Links between climate and the upper ocean structure: the Canary current upwelling system

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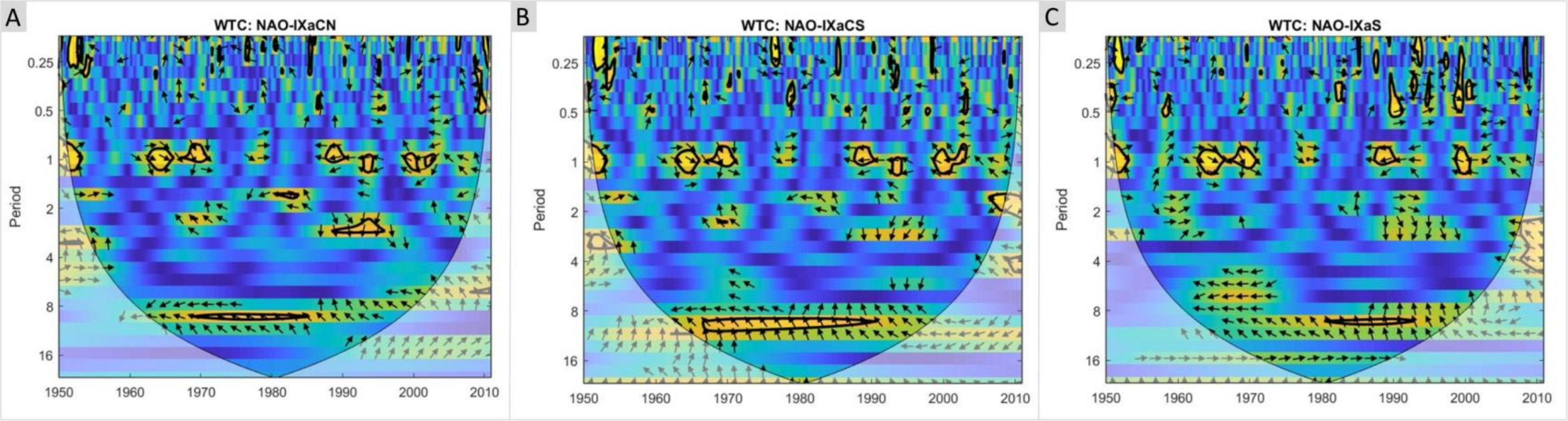
1 Previous Work



Correlation between the Sea Surface Temperature (SST) and the North Atlantic Oscillation (NAO):

- Wavelet Coherence (WTC) with the SST and the NAO time series detects non-stationary trends over time
- 8 year frequency of NAO (framed by black lines) detected along the northern (IXaCN) and southern (IXaCS) west coast of Portugal as well as at the Algarve coast (IXaS)

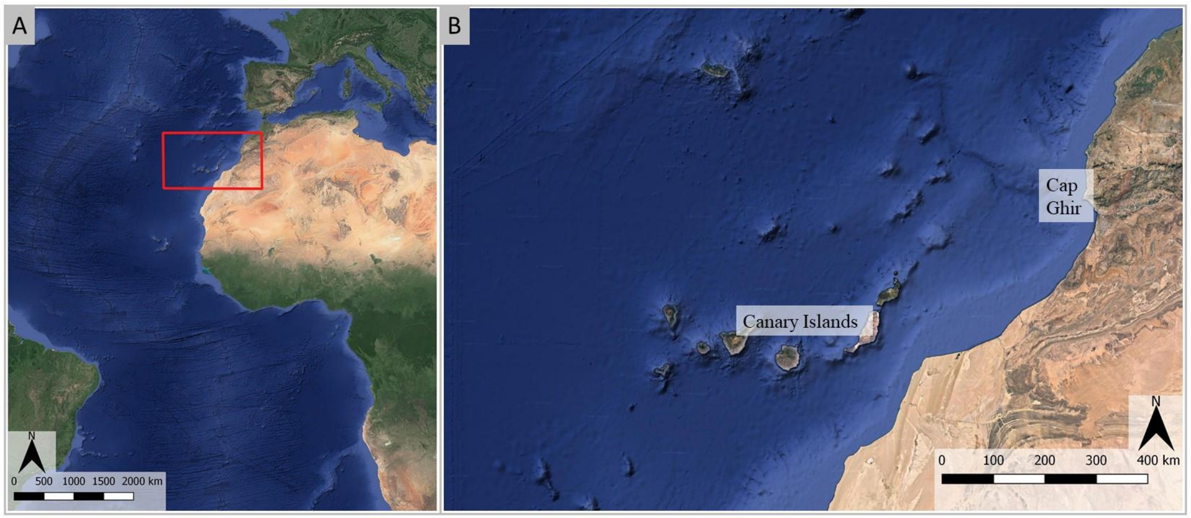
based on Baptista, V., et al., Int. J. Clim. 38 (2018): 1145–1160; Bastos, A., et al., Tellus A 65 (2013): 1-12; Neves, M.C., J. Hydrol. 568 (2019): 1105–1117

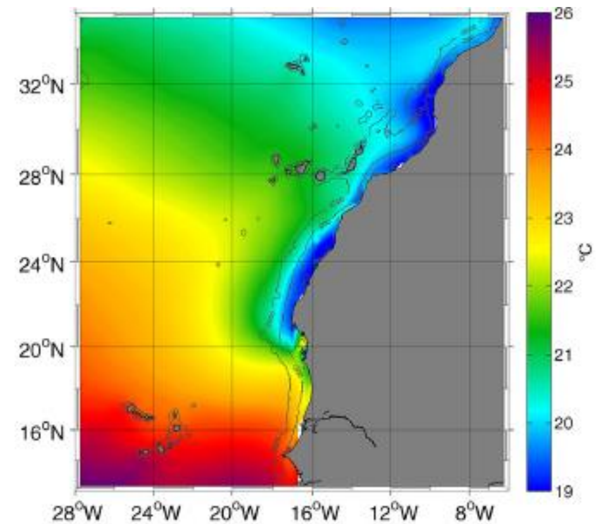
2 Objectives

- Explore the three-dimensional spatial structure of the upwelling activity along the Canary Current Upwelling System (CCUS) using in-situ data, study limited to 25-35° N (permanent upwelling)

- Relate the vertical structure in periods of strong upwelling with large-scale climate modes (North Atlantic Oscillation and East Atlantic pattern)

3 Study Area and Upwelling

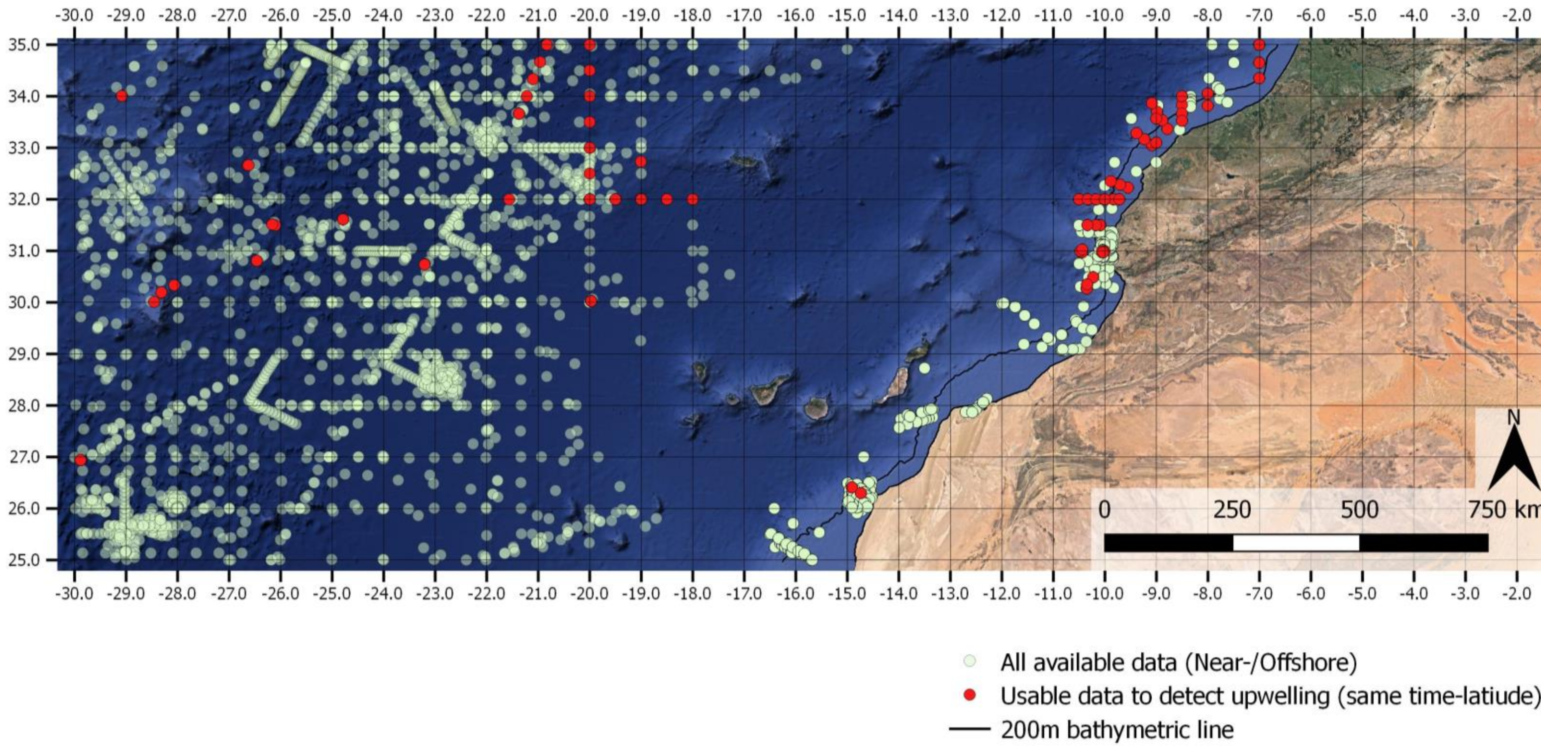




- ➢ Location of the study area
- ➢ Upwelling in the central part of the Canary Current (Mean SST 1993-2014)[1]

[1]*Gómez-Letona, M., Front. Mar. Sci. 4: 370*

4 Data World Ocean Atlas (v2018)



All available data from 1969-2019 (selected near- and offshore area) vs. usable data for the study purpose (detection of Upwelling for each latitude and time)

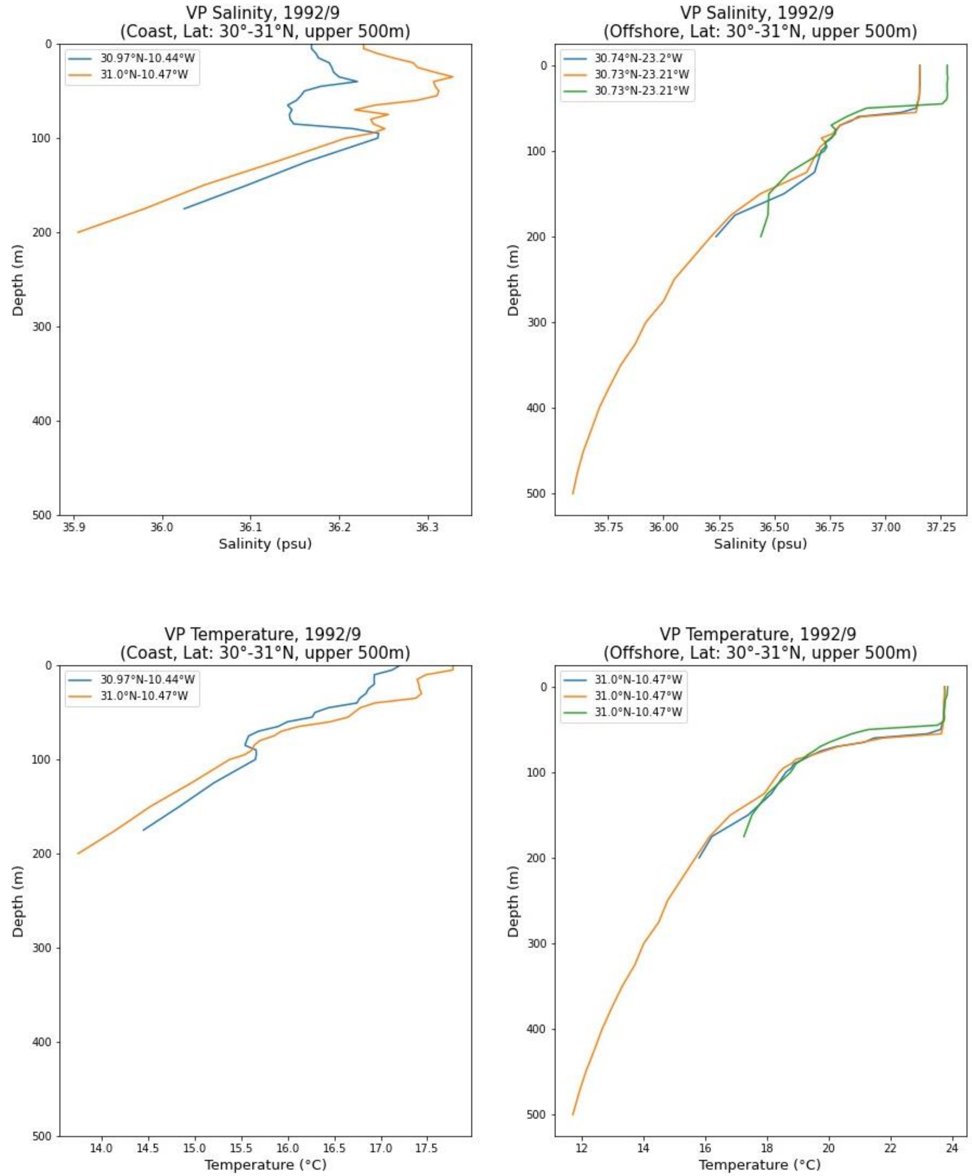
Boyer, T. P., World Ocean Database 2018 (2018)

5 Preliminary Results

Plots of the upper 500m of available vertical profiles for the same time and latitude:

- ➢ September 1992
- ➢ Latitude 30-31°N

→ Visual differences in the coastal and offshore profiles (distinct mixed-layer depth offshore) = Upwelling?

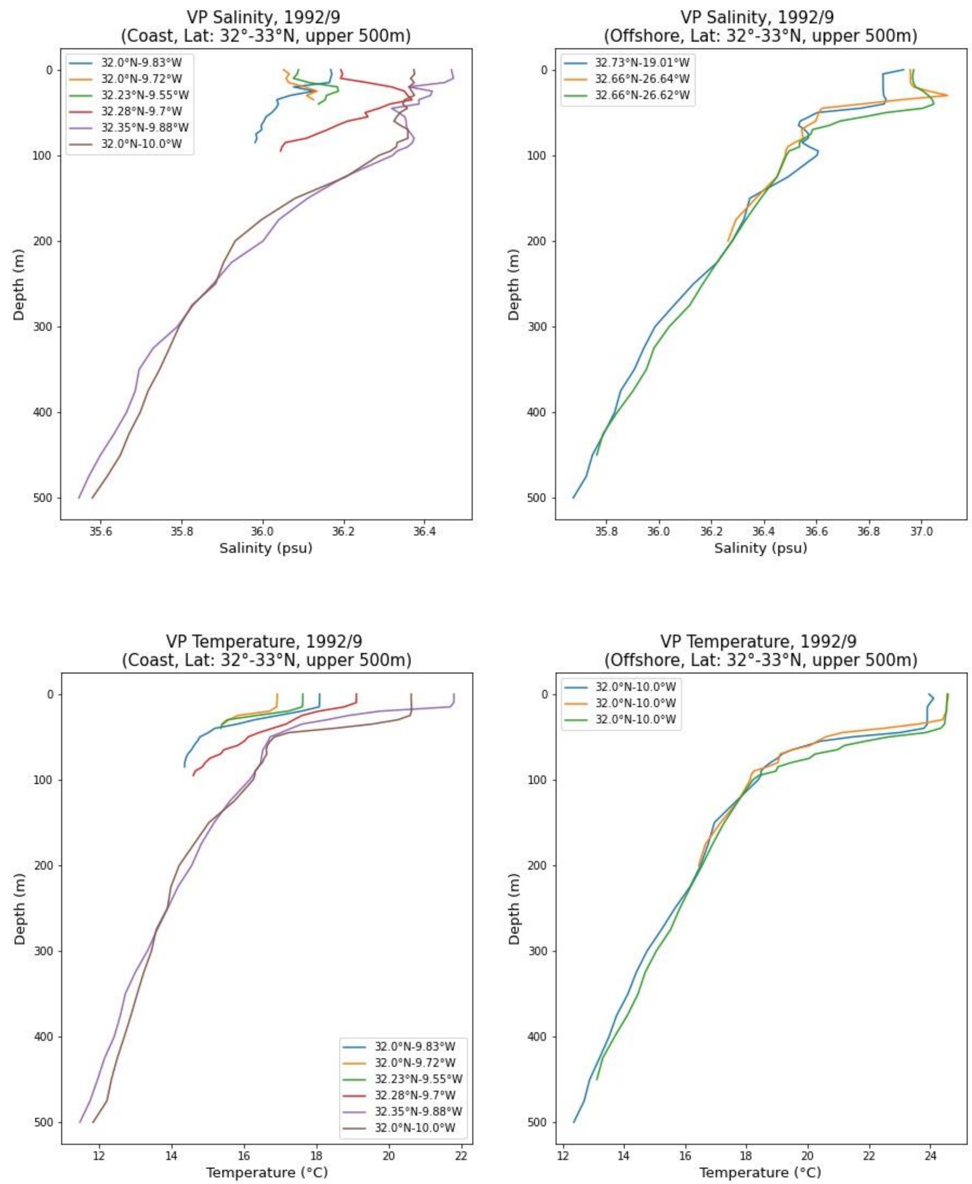


5 Preliminary Results

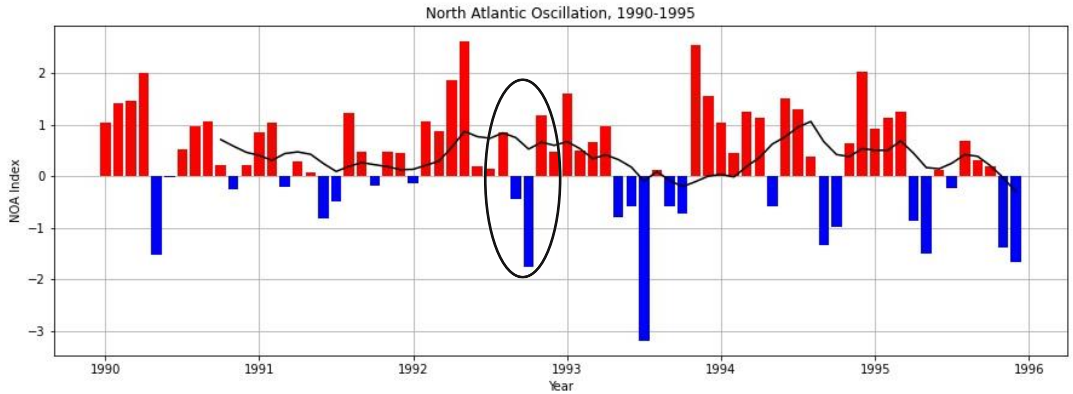
Plots of the upper 500m of available vertical profiles for the same time and latitude:

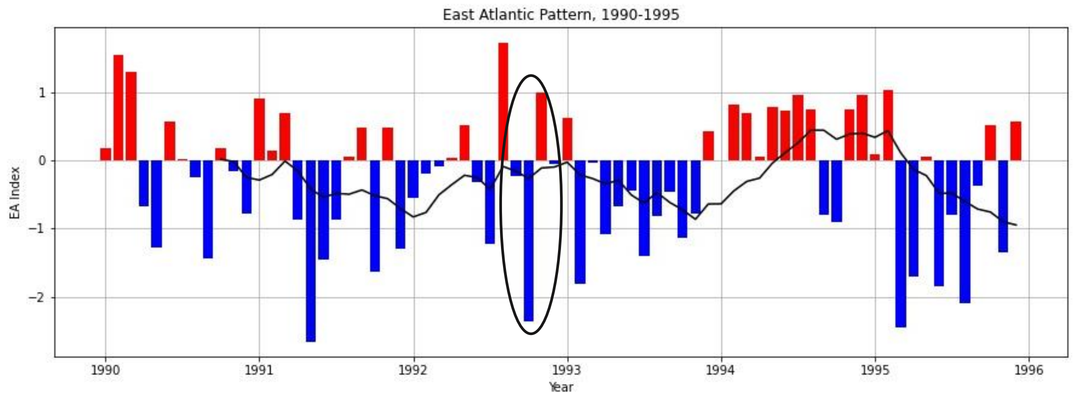
- ➢ September 1992
- ➢ Latitude 32-33°N

→ Visual differences in the coastal and offshore profiles (distinct mixed-layer depth offshore) = Upwelling?



5 Preliminary Results





Plots of the NAO and the EA index:

➢ Both in transition from a positive to a slightly negative phase in September 1992 (black circle)

→ Direct correlation or lagged response?

6 Conclusion and Outlook

- Lack of in-situ data available from the World Ocean Atlas demands the implementation of reanalysis data (modelled and interpolated)
  → Addition of data obtained from Copernicus[1], etc.
  → Verify the data with the available in-situ measurements

- Interpretation of the data using Upwelling Indices

- Built composite maps (extraction of positive and negative phases of the climate pattern and relate them to the SST and the vertical structure)[2]

[1]*Copernicus website: https://marine.copernicus.eu*
[2]*based Iglesias, I., Sci. Total Environ. 609 (2017): 861-874.*