

# Coastal and regional Marine HeatWaves and Cold-Spells in the Bay of Biscay and the English Channel

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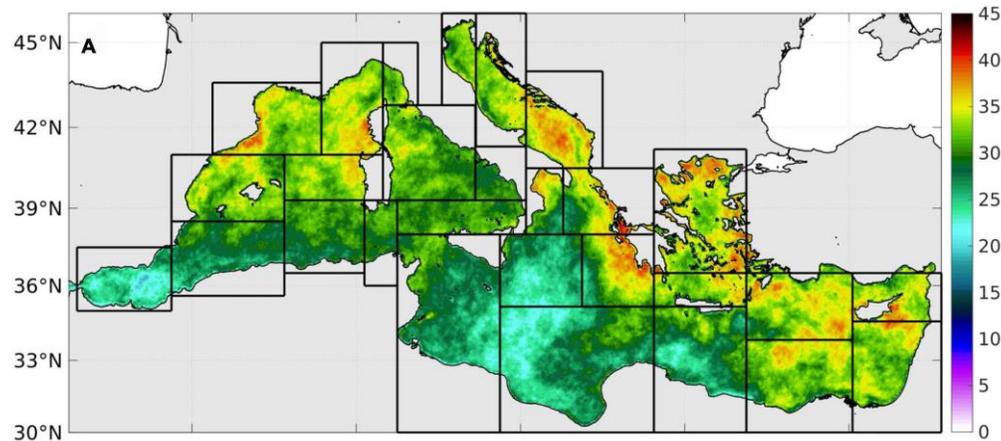
# Coastal and regional Marine HeatWaves (MHWs)

What do we consider as a **MHW** ?

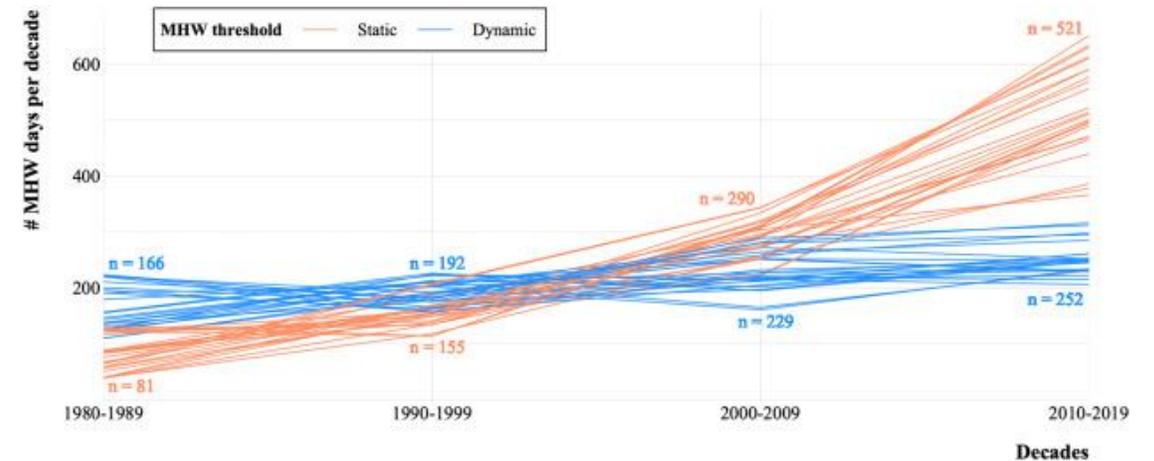
*A prolonged discrete anomalously warm water event that can be described by its duration, intensity, rate of evolution, and spatial extent (Hobday et al., 2016)*

Recent studies confirm in coastal ocean the **increase of MHW** (number, intensity)

*( e.g. Schlegel et al., 2017; Juza et al., 2022; Izquierdo et al., 2022)*



*Juza et al. (2022)*



*Izquierdo et al. (2022)*

## Objectives

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What is the **evolution of the MHW activity** in the Bay of Biscay and the English Channel during summer (JJAS) ?

Are these evolutions observed in **coastal *in situ* observations** ?

Depending main hydrodynamical processes, what is the **regional variability of coastal ocean MHW** ?



# OISST Dataset

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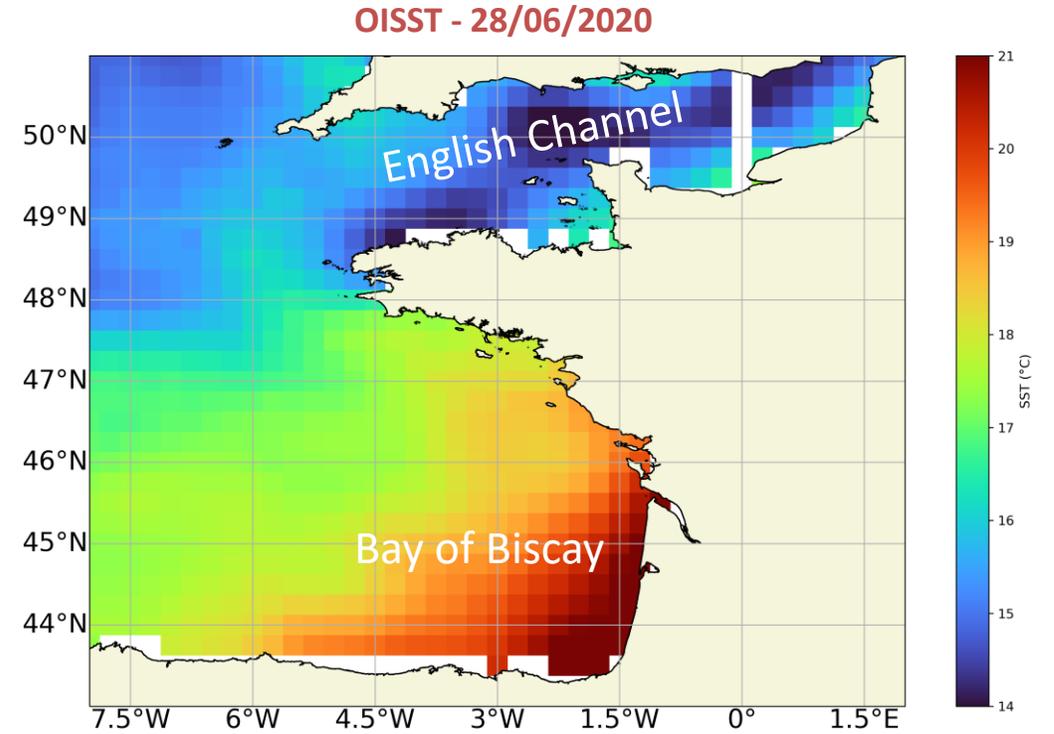
## Daily Optimum Interpolation Sea Surface Temperature – OISST

(Reynolds et al., 2007; Huang et al., 2020)

Long term Climate Data Record from different platforms  
(satellites - AVHRR, ships, buoys and Argo floats)

Time Period: **1982-2021**

Spatial resolution: **¼ degrees**



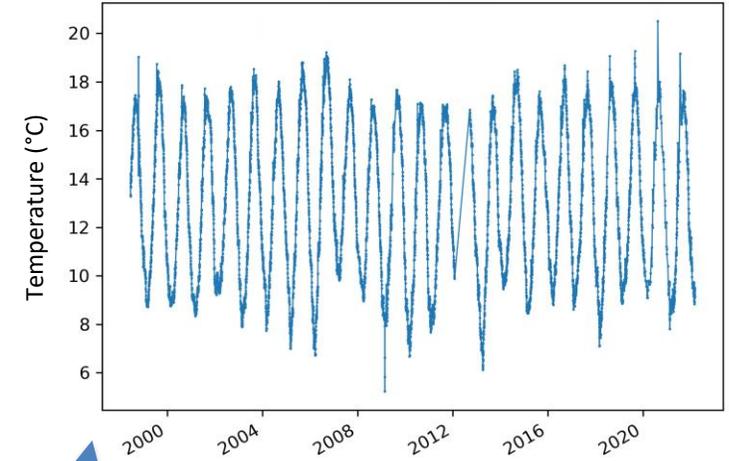
# In situ Dataset

## 13 buoys

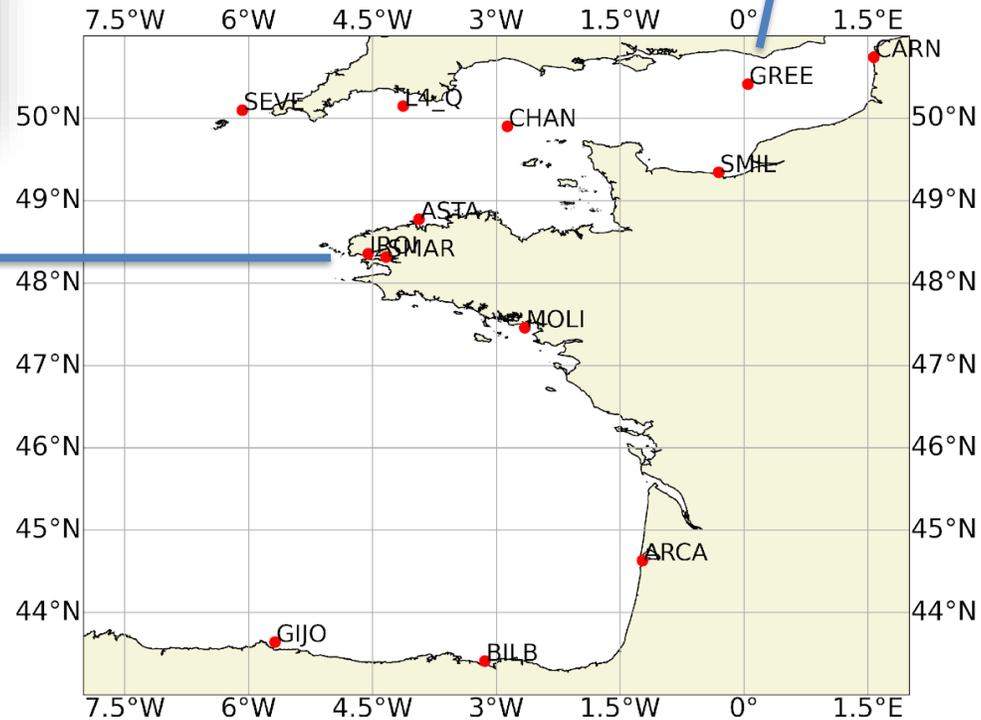
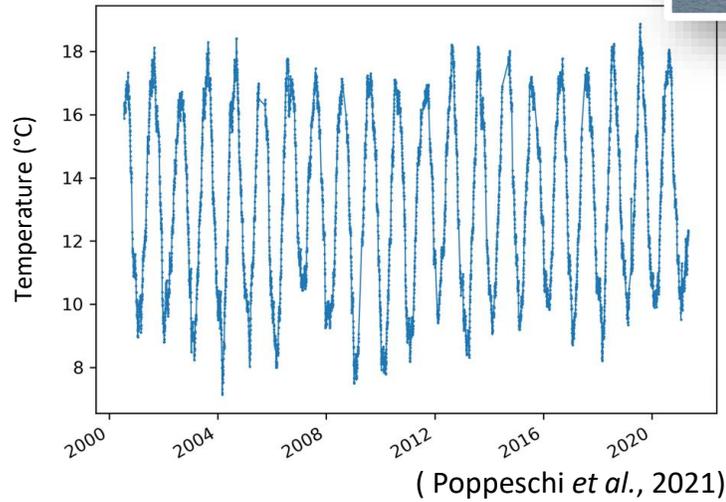
(COAST-HF network - France (7), Met Office – UK (3),  
Western Channel Observatory – UK (1), Puertos del Estado – Spain (2) )

Continuous automated sampling of **Sea Surface Temperature**

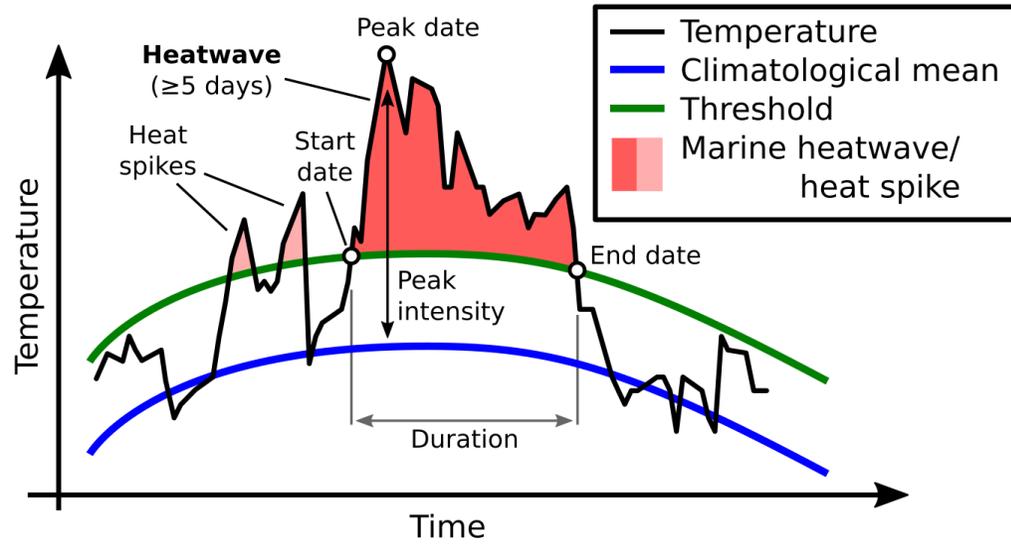
### Greenwich Lightship buoy



### Marel Iroise buoy



# Identification of Marine HeatWaves (MHW)

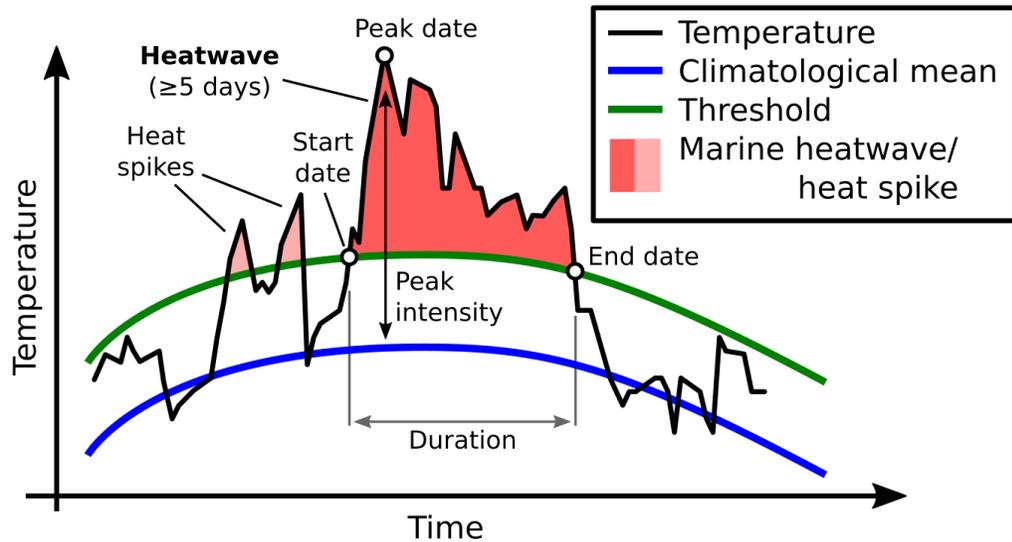


**MHW** = Sea Surface Temperature larger than a threshold for more than 5 days (*Hobday et al., 2016*)

*Threshold (percentile 90) calculated over 40 years of SST climatology (from OISST: 1982-2021)*



# Identification of Marine HeatWaves (MHW)



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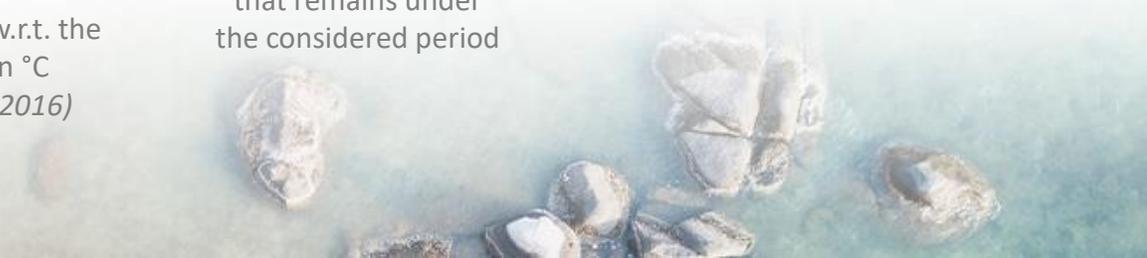
An integrated indicator: **Activity** (Simon et al., 2022)

$$Activity = \sum_{EE \in Time\ Range} mean\ intensity_{EE} \cdot duration_{EE \cap Time\ Range} \cdot area_{EE}$$

Mean temperature anomaly, w.r.t. the threshold, during the EE, in °C (as defined in Hobday et al, 2016)

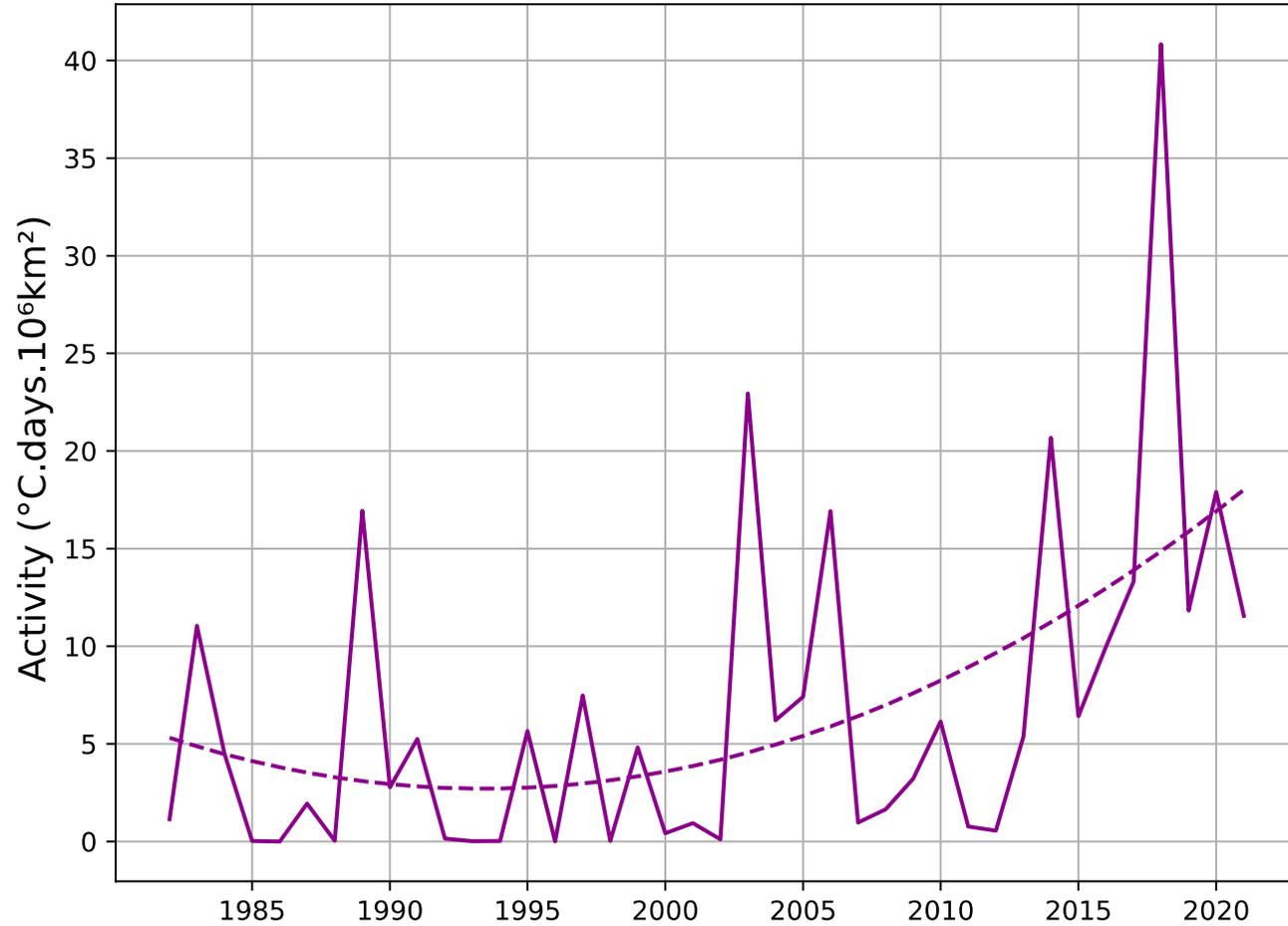
Duration of the EE that remains under the considered period

Area affected by the discrete EE



# Synoptic view

MHW JJAS 8W2E-43N51N oisst



Since 2000, increase of MHW activity

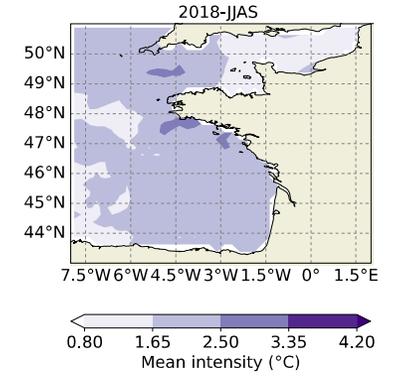
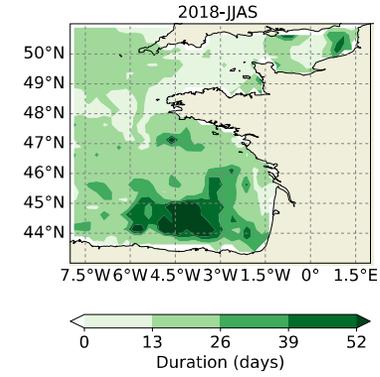
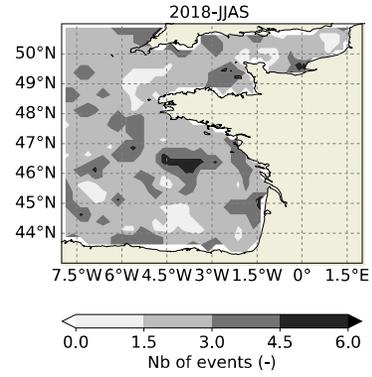
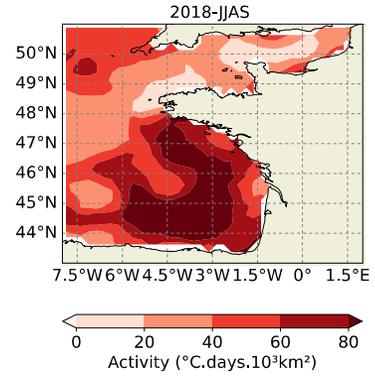
6 most active years: 2018, 2003, 2014, 2020, 1989, 2006

(5/6 in 2000's years)

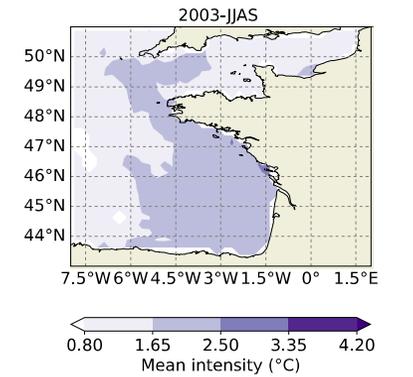
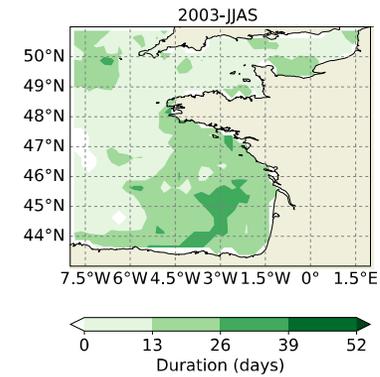
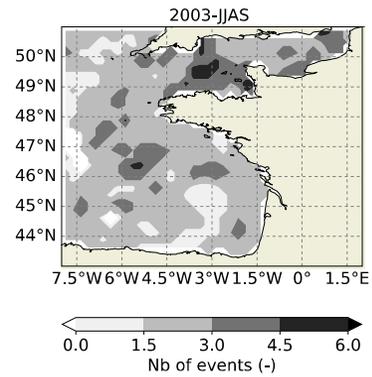
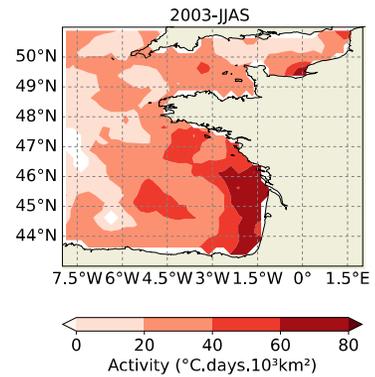


# 2018 and 2003 - most active years

2018



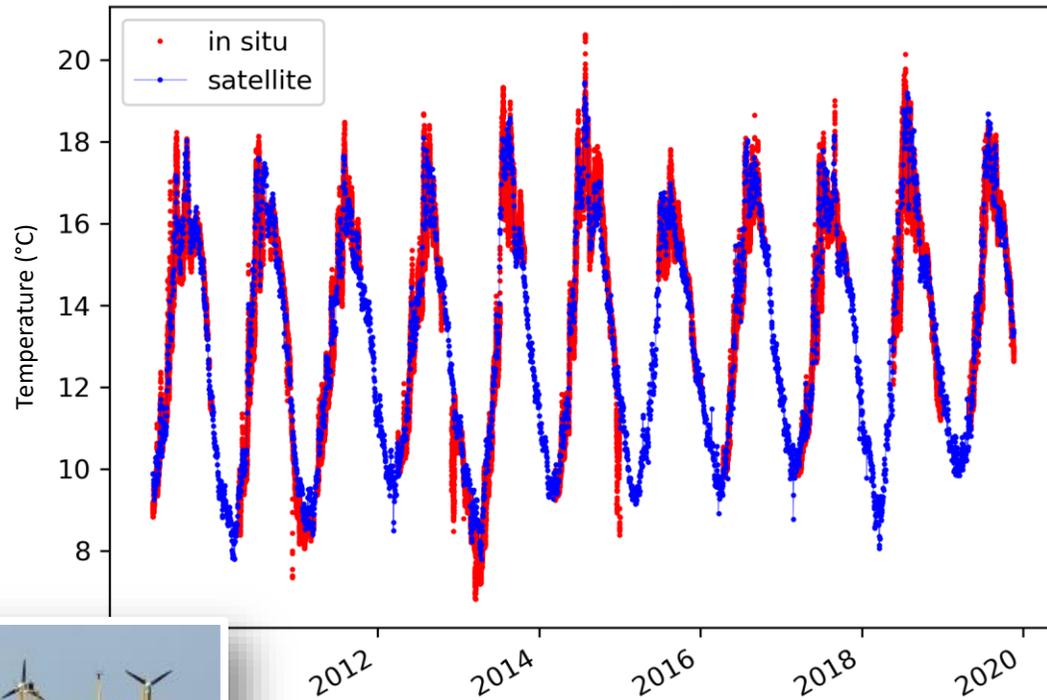
2003



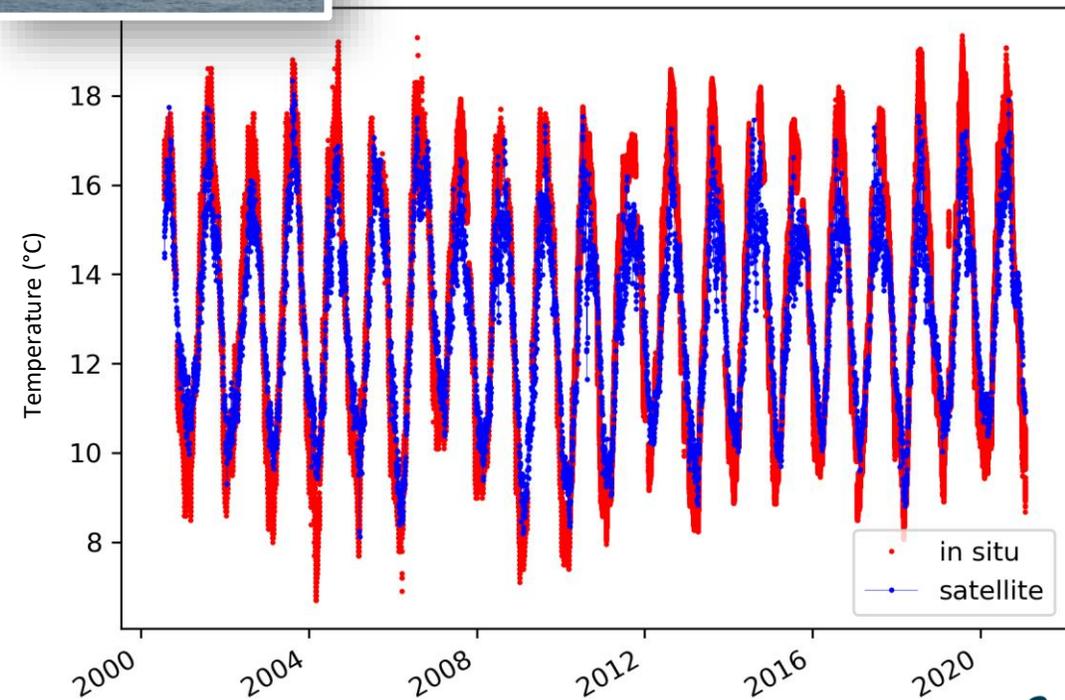
# Coastal *in situ* observations

Agreement between *in situ* and  
OISST (satellite)

### L4 buoy



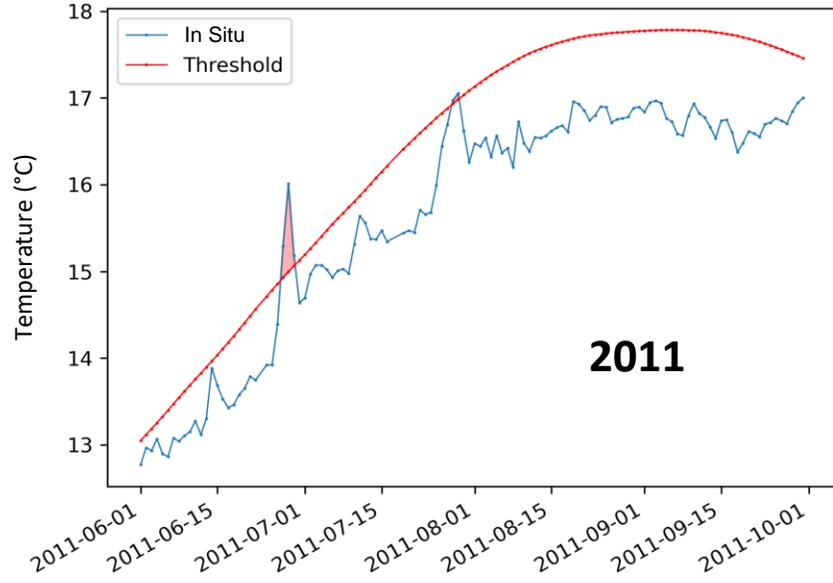
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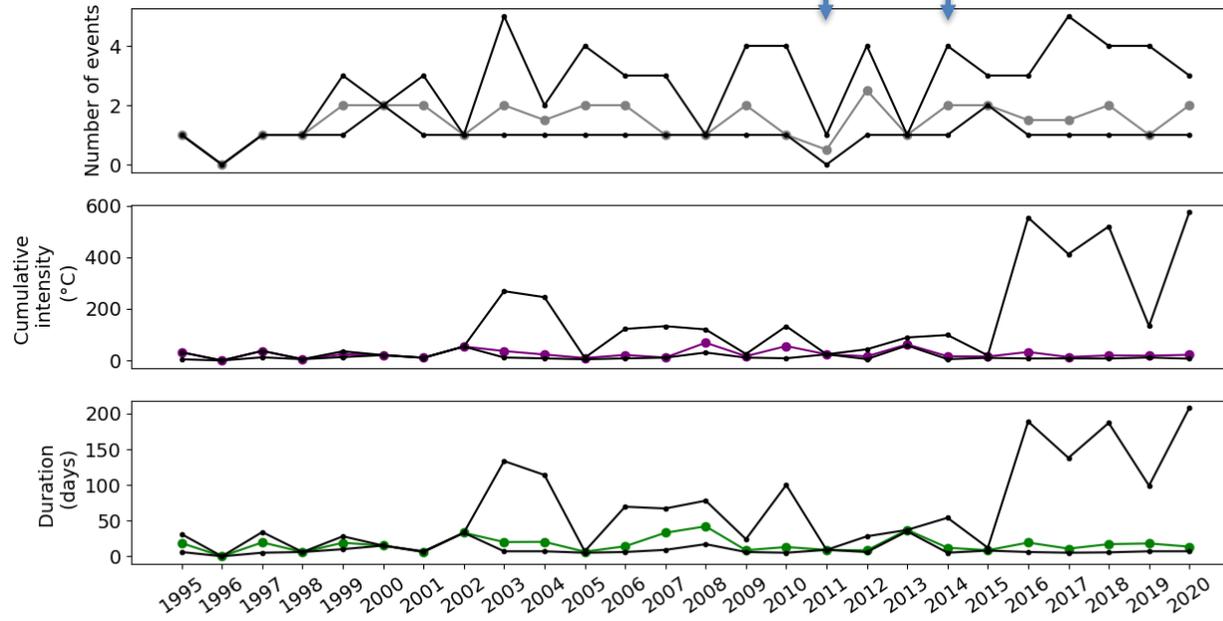
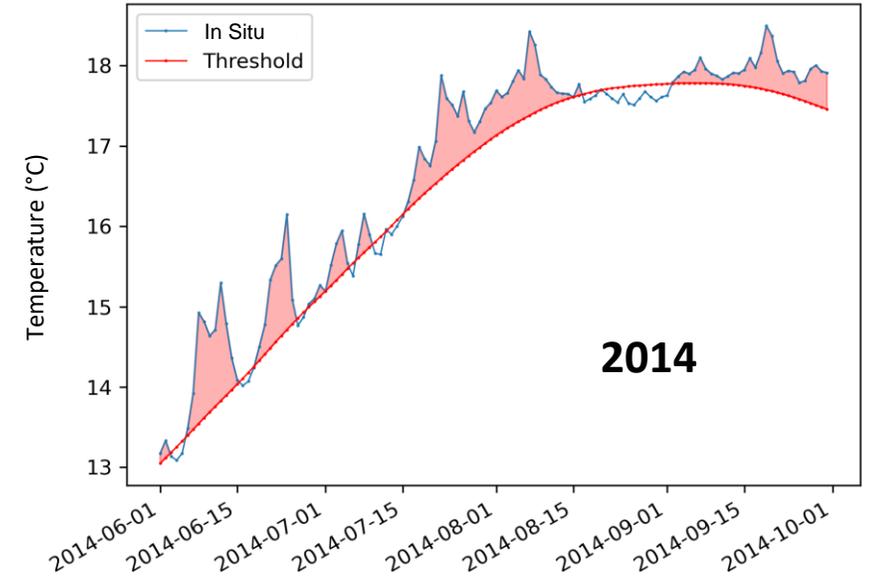
Western Channel  
Observatory

# Detection of Marine HeatWaves from *in situ* observations

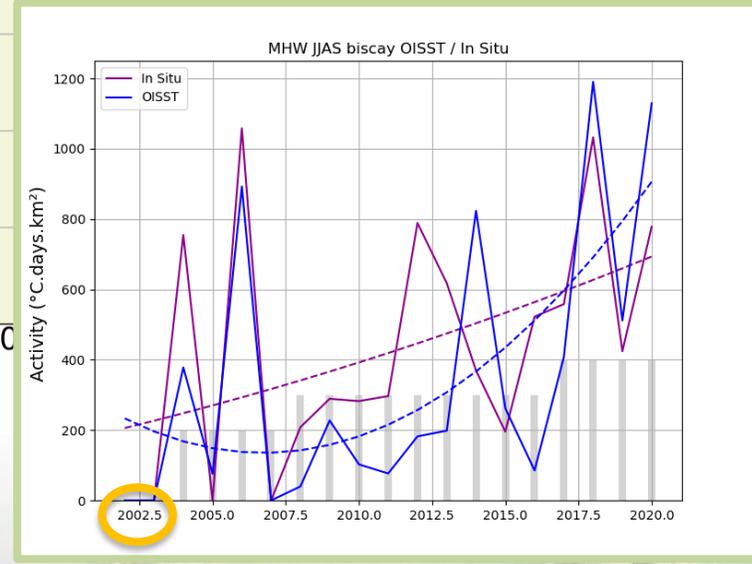
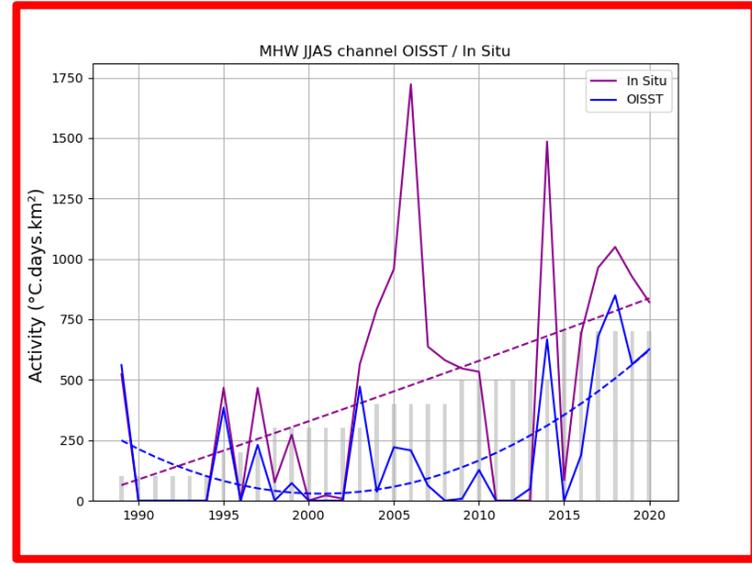
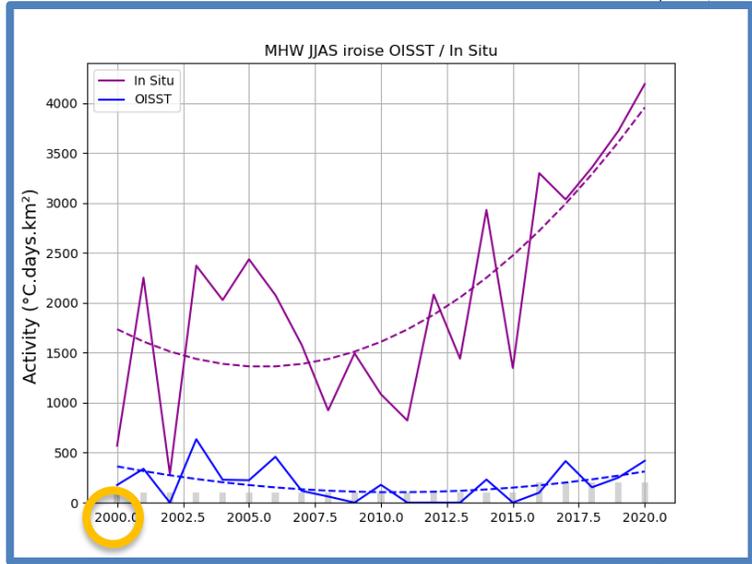
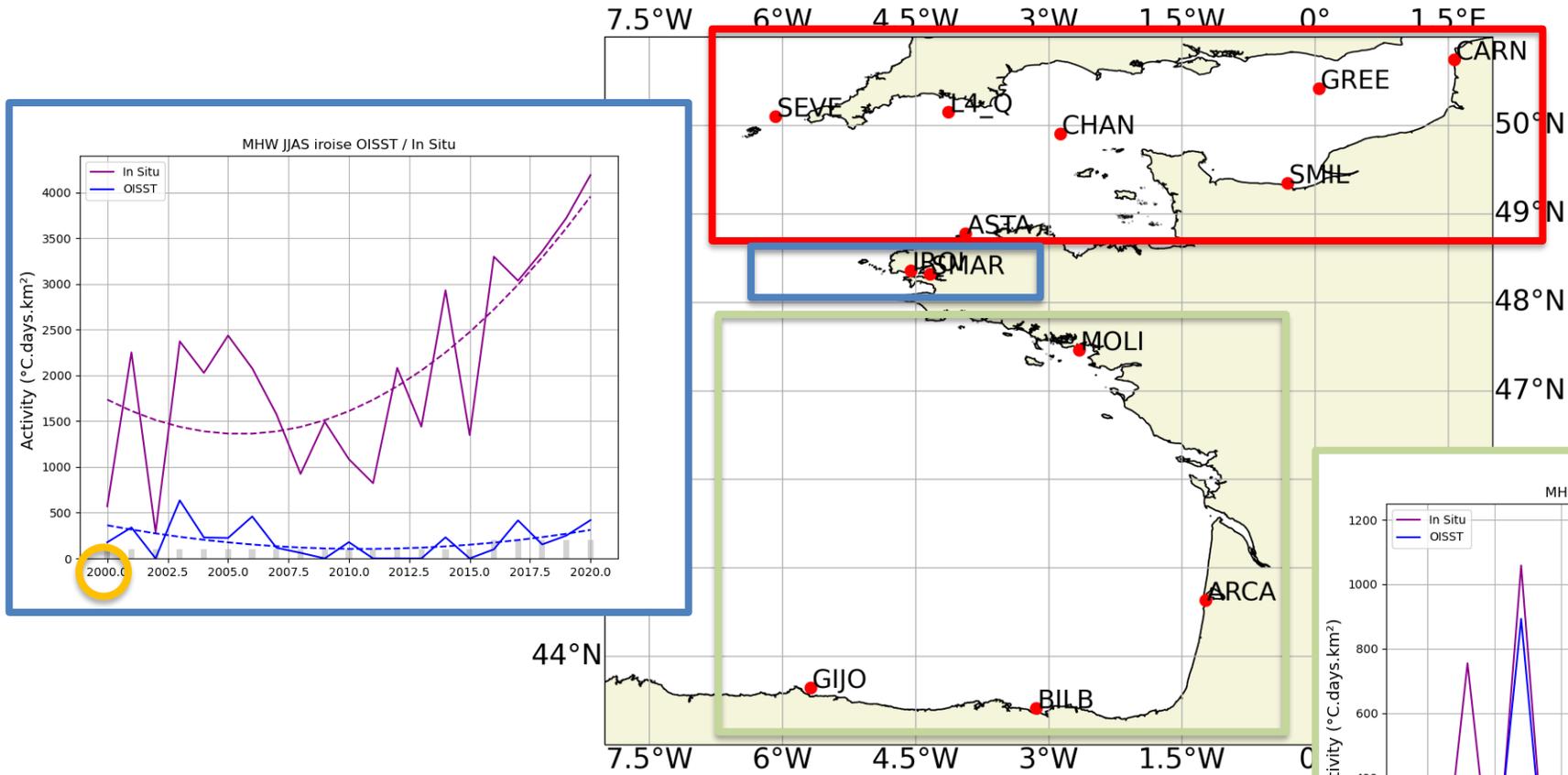
## Greenwich Lightship buoy



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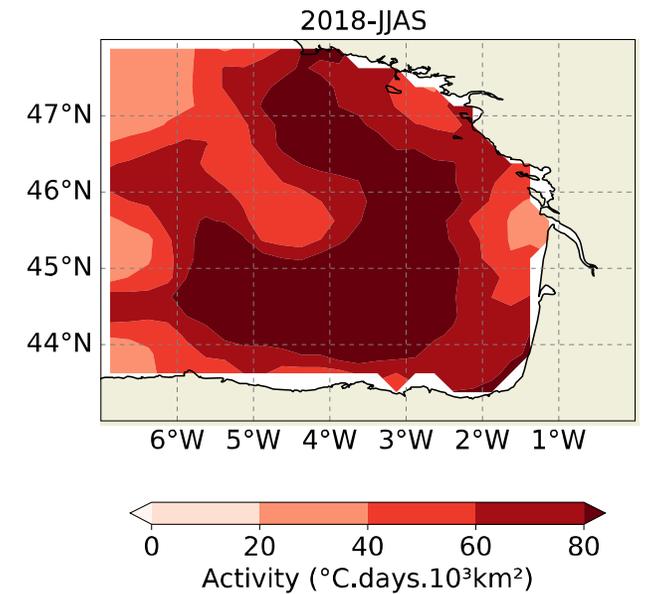
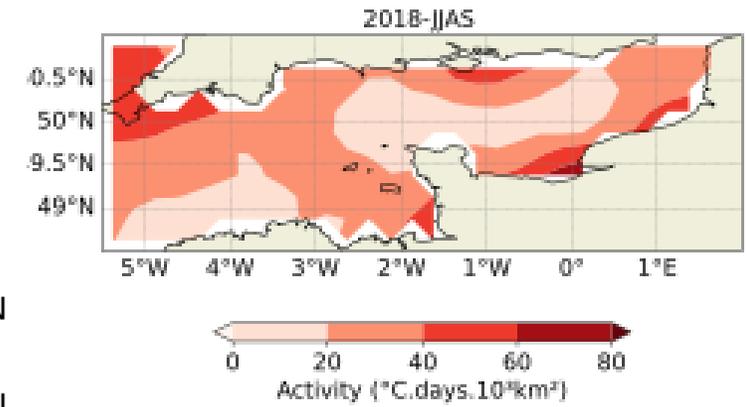
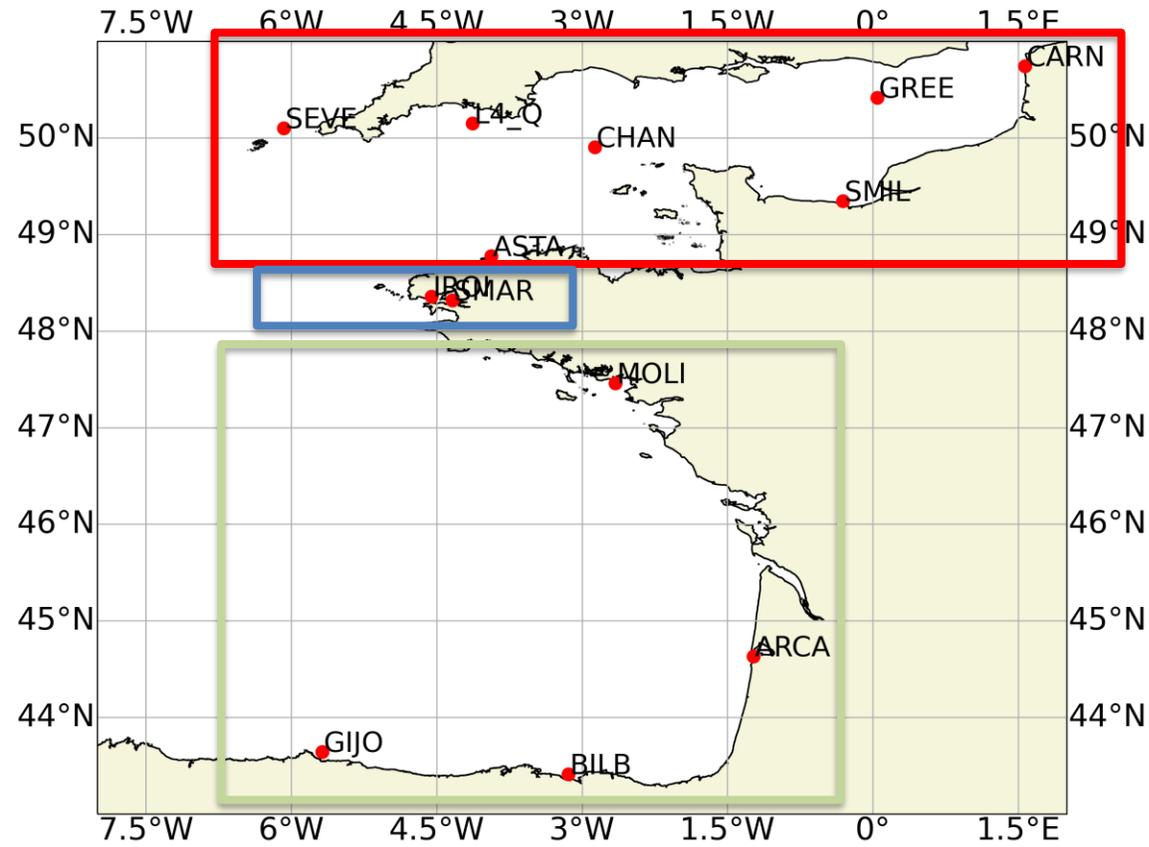
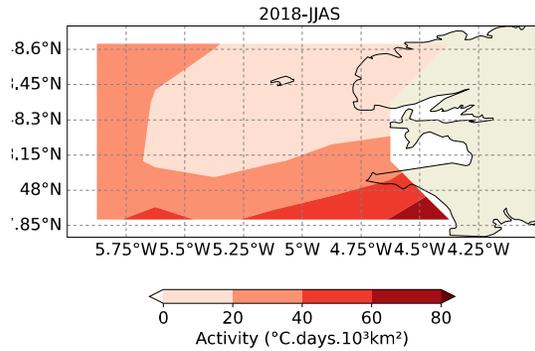


# MHW activity in subregions



# MHW activity in subregions

## Example: 2018



## Conclusion and Perspectives

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In the Bay of Biscay and English Channel

- Detection of an **increase of MHW activity** since 2000
- Existing **coastal *in situ* stations** adapted to detect evolution of MHW activity
- **Regional variability** of MHW activity

Next steps

- Document **drivers** of observed Marine Heatwaves
- Document the decrease of **Marine Cold-Spells** in the English Channel and the Bay of Biscay



Thanks for your attention ...

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=> We acknowledge FCT funding through project ROADMAP (JPIOCEANS/0001/2019)

**Job offer: European project coordinator**

Brest - France, Ifremer, deadline: 17<sup>th</sup> of July



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