



SOCIB

Balearic Islands
Coastal Observing
and Forecasting
System

Monitoring and resolving sub-seasonal to
inter-annual variability through a choke point
in the Western Mediterranean Sea
circulation, using gliders and models

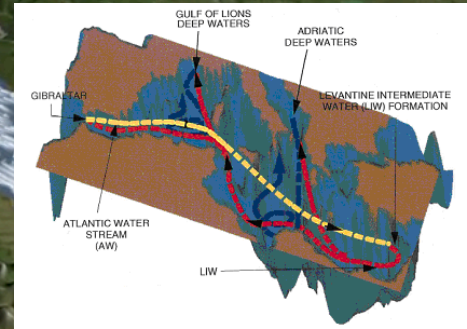
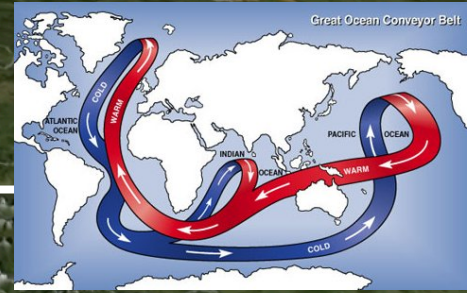
Emma Heslop (IOC/UNESCO)
Baptiste Mourre, Mélanie Juza, Eva Aguiar, Marc Torner, Nikolaos
Zarokanellos F. Mirgirier, J. Tintoré
SOCIB, IMEDEA, UPMC

8th EGO Meeting, May, 2019, Rutgers, USA



The Mediterranean Sea – a small scale global ocean

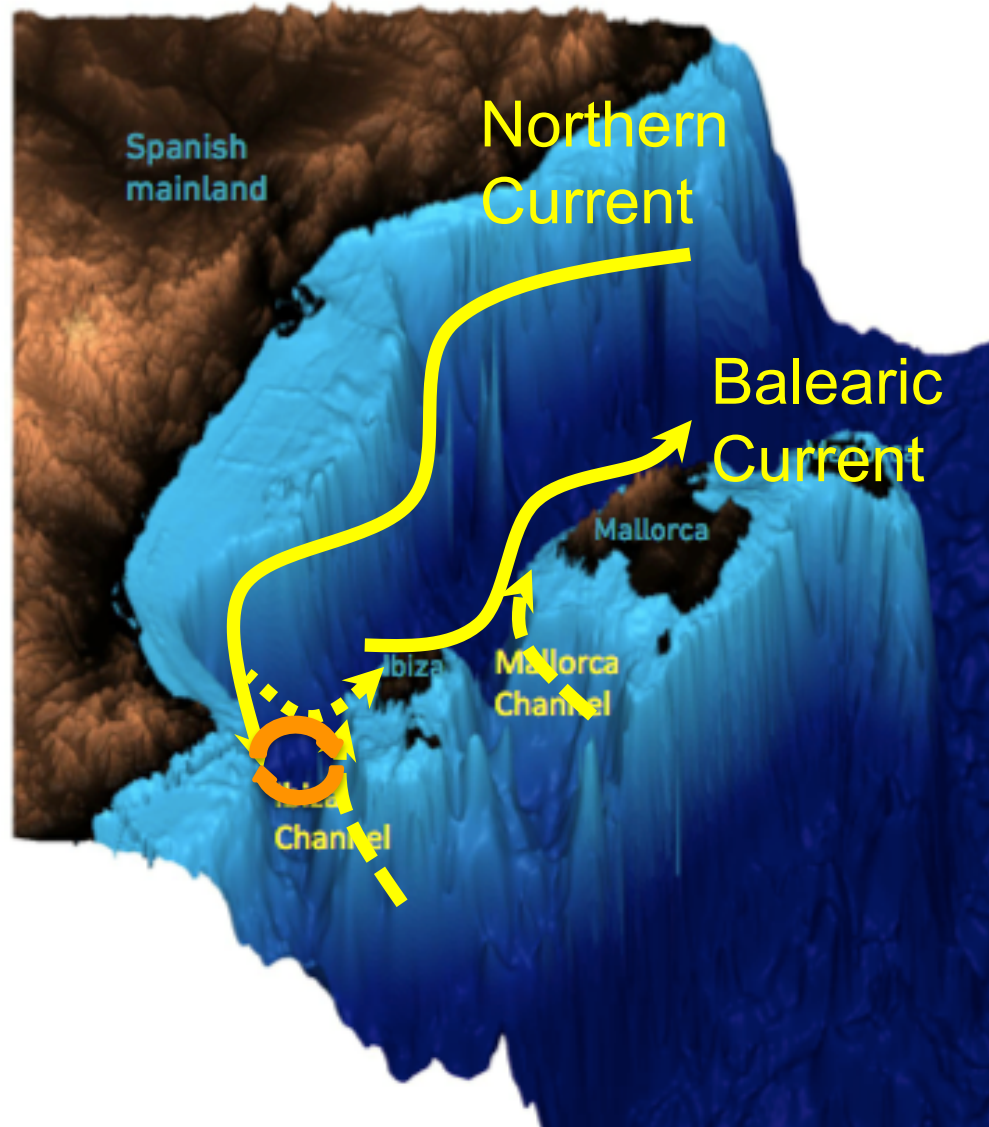
Density driven basin-scale circulation
Continuous, vigorous mesoscale interactions
Deep water formation
Transports & exchange with Atlantic
Variability affects regional ecosystems
Significant human pressures



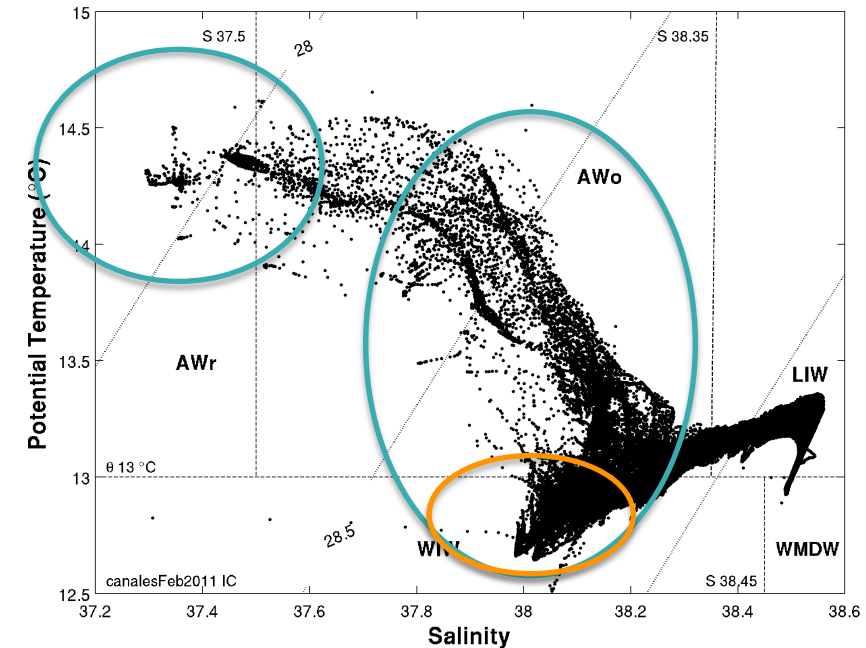
NASA. Ocean current flows in the Mediterranean (16 Feb 2005 through 16 January 2006).

<http://svs.gsfc.nasa.gov/goto?3820>

Ibiza Channel: 'choke point' in basin circulation



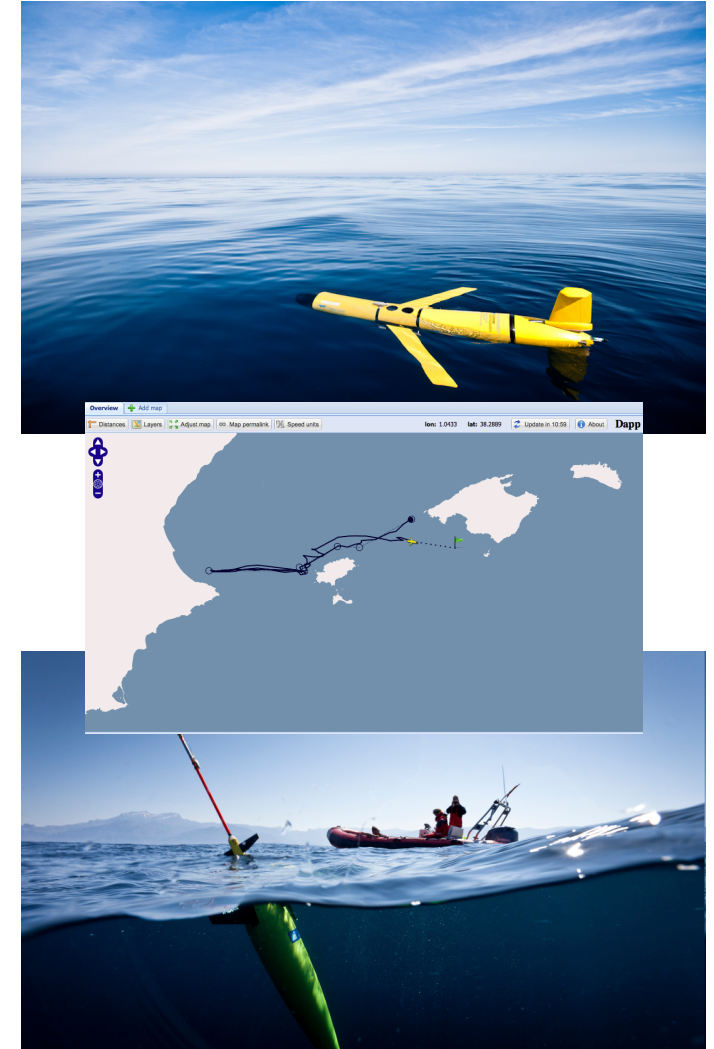
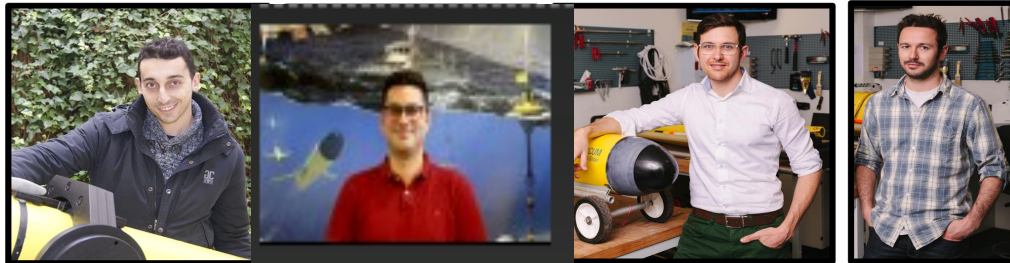
- Narrow channel & sill (80 km / 800 m)
- Governs N/S exchange water mass
- Northern Current flows south
- Inflows northward fresher Atlantic Water
- Eddies 'block' channel – winter mode water
- Exchange impacts ecosystems



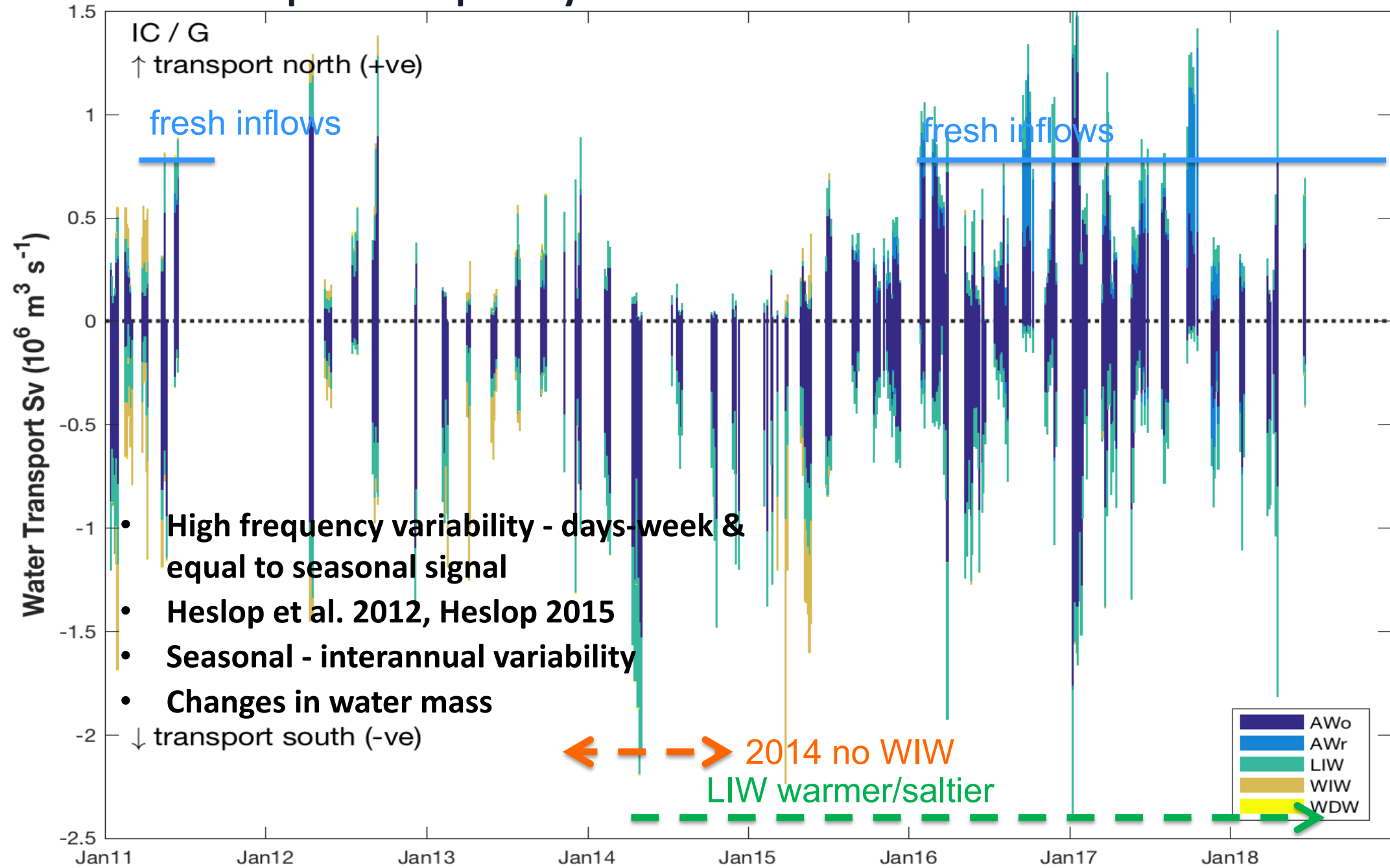
SOCIB sustained glider monitoring of the Ibiza Channel

- Ibiza Channel monitoring started Jan 2011
- Part of OceanGlider TT Boundary Currents - OO19 White Paper
- Mainly Slocum (G1 & G2), some Seaglider missions

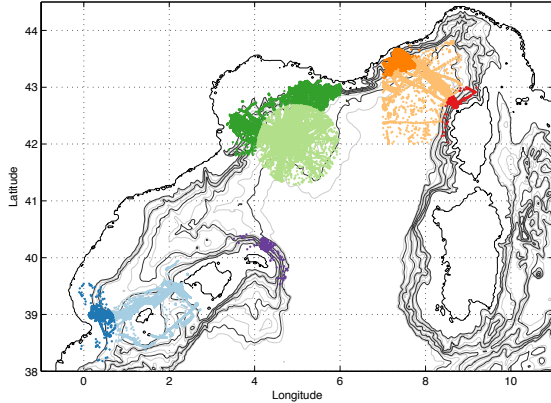
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Geostrophic transport by watermass – Ibiza Channel – 2011 - 2018

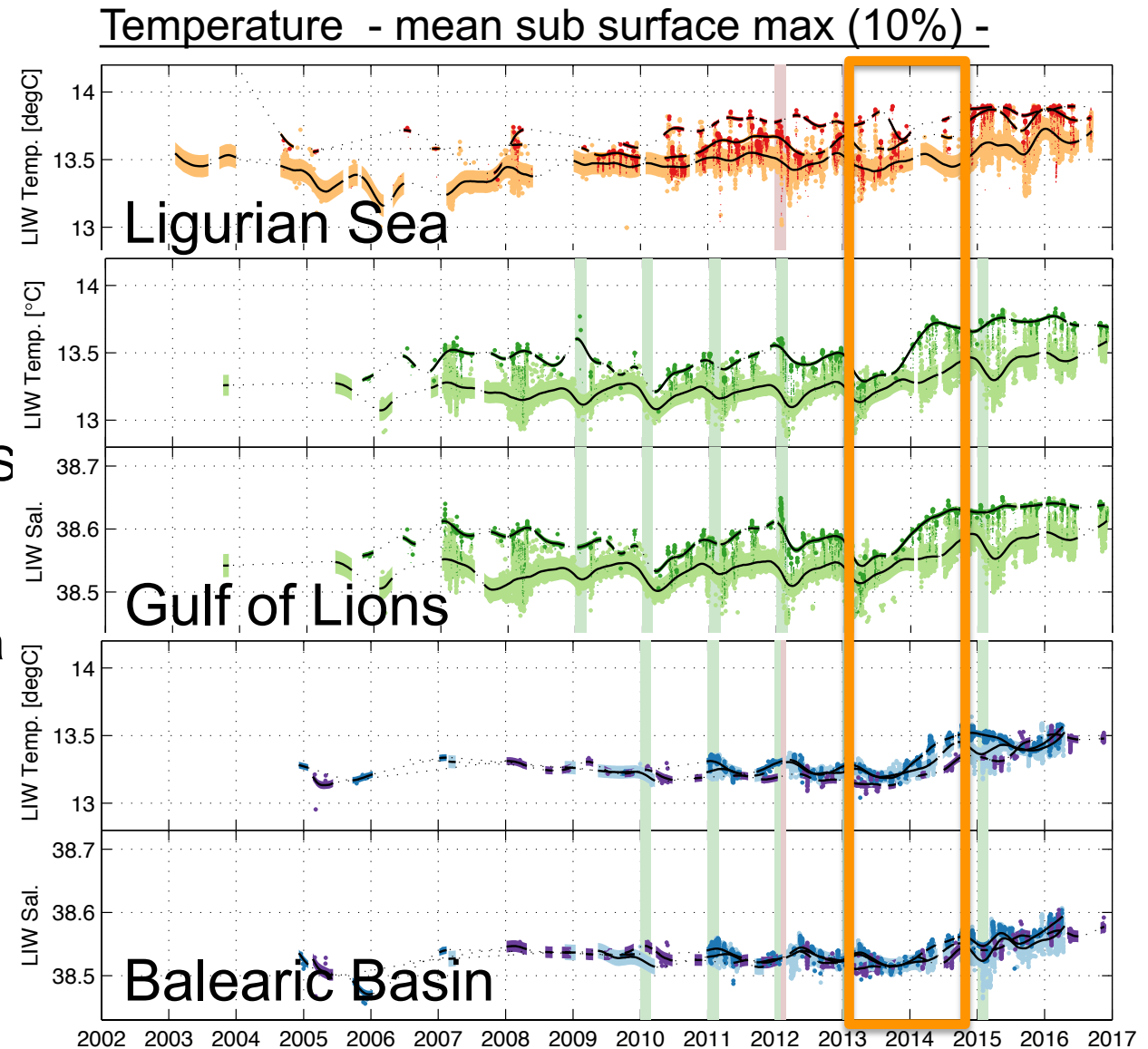


LIW change – tracked from Gulf of Lions

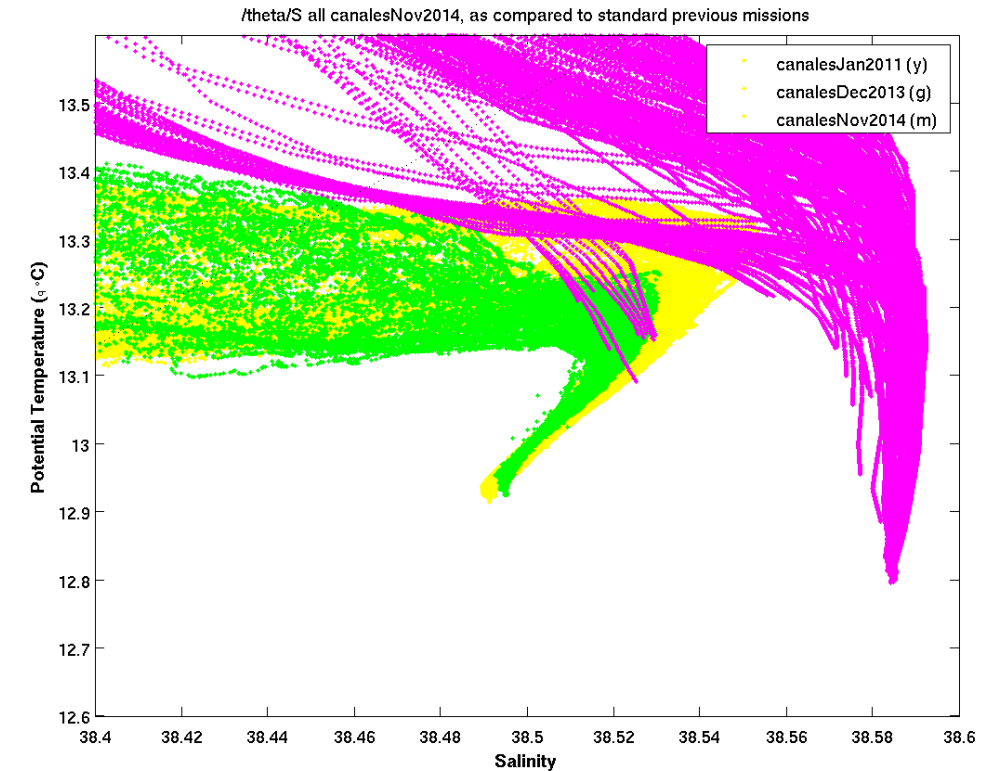
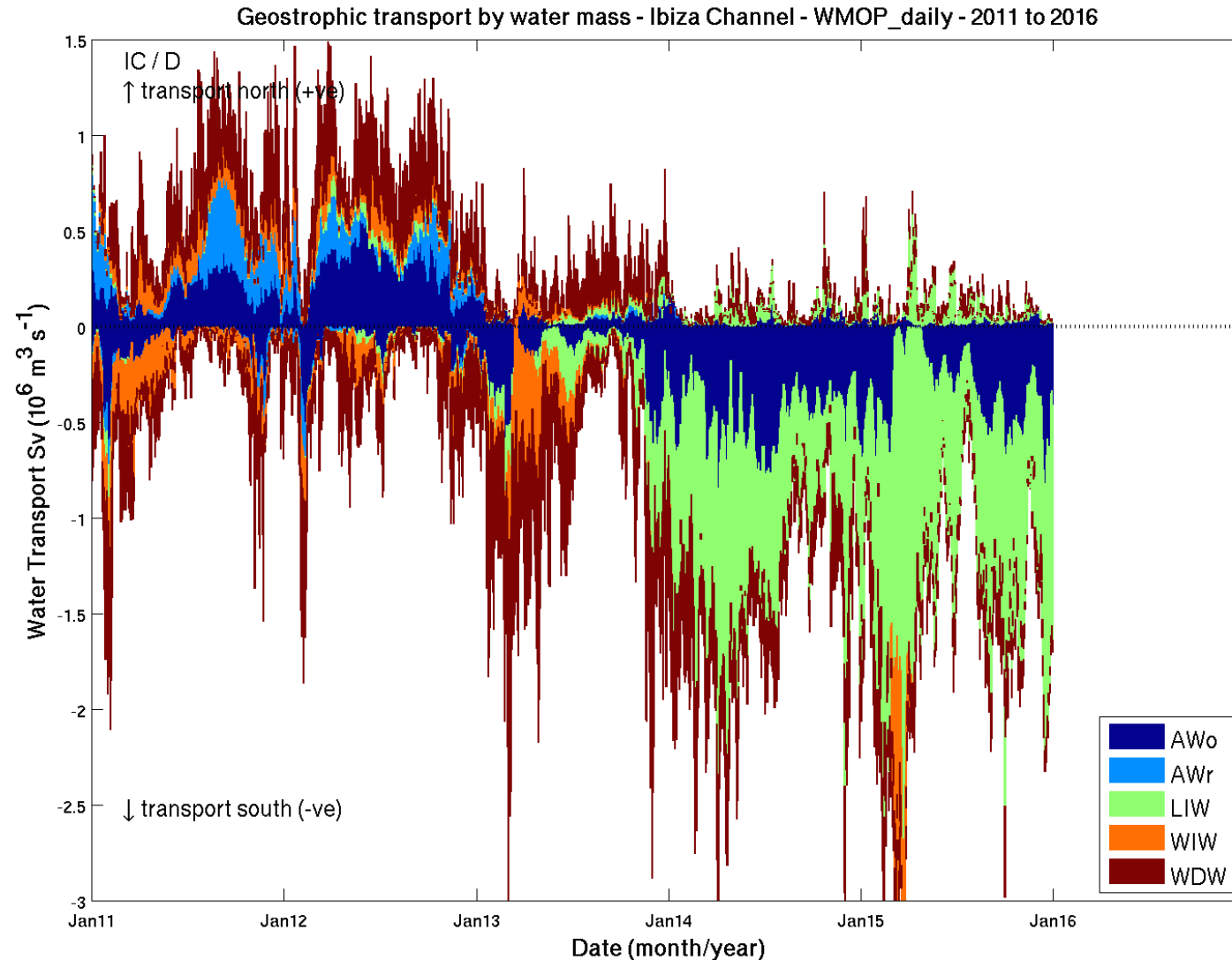


PhD Thesis Felix Mirigirier
(UPMC/CNRS) -
combining glider missions
and other in situ

- 2014 LIW subsurface maxima – jump in T and S - order 0.2°C - to 13.5 seasonal variability 0.04°C
- Backdrop increasing T & S trend in LIW maxima – source eastern Med
- Winter 2014 no deep water formation – step change LIW subsurface max.
- Reach the Ibiza Channel in spring (April 2014)



Comparison with numerical model

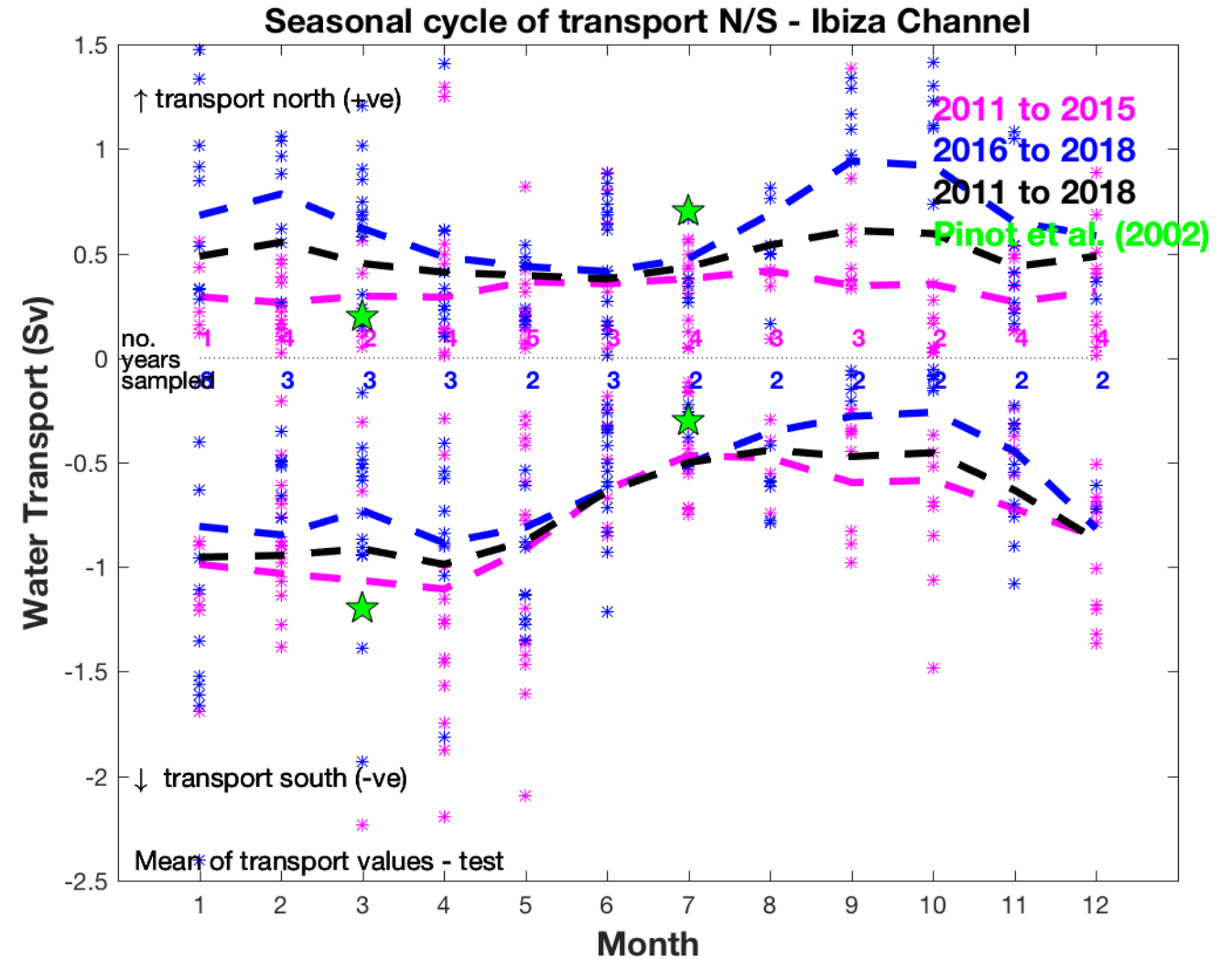
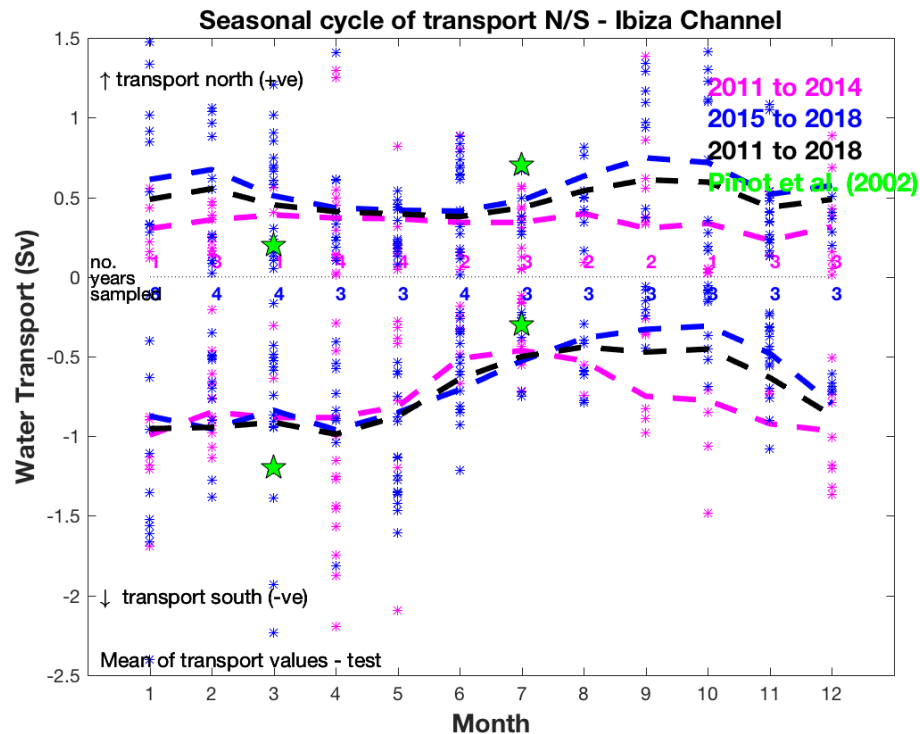


Transport comparison 2011 - 2015:

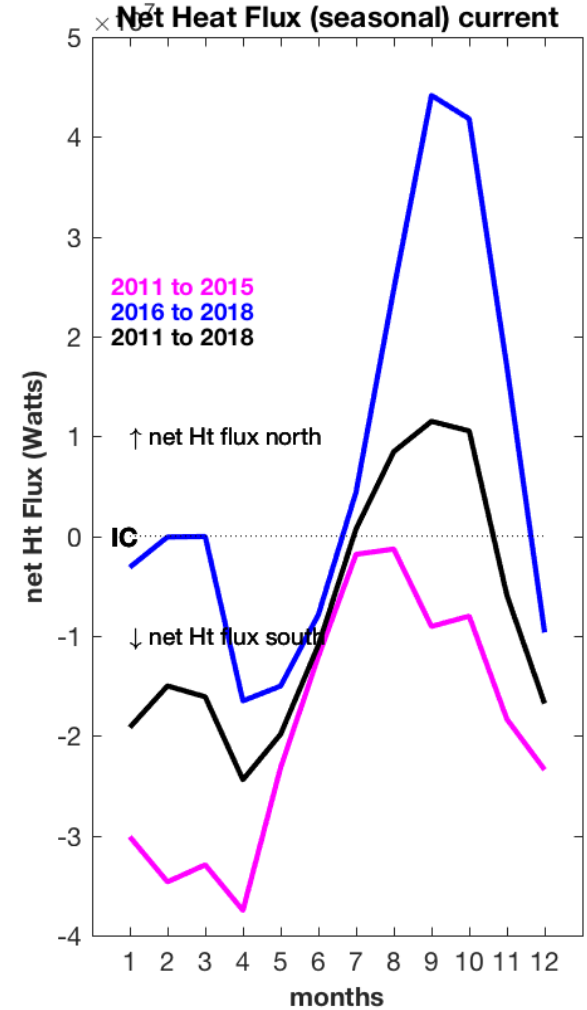
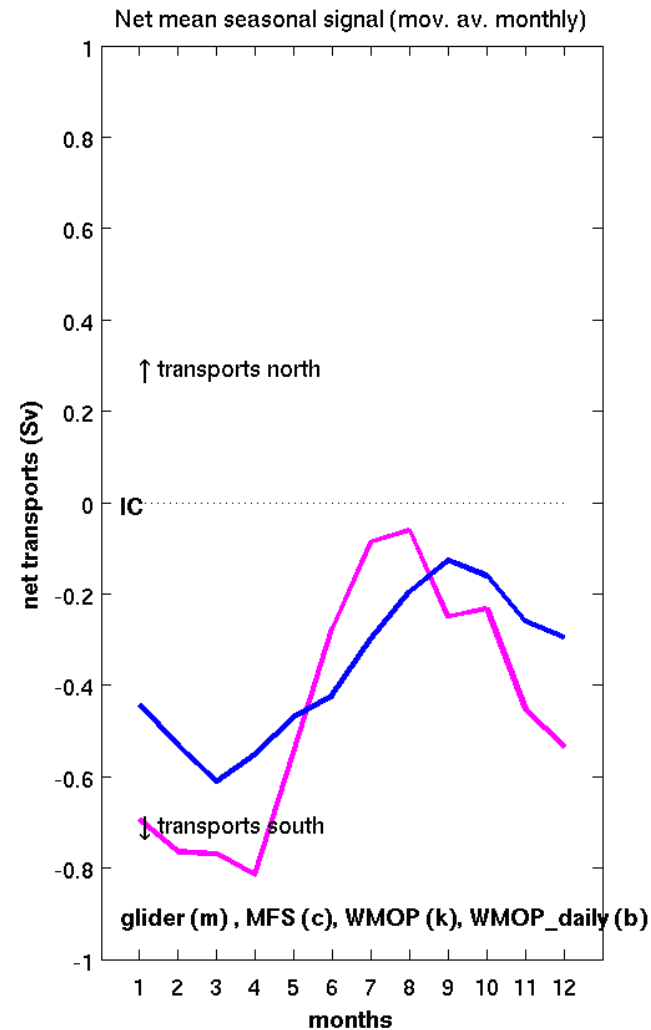
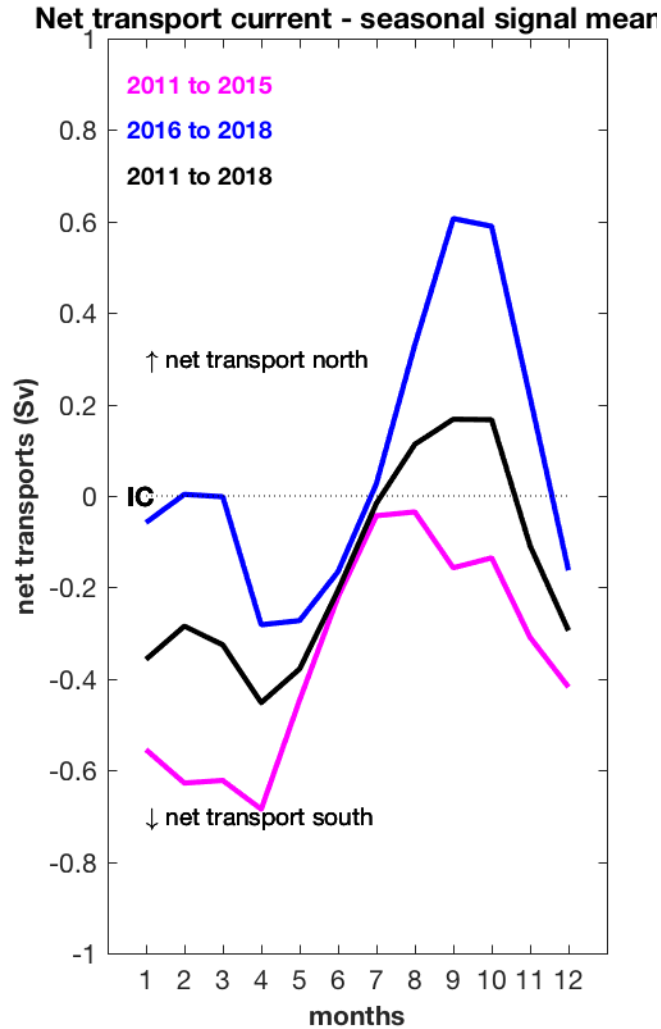
- WIW – presence/absence captured
- LIW change represented
- Some fresh AW inflows
- Bias LIW & WIW properties – origin is bias in initial state & boundaries

Seasonal Cycle Transport (monthly mean values)

- Split around time LIW change
- Stronger signal is from the fresher inflows – inhibits southward flows in winter – seasonal maxima



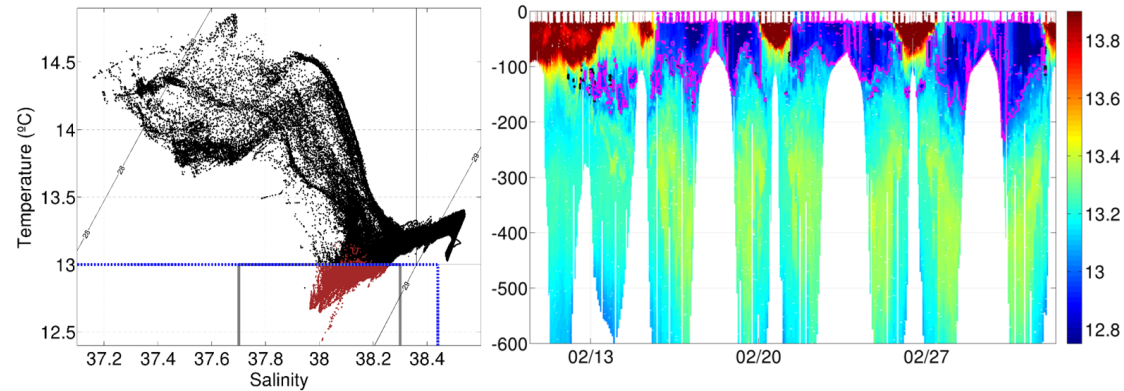
Net seasonal transport and heat flux



Conclusions & Next Steps

- Range of scales variability: interplay long term changes Mediterranean, forcing Gulf of Lions, eddies/gyres to the south
- Numerical model – capture forcing Gulf of Lions - bias affects overall performance
- Recent inflows modulating pattern seasonal transport – net heat flux

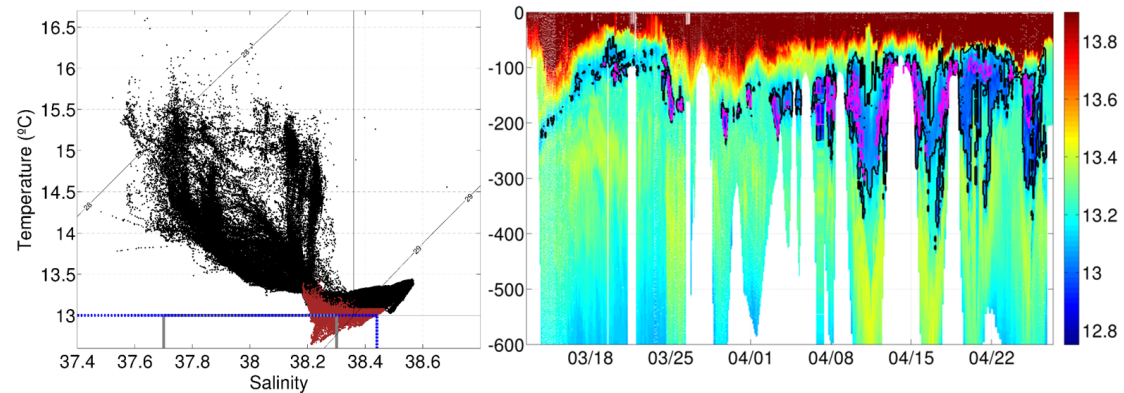
Criteria for detecting WIW – new techniques to cope!



Contornos WIW

Literatura

Automatico



Criterio WIW

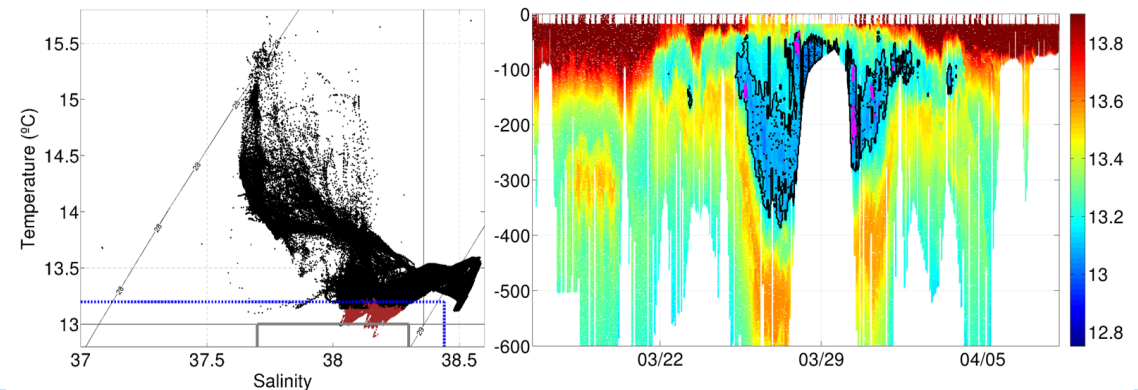
Literatura

$T < 13^{\circ}\text{C}$, $37.7 < S < 38.3$

Visual /anual

$T < 13/13.2^{\circ}\text{C}$, $S < 38.44$

Automatico - shape



Questions!

