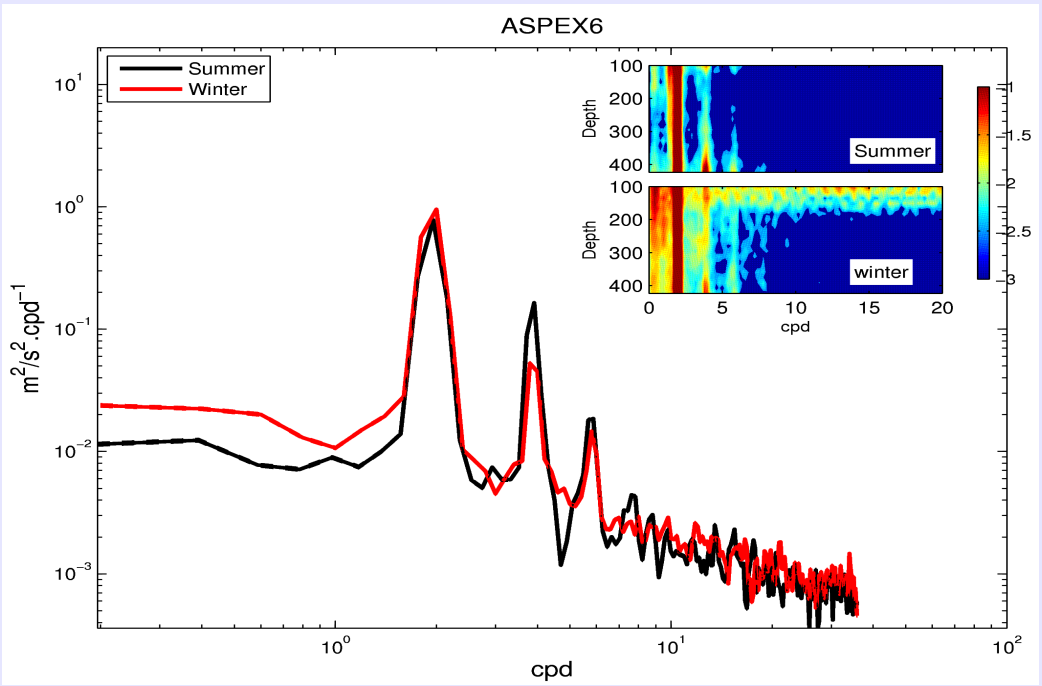
Koutsikopoulos et Le Cann,1996

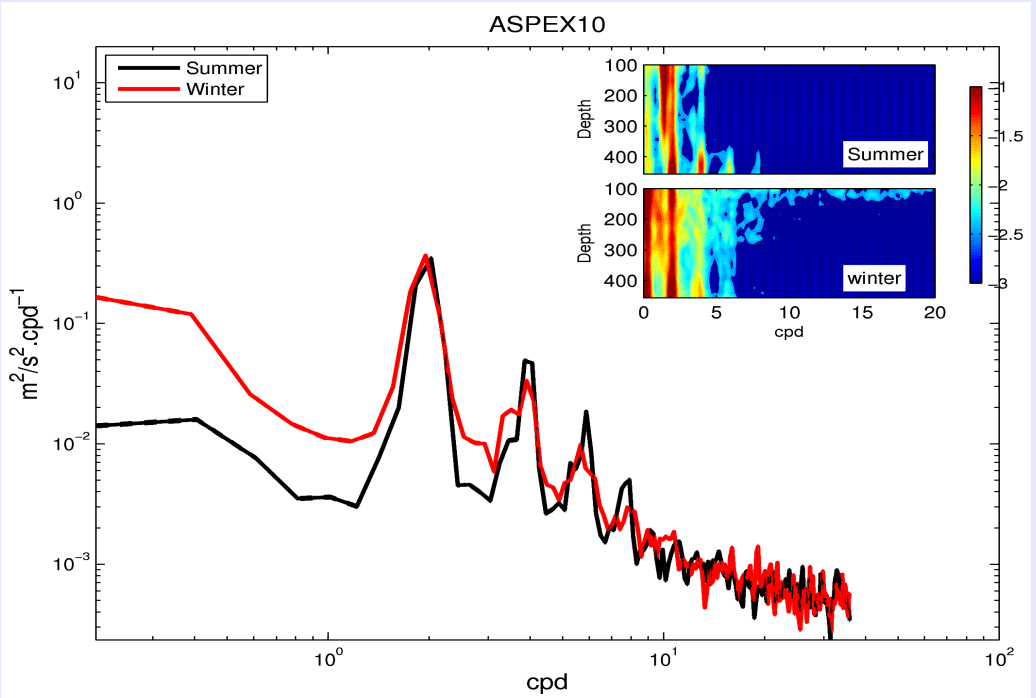
Tides in the Bay of Biscay

Seasonal differences in the tide behaviour

M2 Harmonics on the bottom = non linear tides







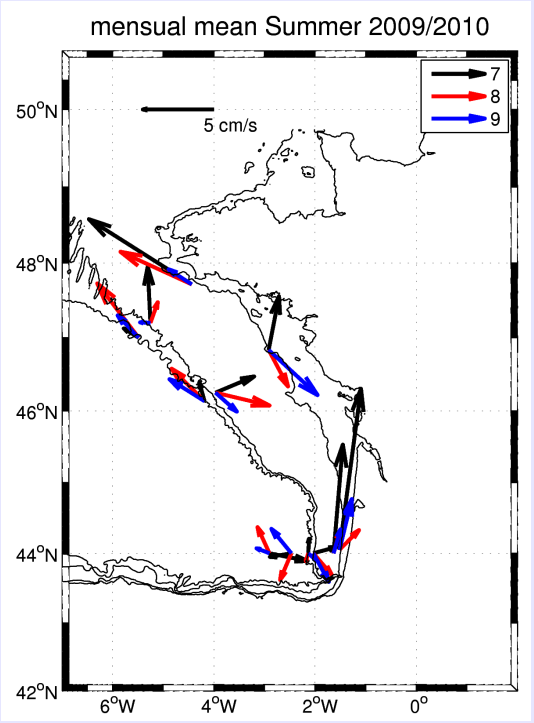
Mensual Mean

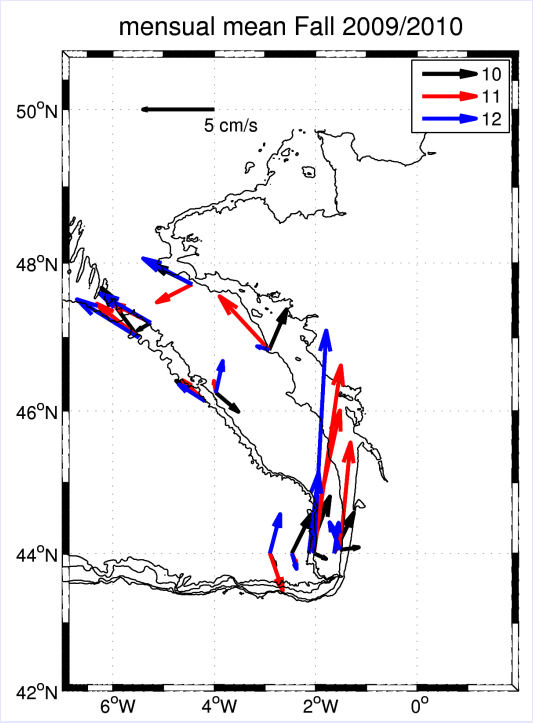
Vertically averaged mean velocity

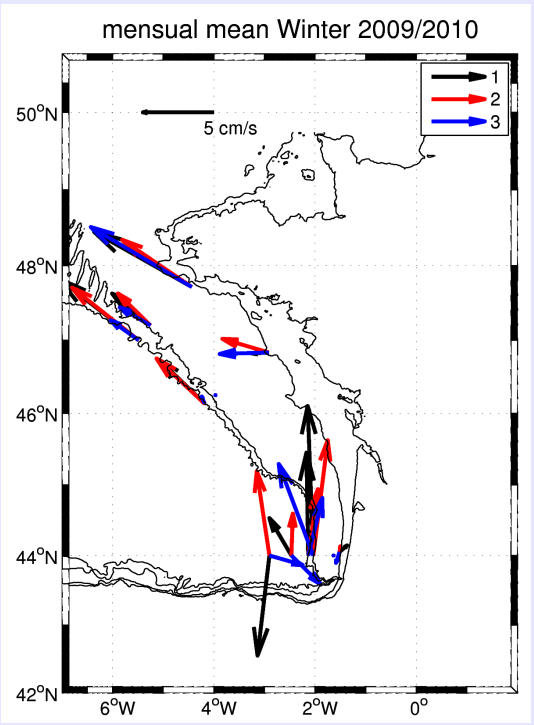
Strong Fall speed current

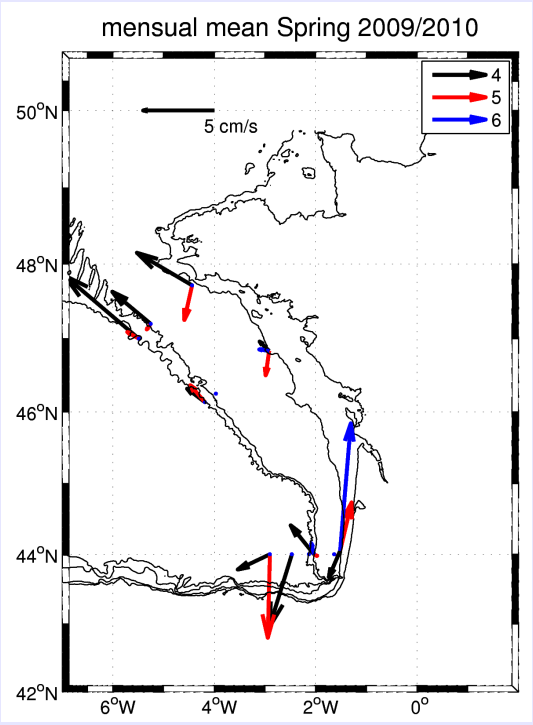
Northward Winter Circulation

Southward to Northward current at ASPEX 4, 5



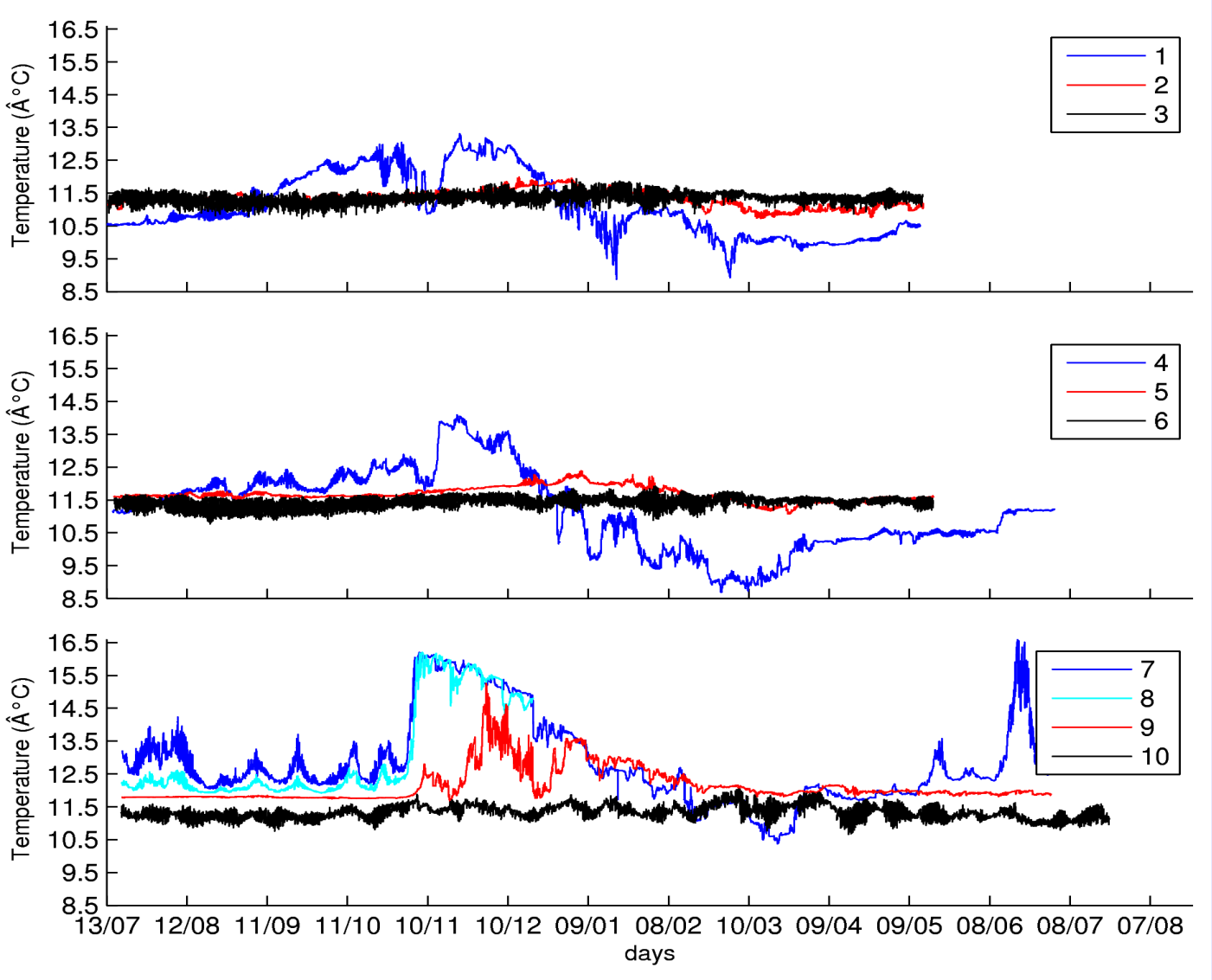






Extreme Events : Temperature

Isobath 60 m :
Temperature event in november 2009 (Next Talk)

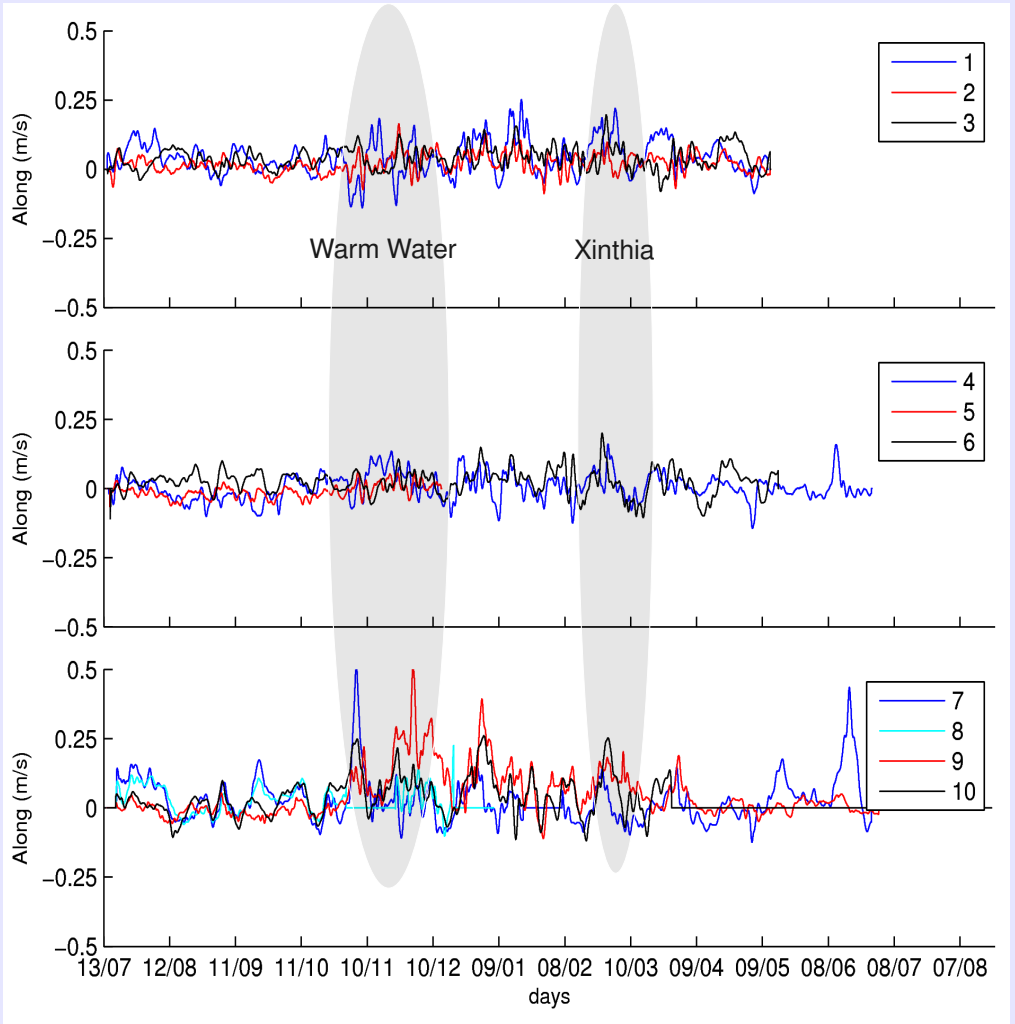


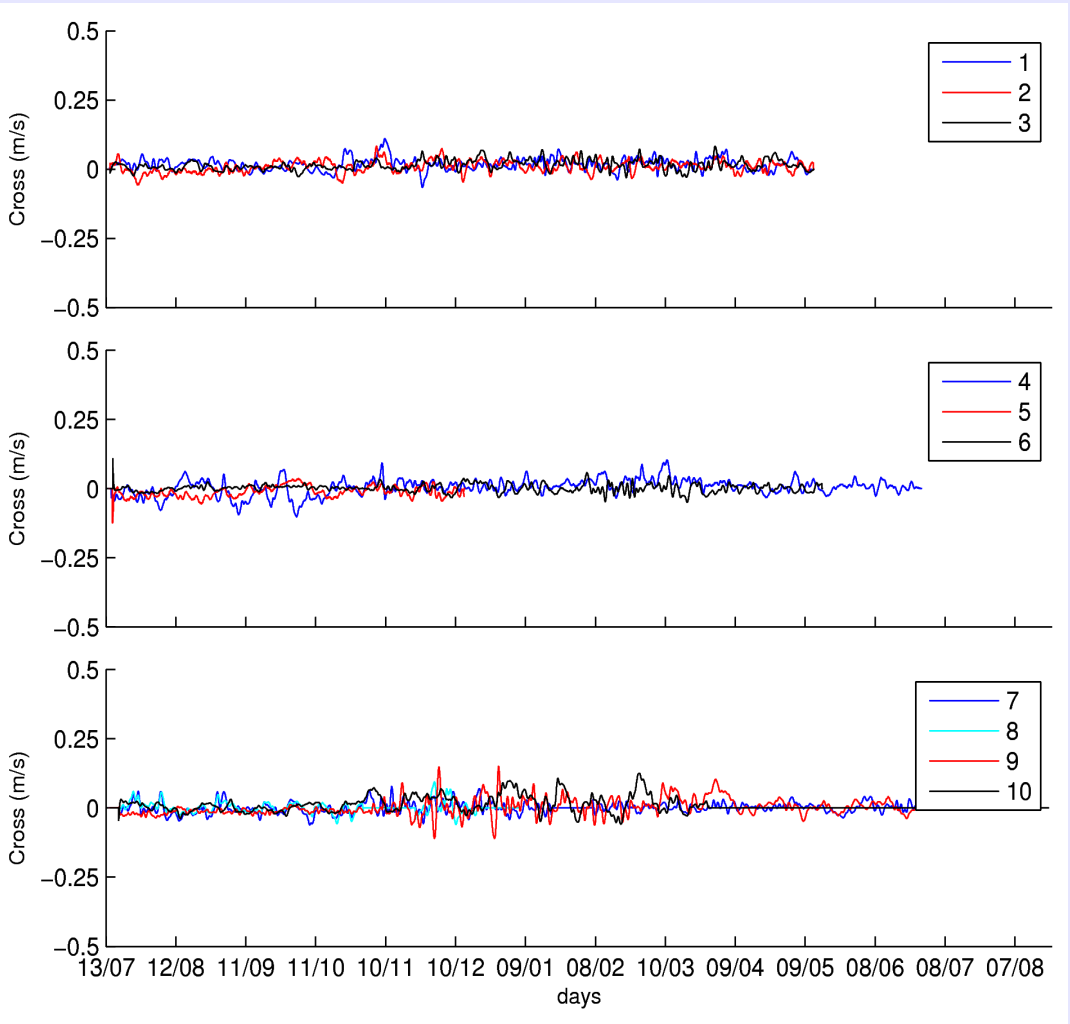
Extreme Events : Currents

Along cross shore :
diagonalisation de la matrice de covariance

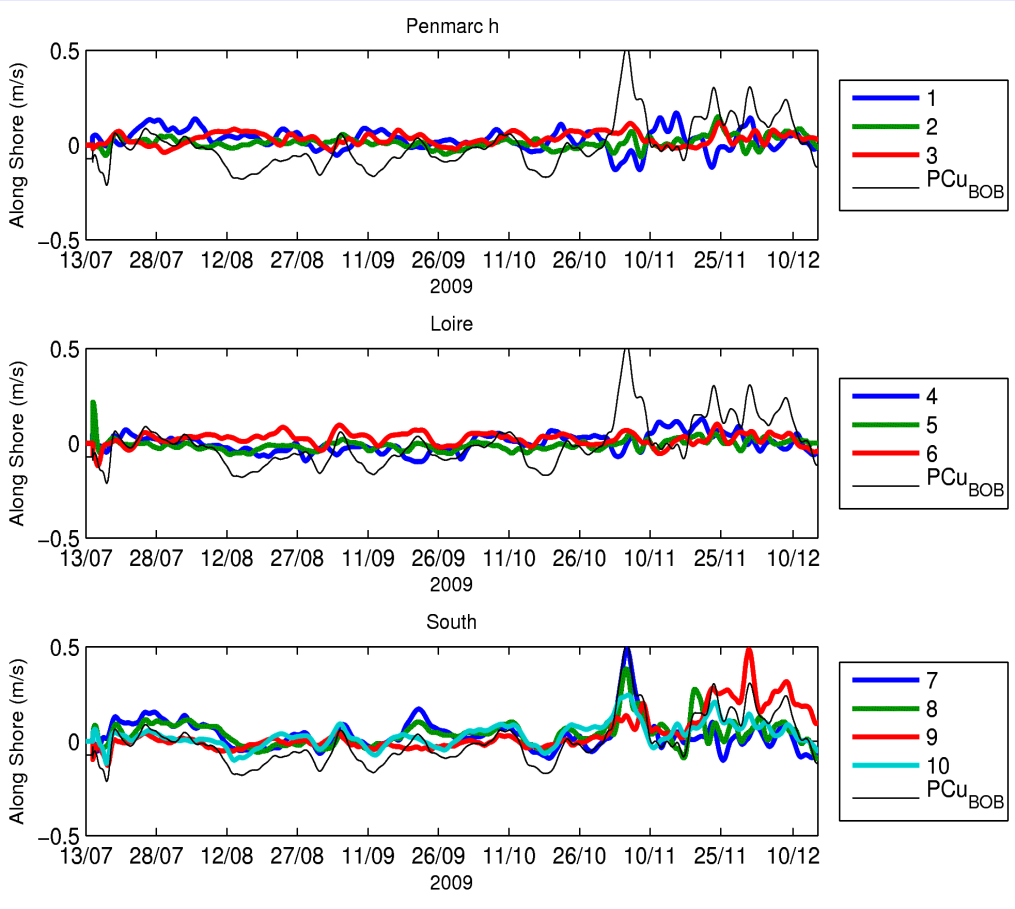
Greater variability for Along Shore Currents

Xinthia Signature

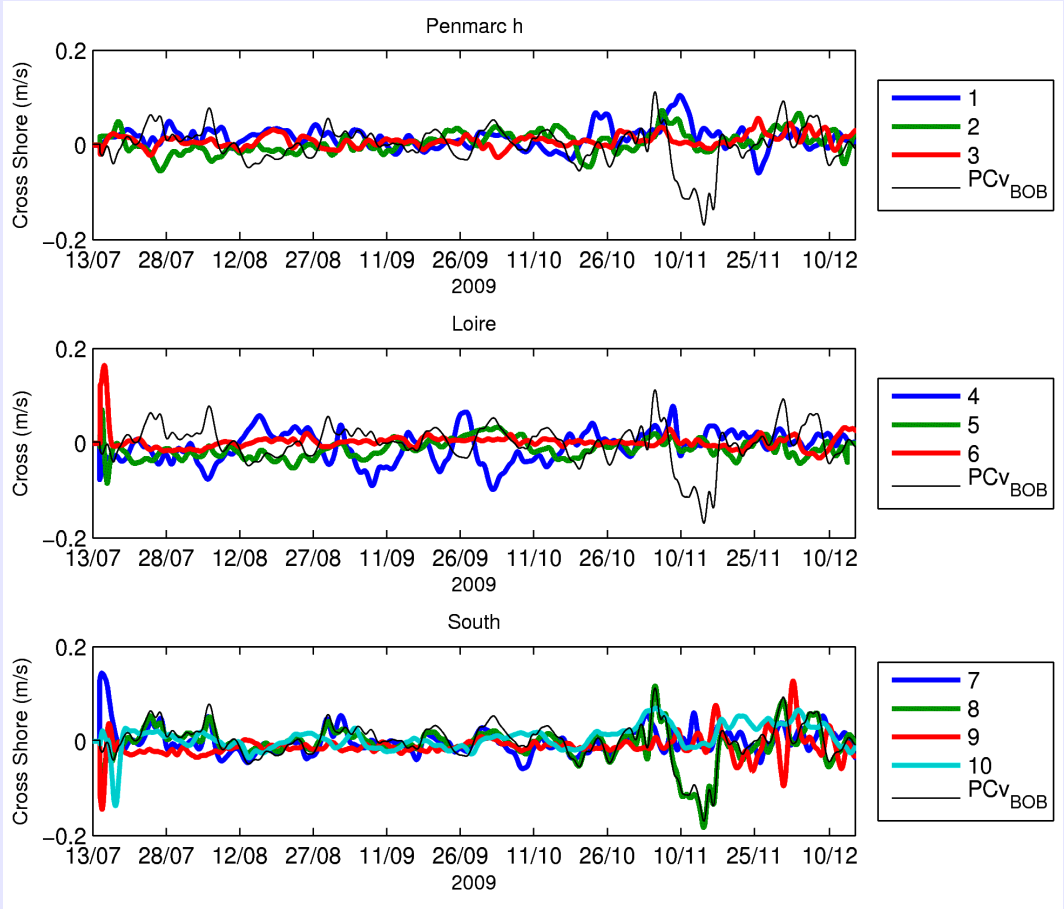




Bassin Modes : EOF



PC=55%



PC=45%

Dynamical Approch

Goal :
Balance the vertically average momentum equation with the observations

$$\vec{U}_t + \vec{f} \times \vec{U} = \frac{1}{\rho_0} \vec{\nabla} P + \vec{\tau}_s + \vec{\tau}_f$$

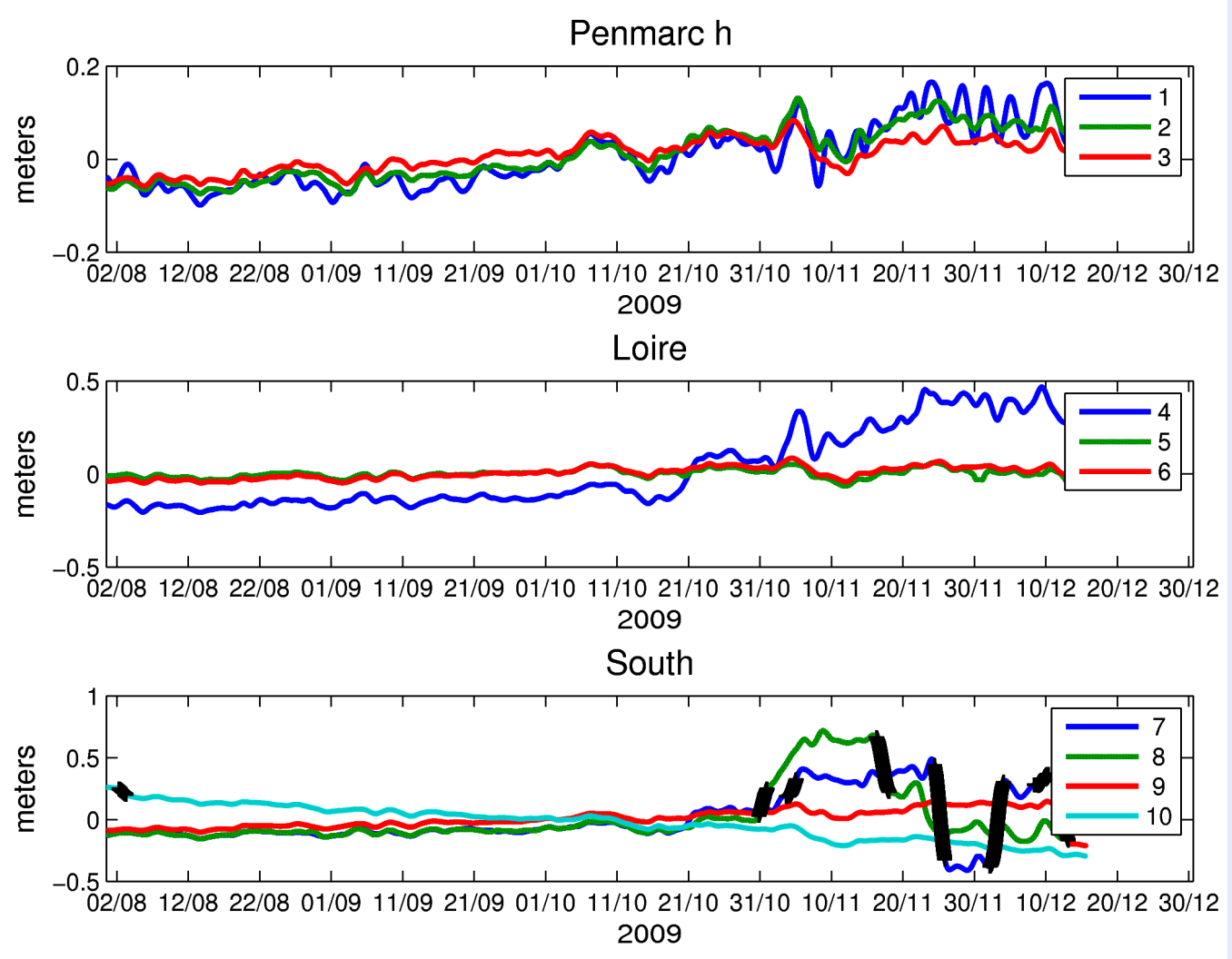
Difficulties :
bulk formule for wind and bottom stress
Pressure gradient

Work in progress ... Hopefully ...

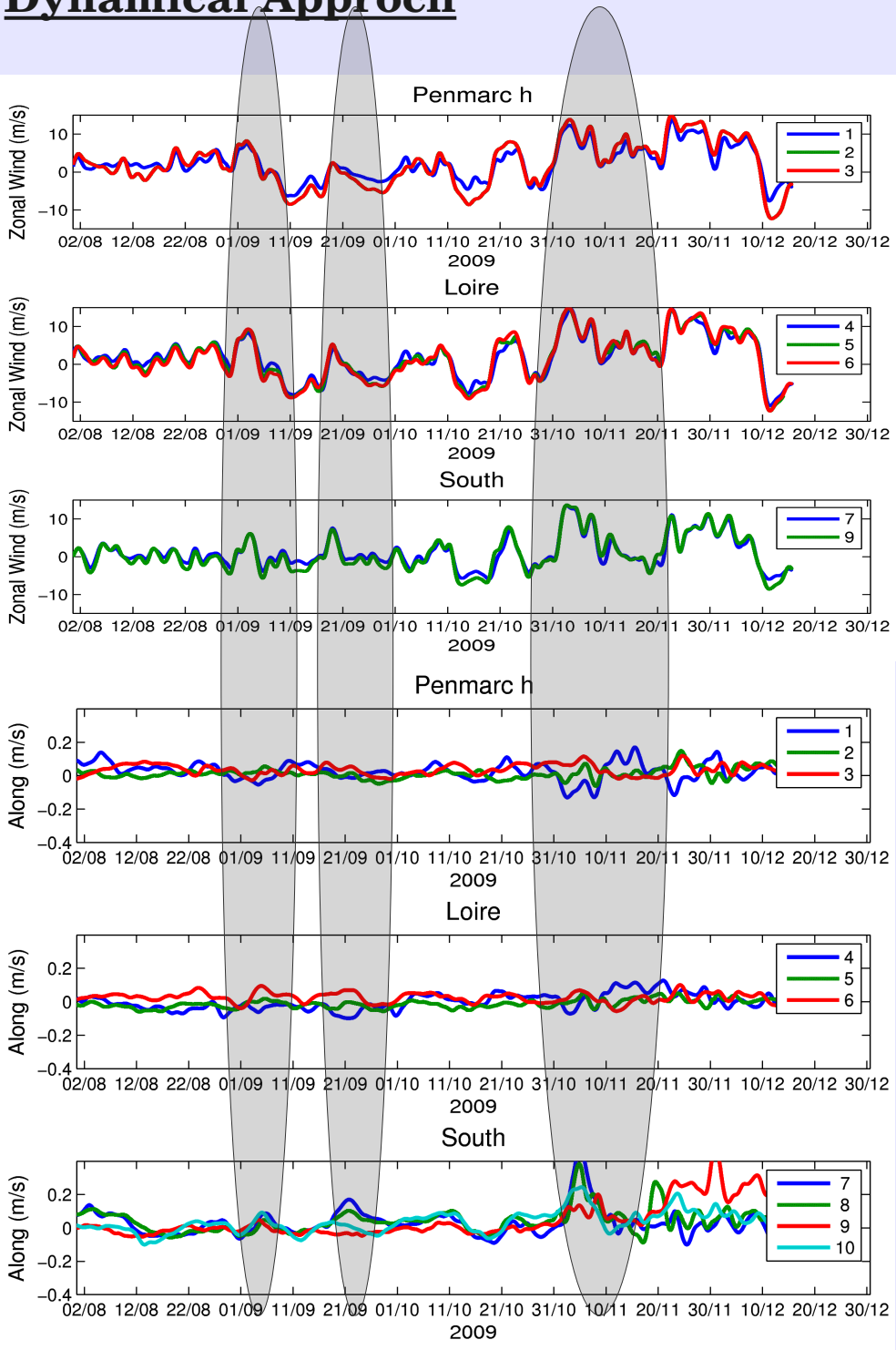
Forcing / Response
Compare Pressure anomalies, Wind and Currents for each section

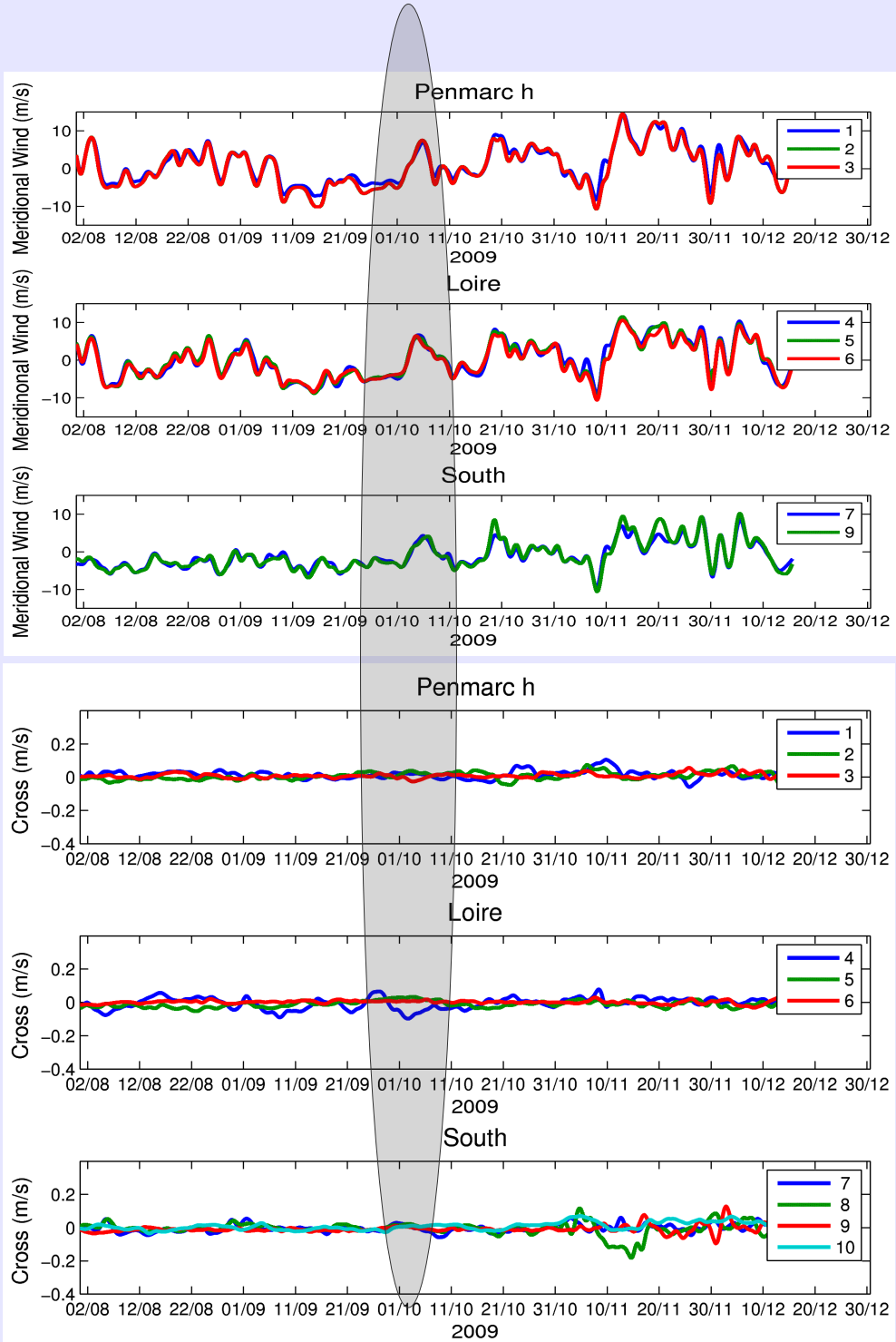
Dynamical Approch : Pressure Anomalies

August / October
Pressure anomalies are similar in the Bay of Biscay



Dynamical Approch





Conclusions / Prospects

Bay of biscay circulation from July 2009 to June 2010 :
- Mainly Nothward,
- Seasonal pattern especially at Loire section
- Extrem event : Temperature event in november 2009 and Xinthia

Prospect :
Dynamical approch of the seasonal variability in the Bay of biscay and the temperature event ...