SOCIB

Balearic Islands
Coastal Observing
and Forecasting
System

# Mesoscale Circulation Variability from Five years of Quasi-continuous Glider Observations and Numerical Simulation at a Key Sub-basin 'Choke' Point


Emma Heslop

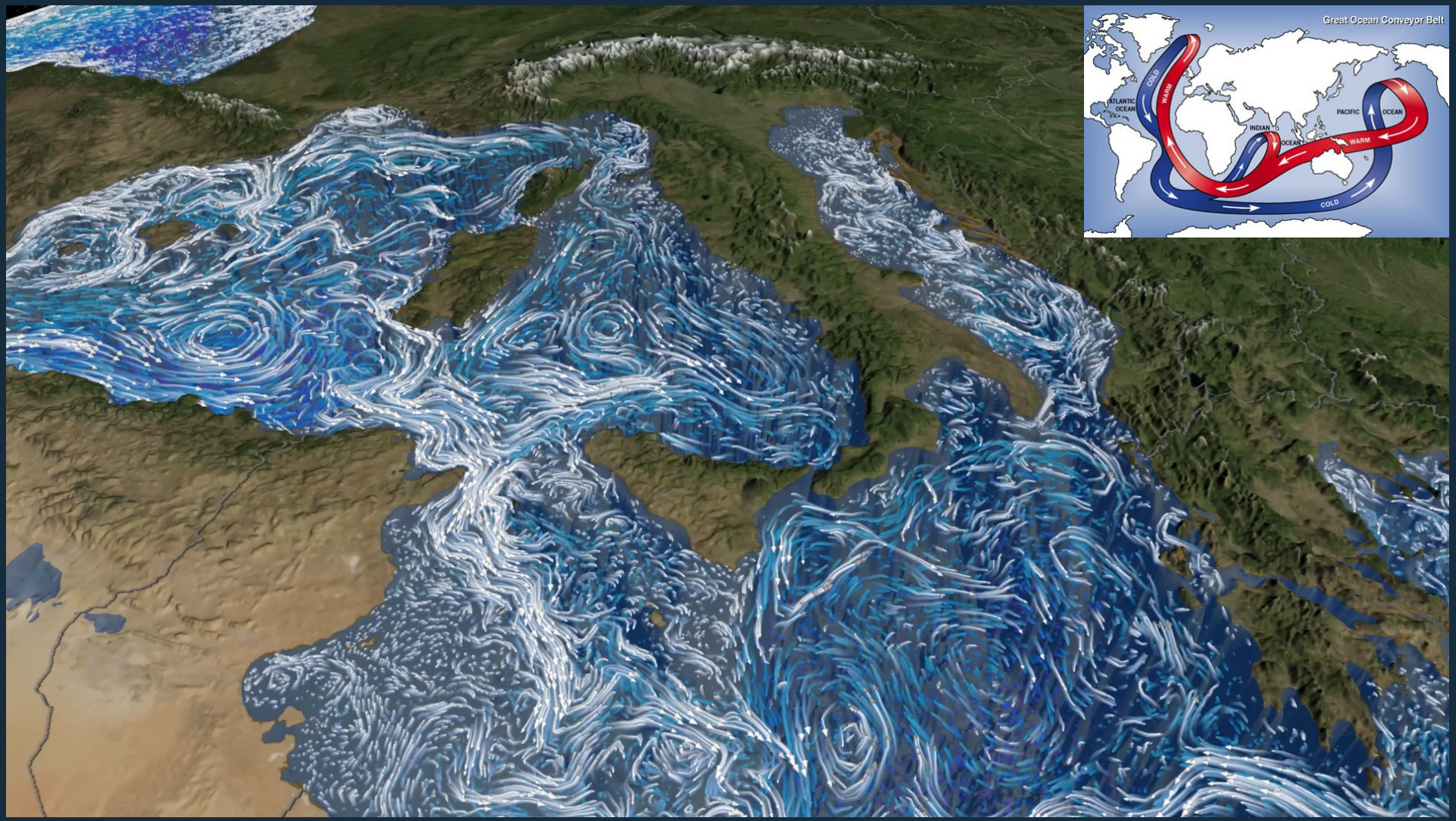
B. Mourre, M. Juza, C. Troupin, R. Escudier, M. Torner, J. Tintoré.



OSM 2016, New Orleans

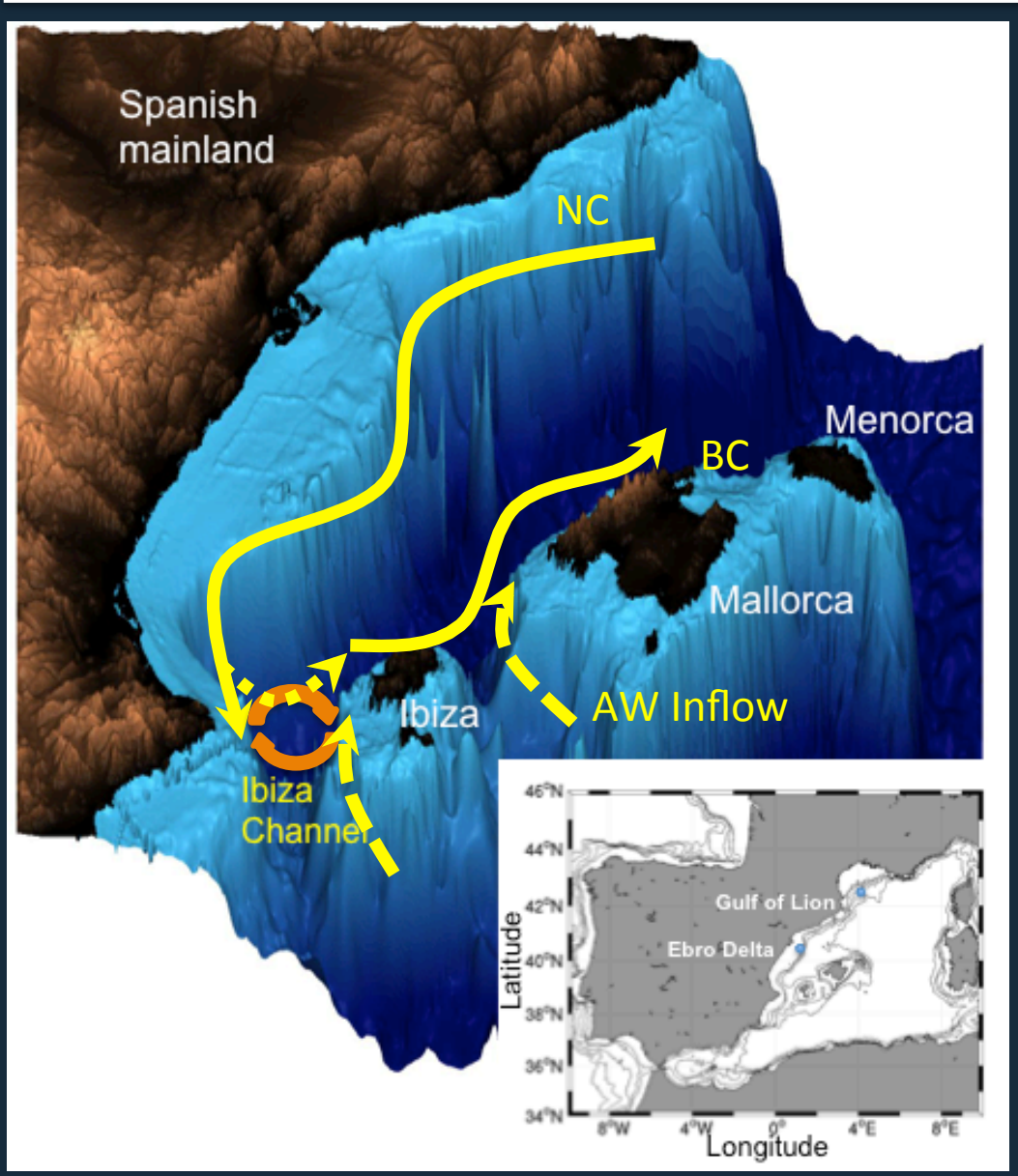
www.socib.es

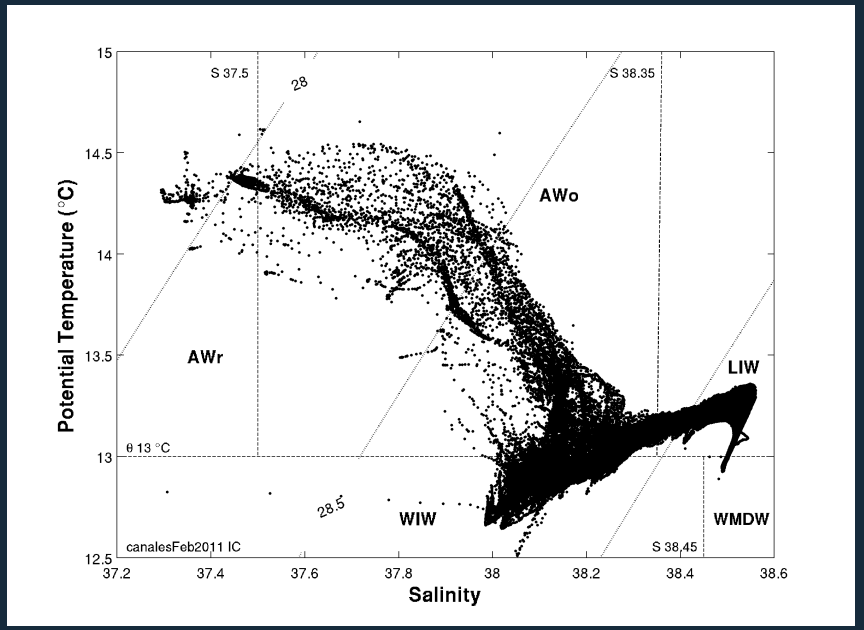
# Mediterranean – small scale global ocean




NASA. Ocean current flows in the Mediterranean (16 Feb 2005 through 16 January 2006). http://svs.gsfc.nasa.gov/goto?3820

# Ibiza Channel – circulation hotspot - narrow 'choke point'

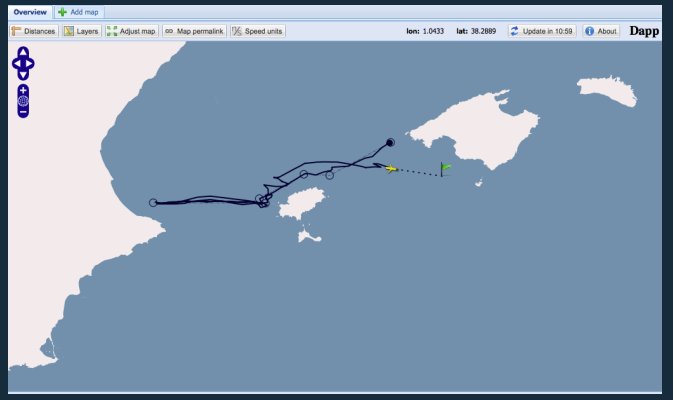


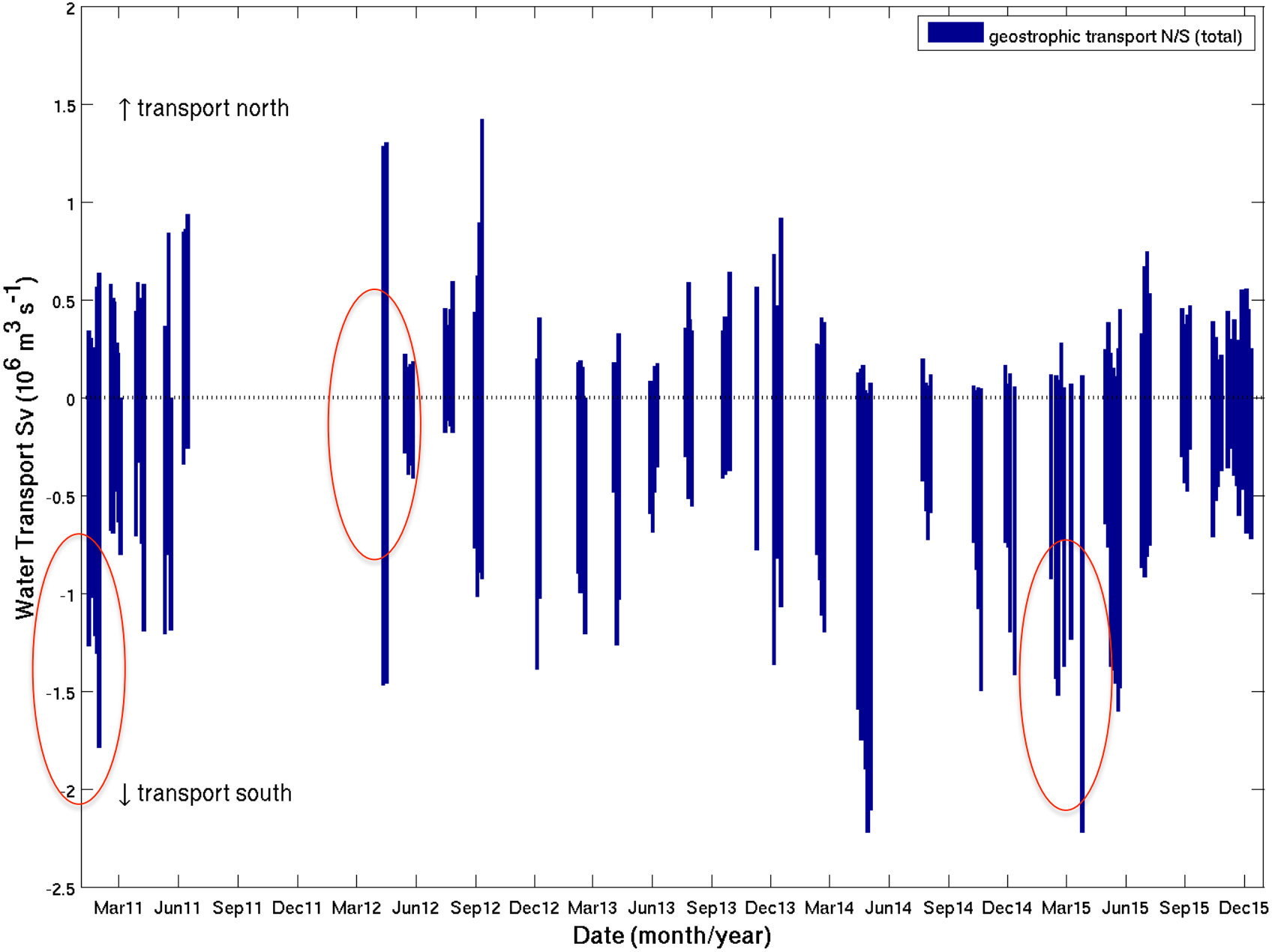

- NC - Northern Current - more saline
- BC - Balearic Current - less saline inflows
- Eddies intermittently block the channel
- Linked to WIW – a cold (T min) winter formed mode water

# Ibiza Channel – ‘endurance’ line monitoring

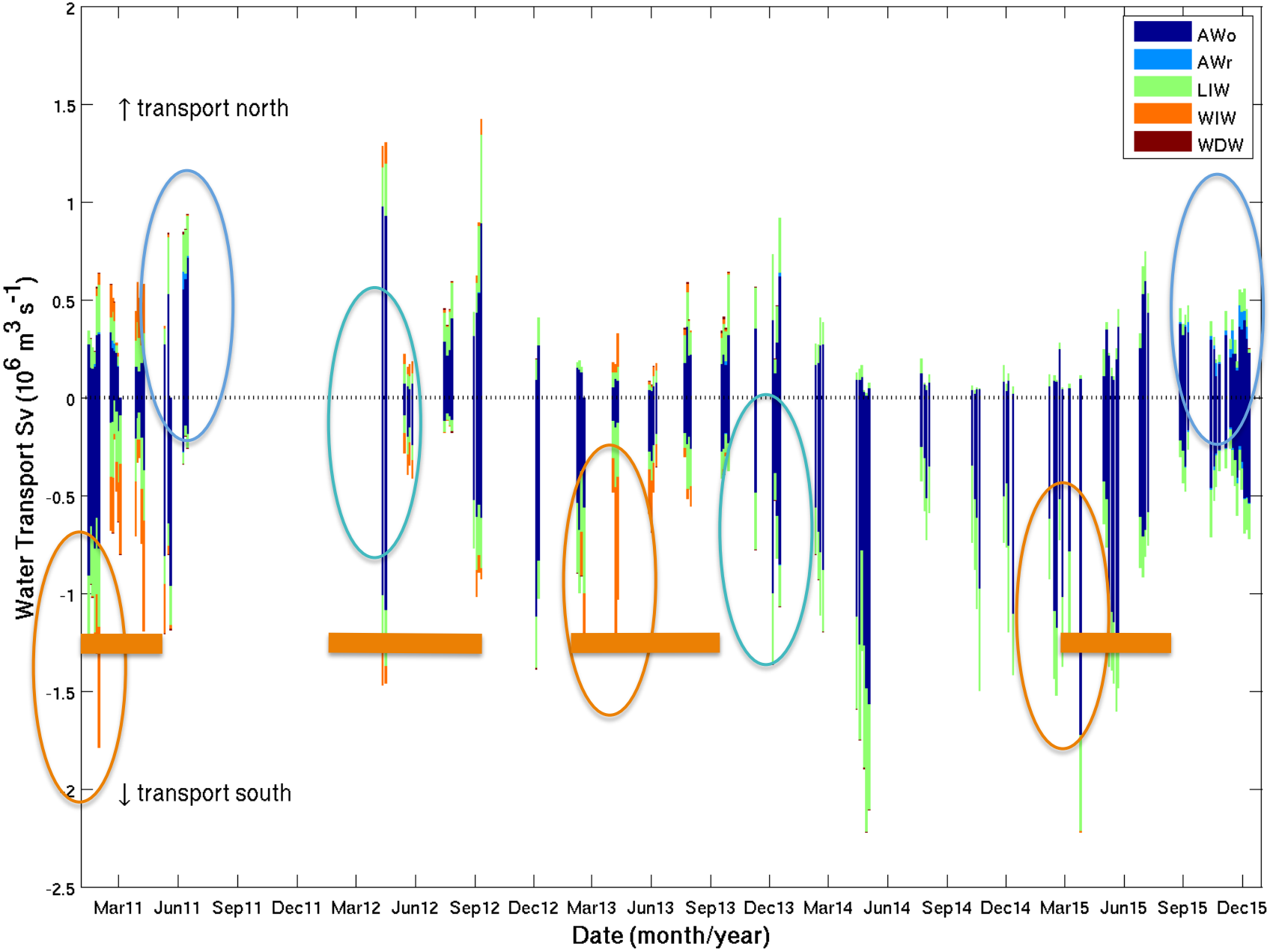
- Platforms: Slocum and Seaglider
- 5 years 01/2011 – 01/2016
- 31 successful deep glider missions
- Not > 1 month gap - quasi-continuous




# Ibiza Channel – 5-year view of geostrophic transport



# Ibiza Channel – geostrophic transport by water mass




WIW

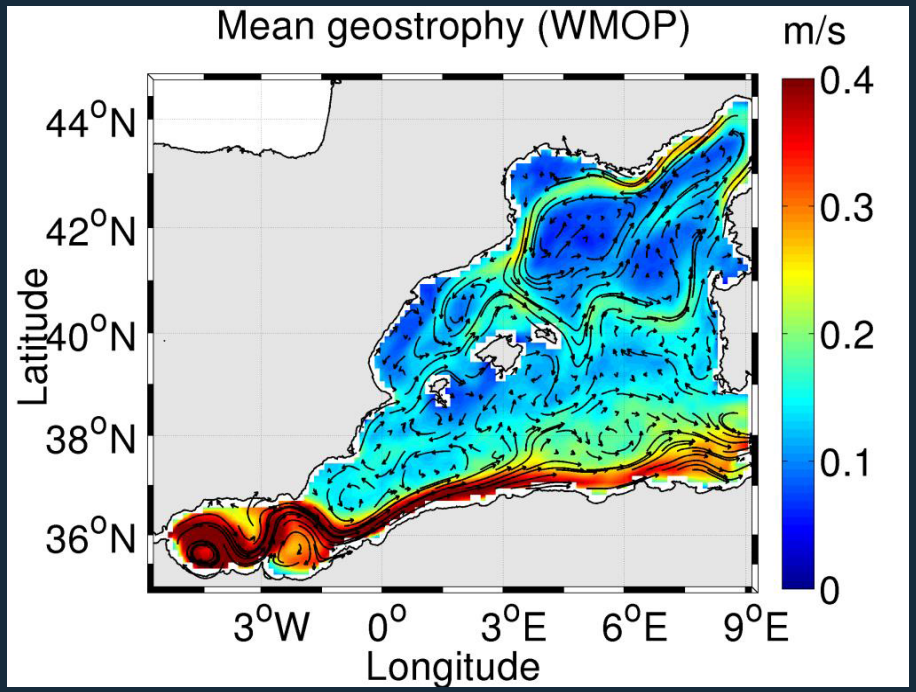
# SOCIB Operational Model configuration:

## Model (WMOP):

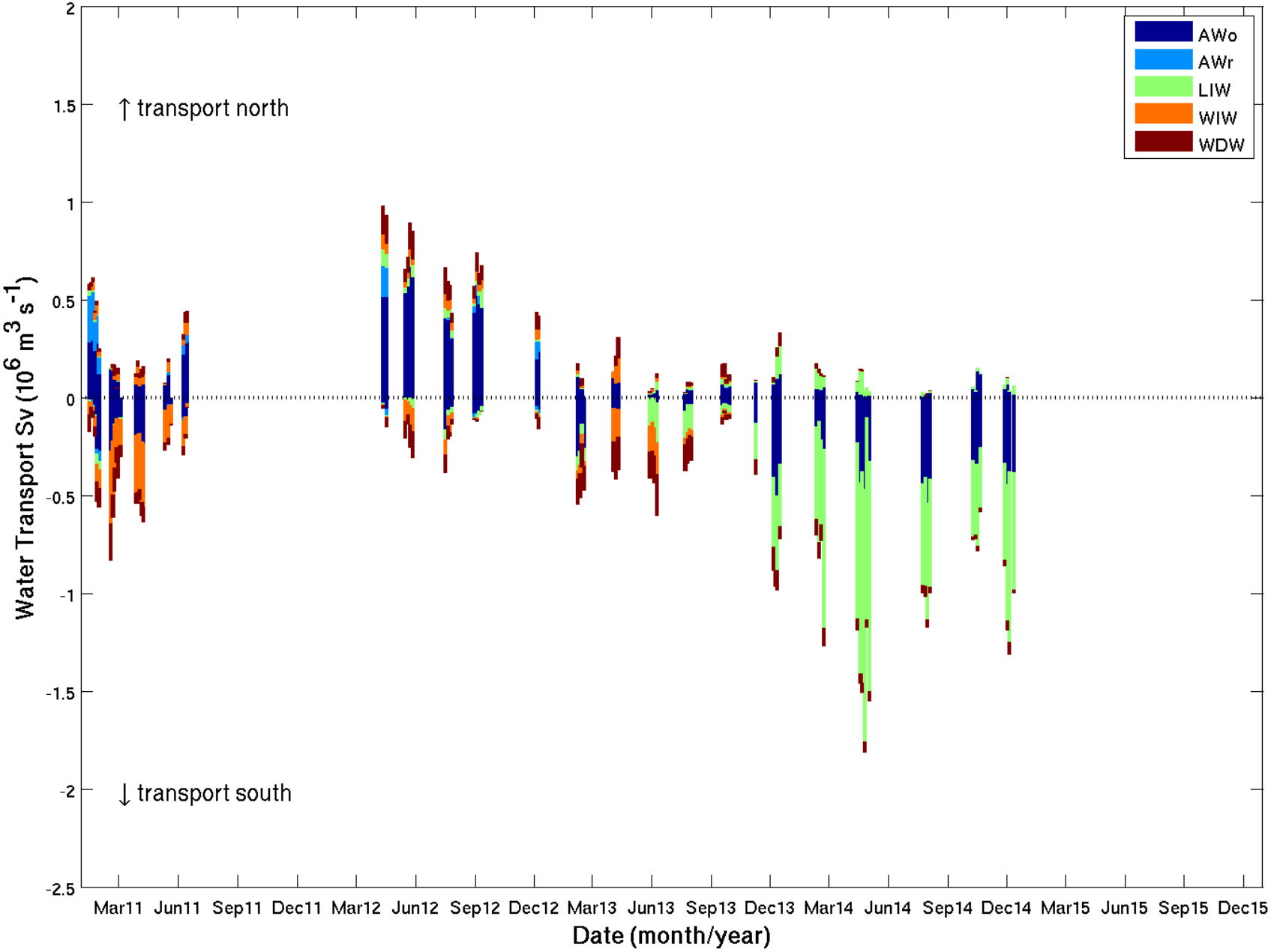
- Regional configuration of the ROMS
- Spin up 2008, run 2009 – 2014
- Gibraltar to Sardinia/Corsica
- High resolution: 1.8 to 2.2km, vertical grid 32 sigma levels, bottom topography 30”

## Forcing:

- Initial & boundary conditions (1/16°, daily) from CMEMS MED-MFC
- Atmospheric forcing Hirlam (3h 1/20°) from the Spanish Meteorological Agency (AEMET)
- River runoff daily averaged for Var, Rhône, Aude, Hérault, Ebro and Júcar



# Ibiza Channel – 4-year view from WMOP (MFSv11)



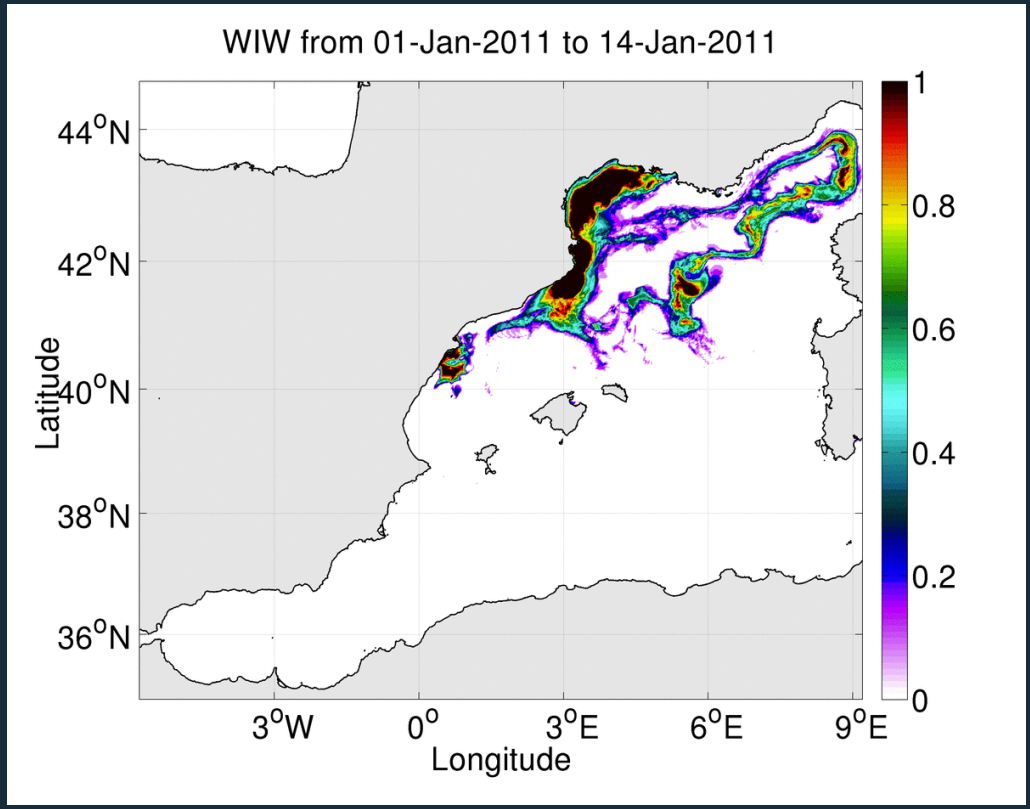
# Modelling of WIW production

## Winters 2011-2013:

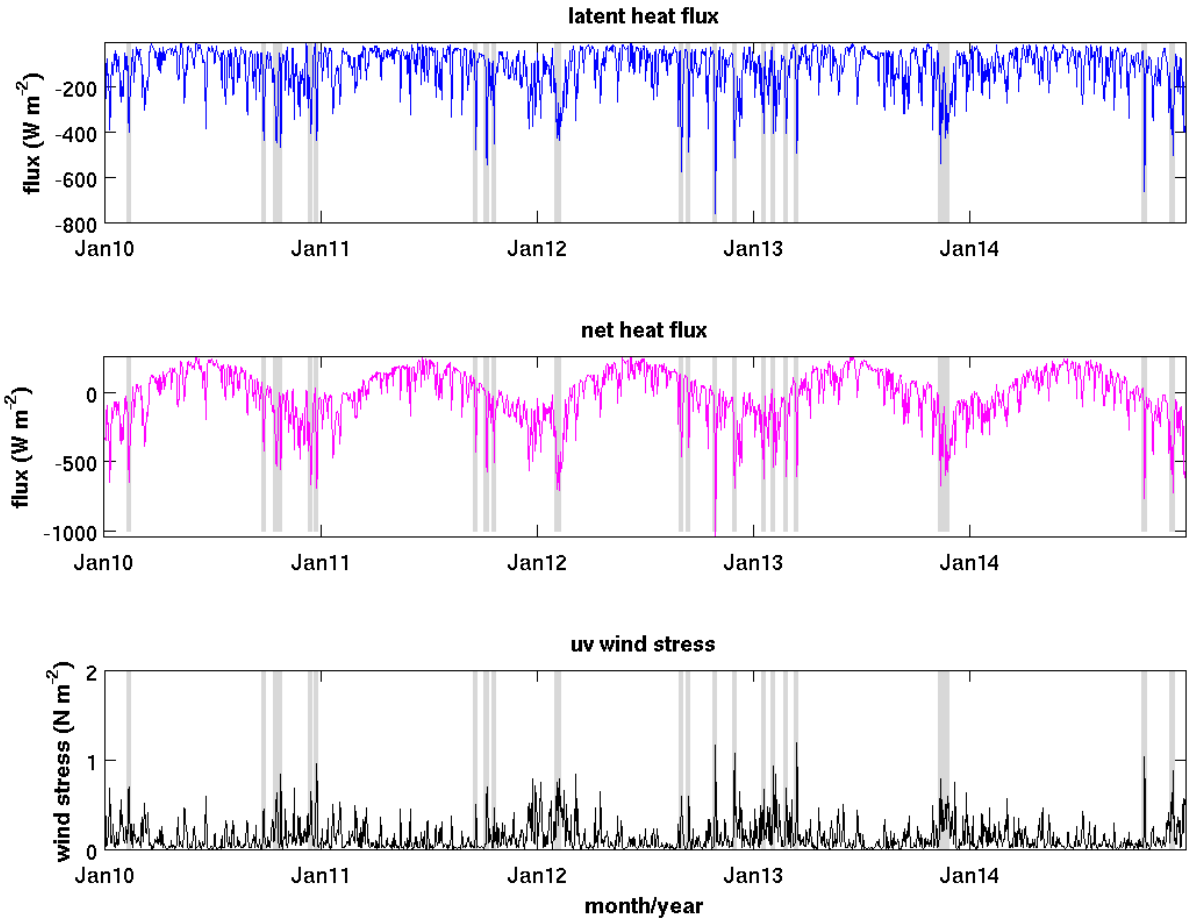
- WIW produced and reaches channels

## Winter 2014:

- Very little WIW produced
- Dissipated before reaching Ibiza Channel



# Atmospheric events in Gulf of Lion – from HIRLAM model

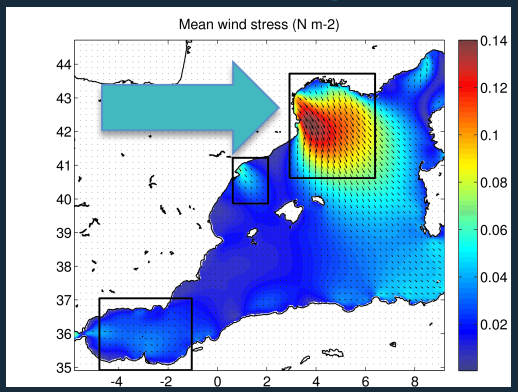



Event threshold > -400 W $m^{-2}$ latent heat flux loss

## Identify Events

- From daily mean heat fluxes and wind stress
- Identify 'events' with large latent heat loss

## Area of analysis

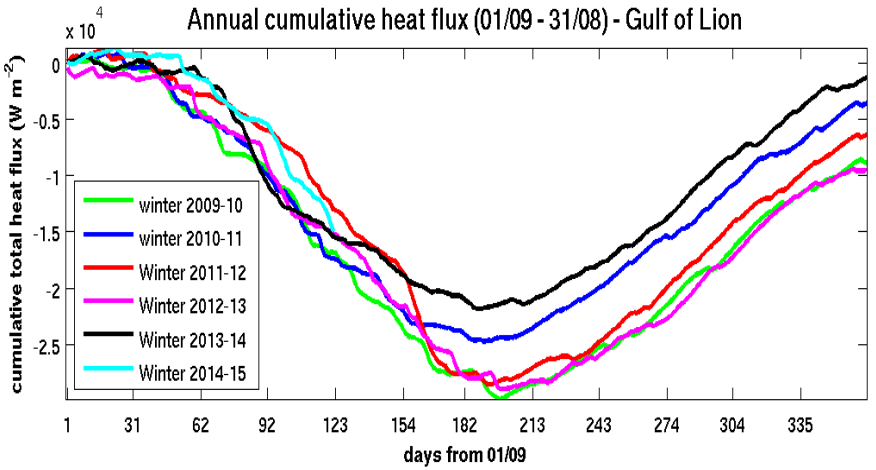


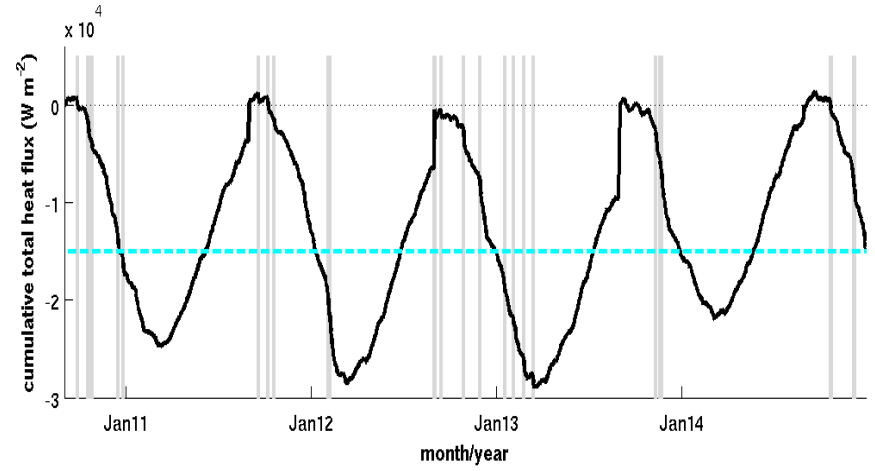
# Connection: events in Gulf of Lions to Ibiza Channel

## Predictive capability?

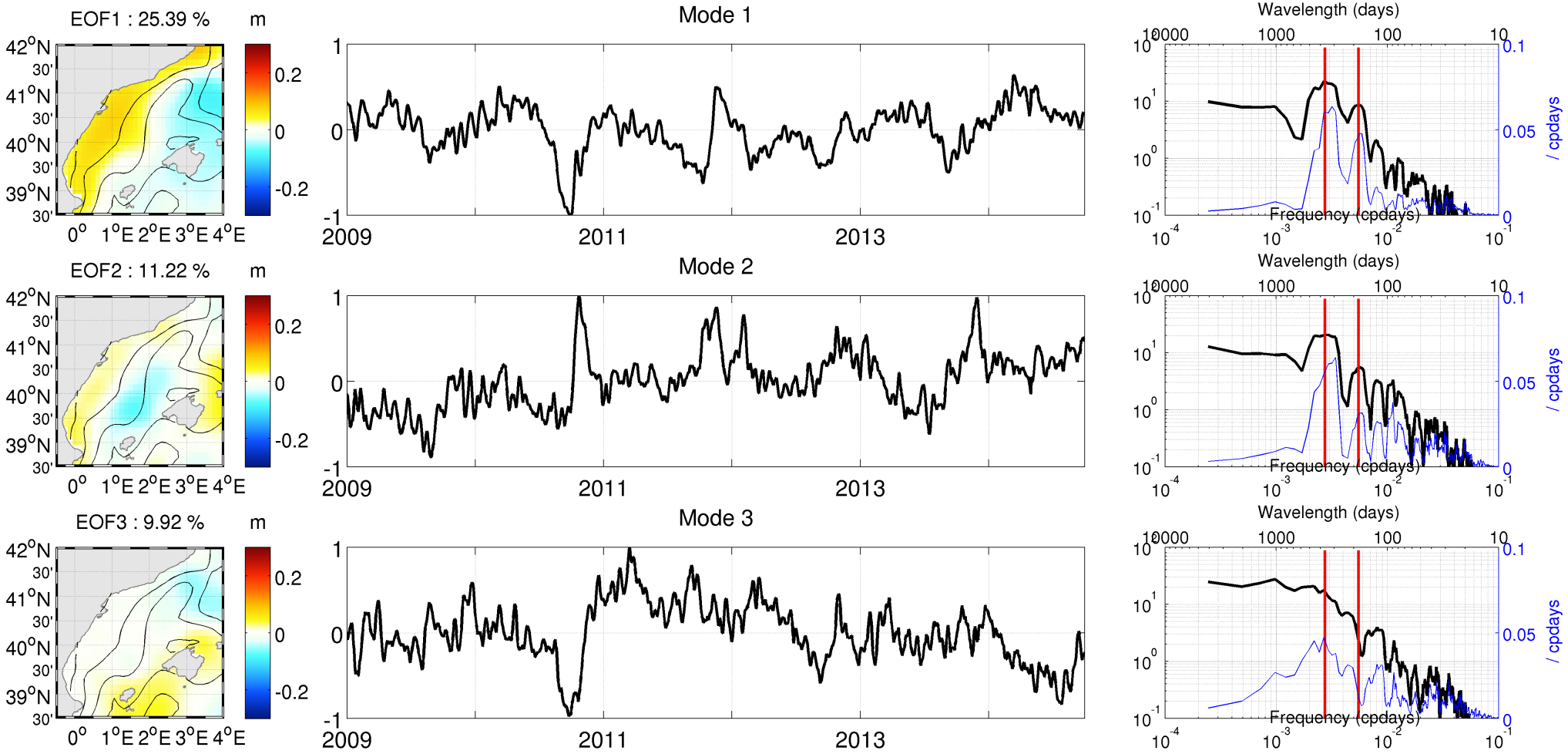
- Winter 2013-2014 cumulative heat loss low
- Event/arrival WIW timing indicates later events important – cumulative heat loss greater
- Strong winter events & cumulative heat loss > 1.5 x $10^4$ W $m^{-2}$

| | Gulf of Lion Forecast | | Ibiza Channel Observation | |
|---|---|---|---|---|
| Year | Strong event | estimated arrival WIW | observed arrival WIW | WIW |
| 2011 | 2010-12-16 | 2011-01-20 | 2011-01-19 | Arrival |
| | 2010-12-26 | 2011-01-30 | 2011-01-29 | Increase |
| 2012 | | | | |
| 2013 | 2013-01-18 | 2013-02-22 | 2013-02-11 | Arrival |
| | 2013-02-25 | 2013-04-01 | 2013-04-01 | New WIW |
| 2014 | | | No WIW | |

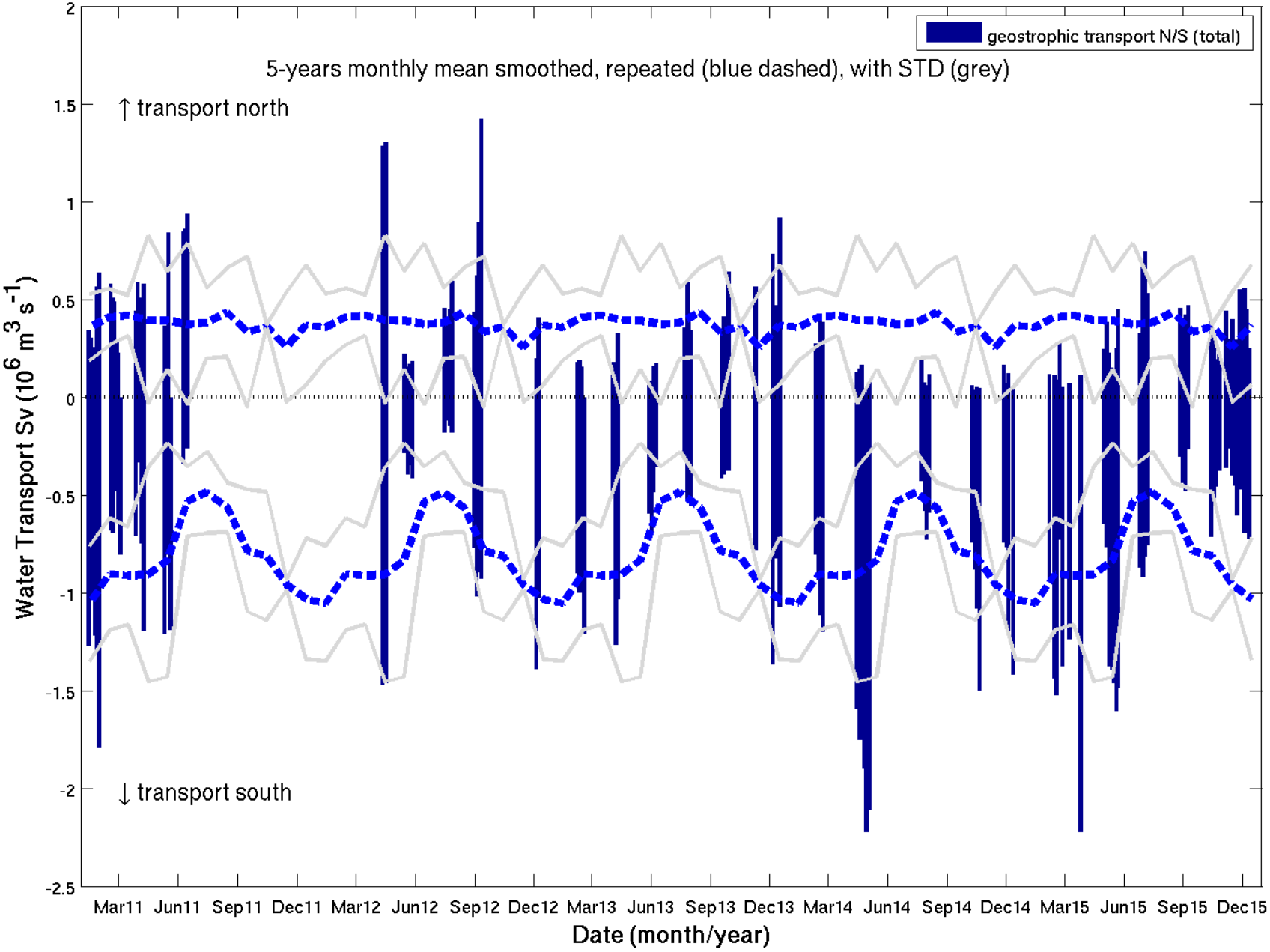


# Flow variability from altimetry - from EOF analysis



# Ibiza Channel – geostrophic transport & monthly mean



# Conclusions:

## Summary of results:

- Glider monitoring shows important sub-seasonal/days to weeks variability in the N/S exchange through the Ibiza Channel
- Combining with models and satellite (multi-platform approach) understanding of remote events and processes can developed, leading to predictive capability
- Next… fresher inflows, where prediction could aid fisheries management