



How to detect marine heatwaves in a fjord-like environment ?

Case study of the semi-enclosed inner seas of North Chilean Patagonia



Cécile Pujol, Iván Pérez Santos, Alexander Barth, Pamela Linford, Aida Alvera Azcárate

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What are marine heatwaves?

Anomalously warm water events

Formed due to
processes

Atmospheric

Oceanic

Dramatic consequences

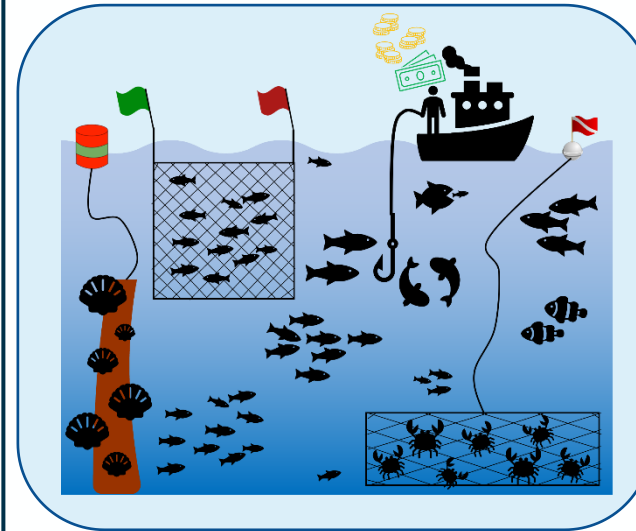
Ocean
properties

Ecosystems

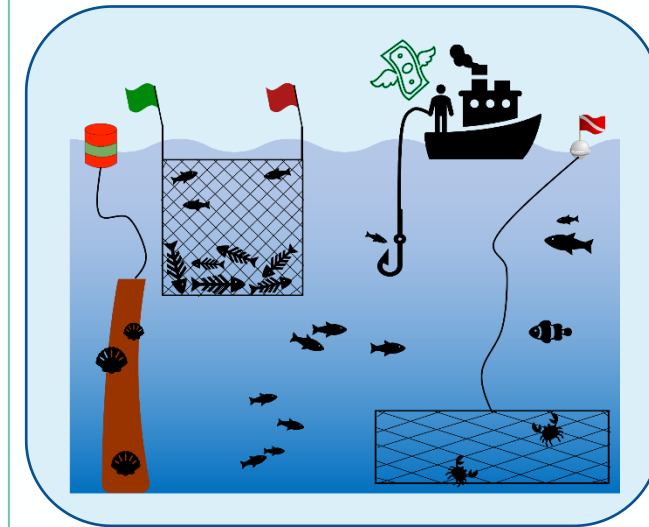
Fishing
Aquaculture

Devastating consequences

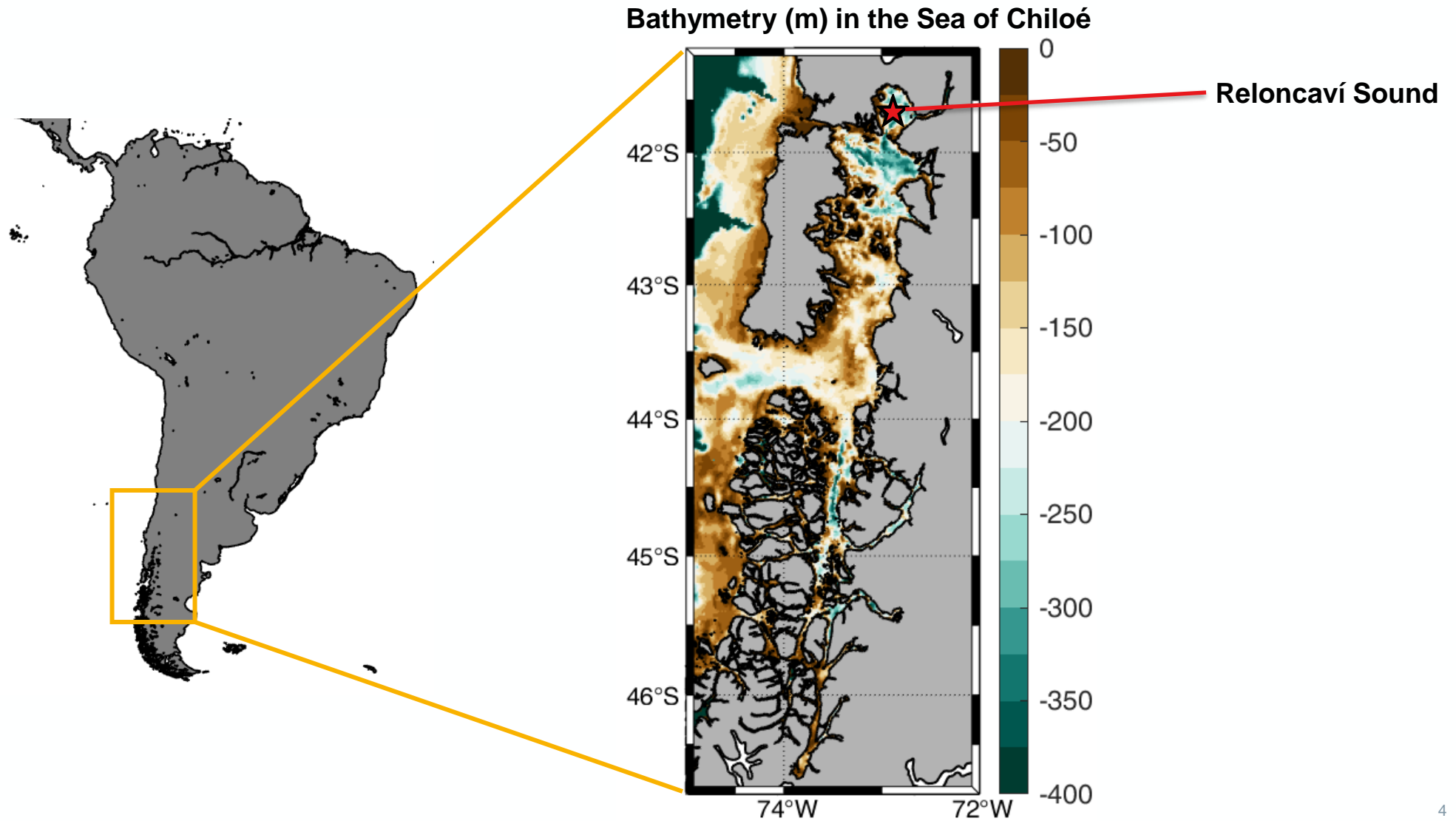
Before a MHW



During a MHW



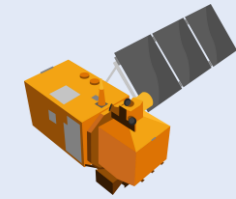
Study area: the Sea of Chiloé



How to detect MHWs?

In an open ocean-like environment

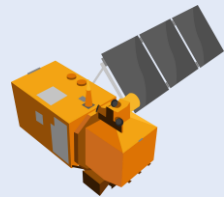
Long-term Climatology



SATELLITE DATA

- Global products
 - Daily temporal resolution
- Spatial resolution of
tens/few kilometers

Local SST



SATELLITE DATA

Detection of the MHWs

Climatology

Local SST

Threshold:
90th percentile

heatwaveR

Schlegel and Smit, 2018



In a fjord-like environment

Detection possible in the largest parts of the sea

+ Very cloudy/rainy region

What about narrow fjords and channels?

What about to use in situ data ?

What about to use in situ data ?

? Climatology

? Local SST

? Threshold:
90th percentile

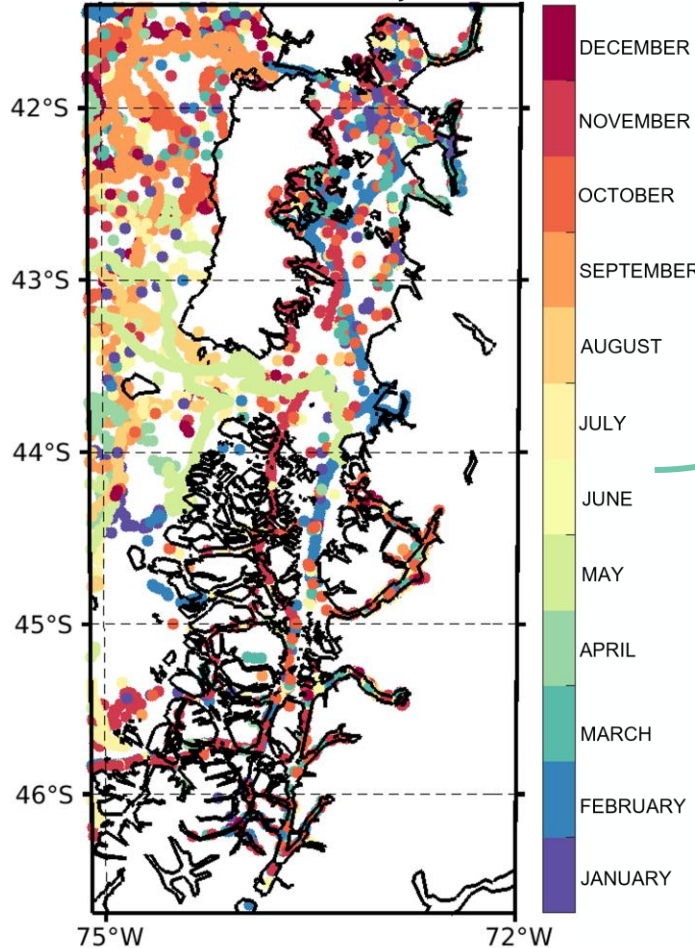
heatwaver

Schlegel and Smit, 2018



Detection of the MHWS: to build a monthly climatology

In situ data in North Patagonia
(colours correspond to the month of the observation)



Data-Interpolating Variational Analysis

(Troupin et al., 2014)



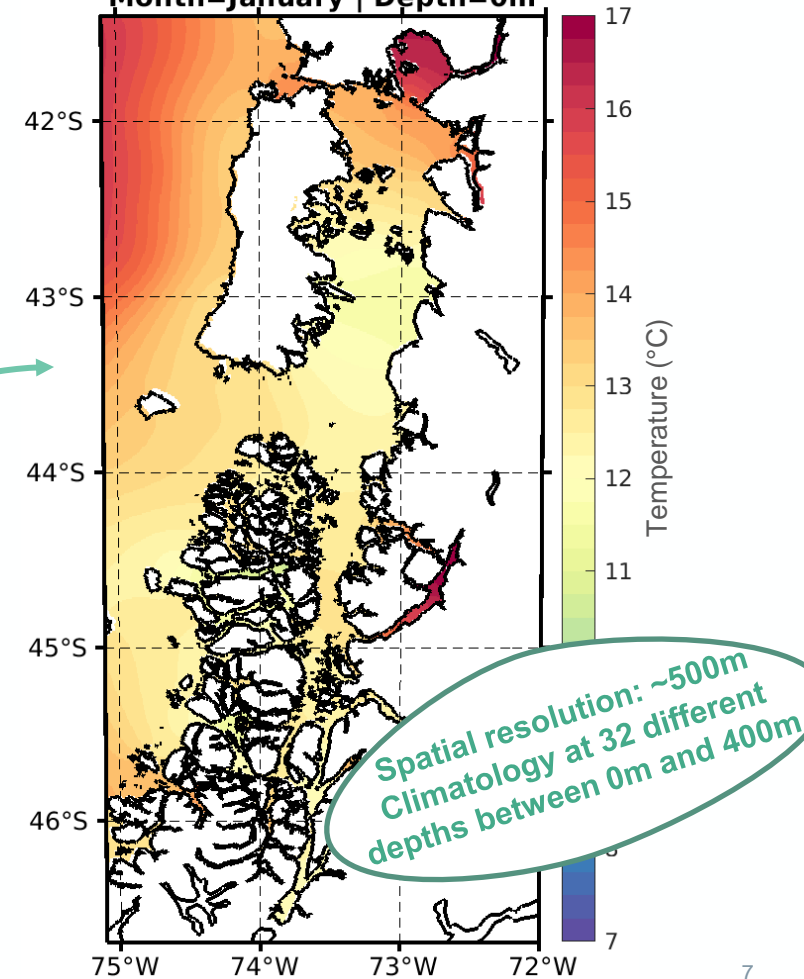
Uses scattered in situ points to
generate a continuous field

4D Monthly
climatology

Horizontal correlation length: 50km
Lower weight attributed to data clusters

DIVA reconstruction

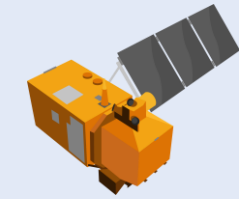
SST reconstruction with DIVA
Month=January | Depth=0m



How to detect MHWs?

In an open ocean-like environment

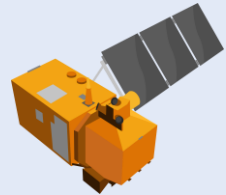
Long-term
Climatology



**SATELLITE
DATA**

- Global products
- Daily temporal resolution

Local
SST



**SATELLITE
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- Spatial resolution of a tens/few kilometers

Detection of
the MHWs

Climatology

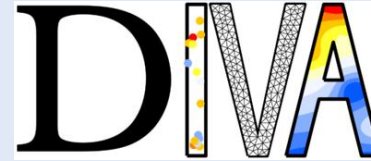
Local SST

Threshold:
90th percentile



Schlegel and Smit, 2018

In a fjord-like environment



**IN SITU
DATA**

High resolution monthly
climaotlogy



**IN SITU
DATA**

Reloncaví Sound:
2017 to present with hourly resolution

OK? Climatology

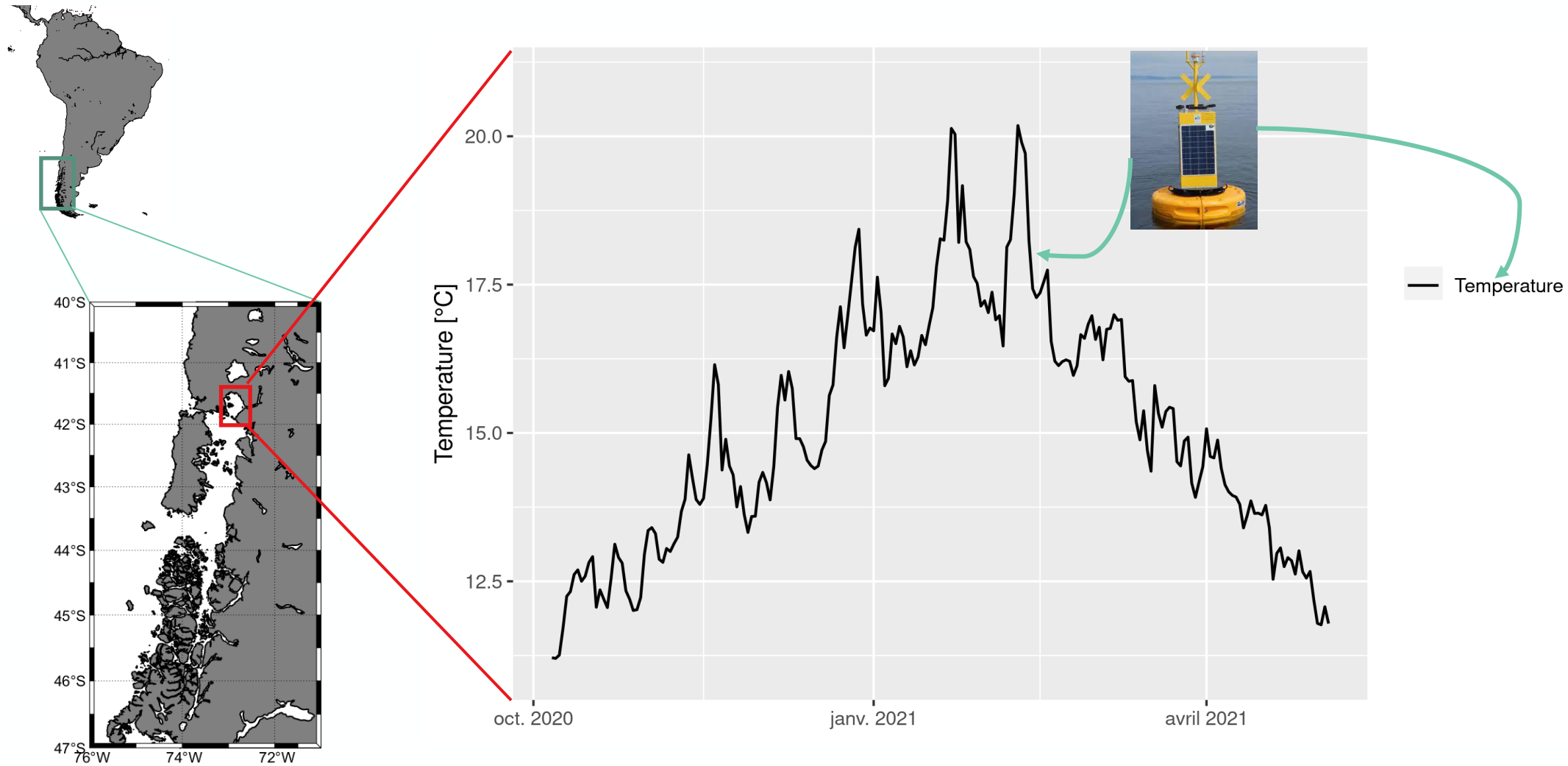
OK? Local SST

OK? Threshold:
90th percentile

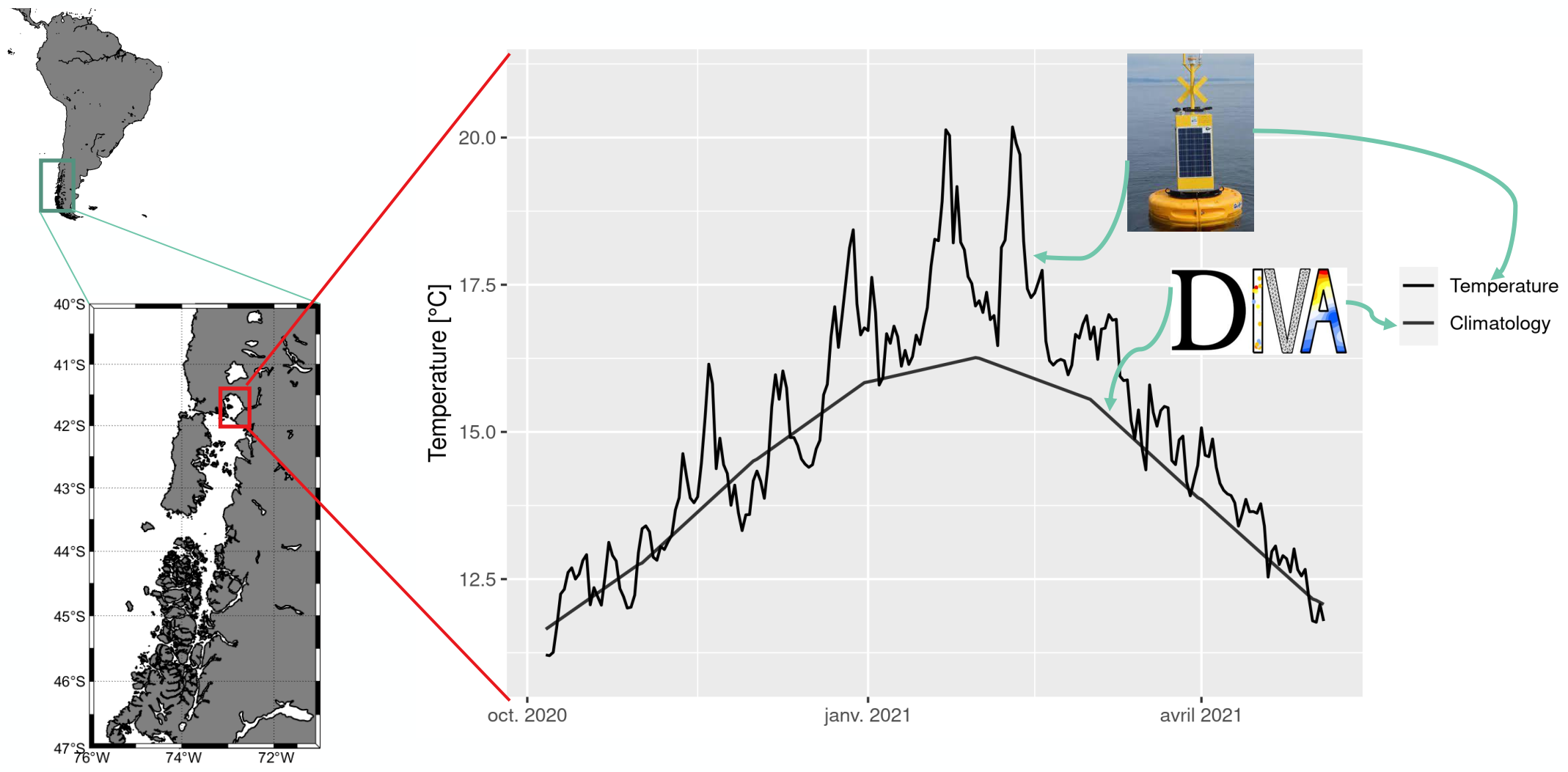


Schlegel and Smit, 2018

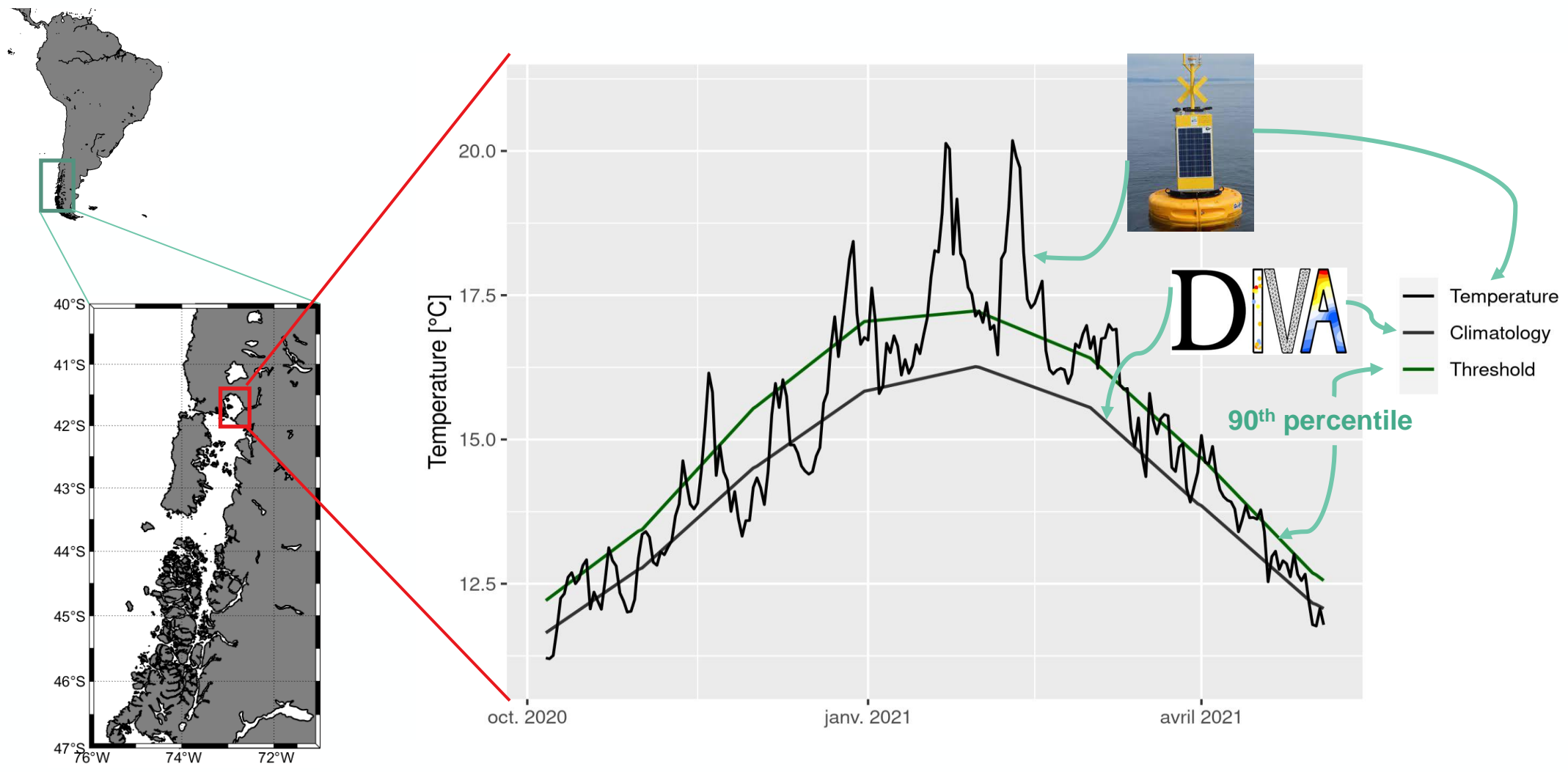
Detection of the MHWs



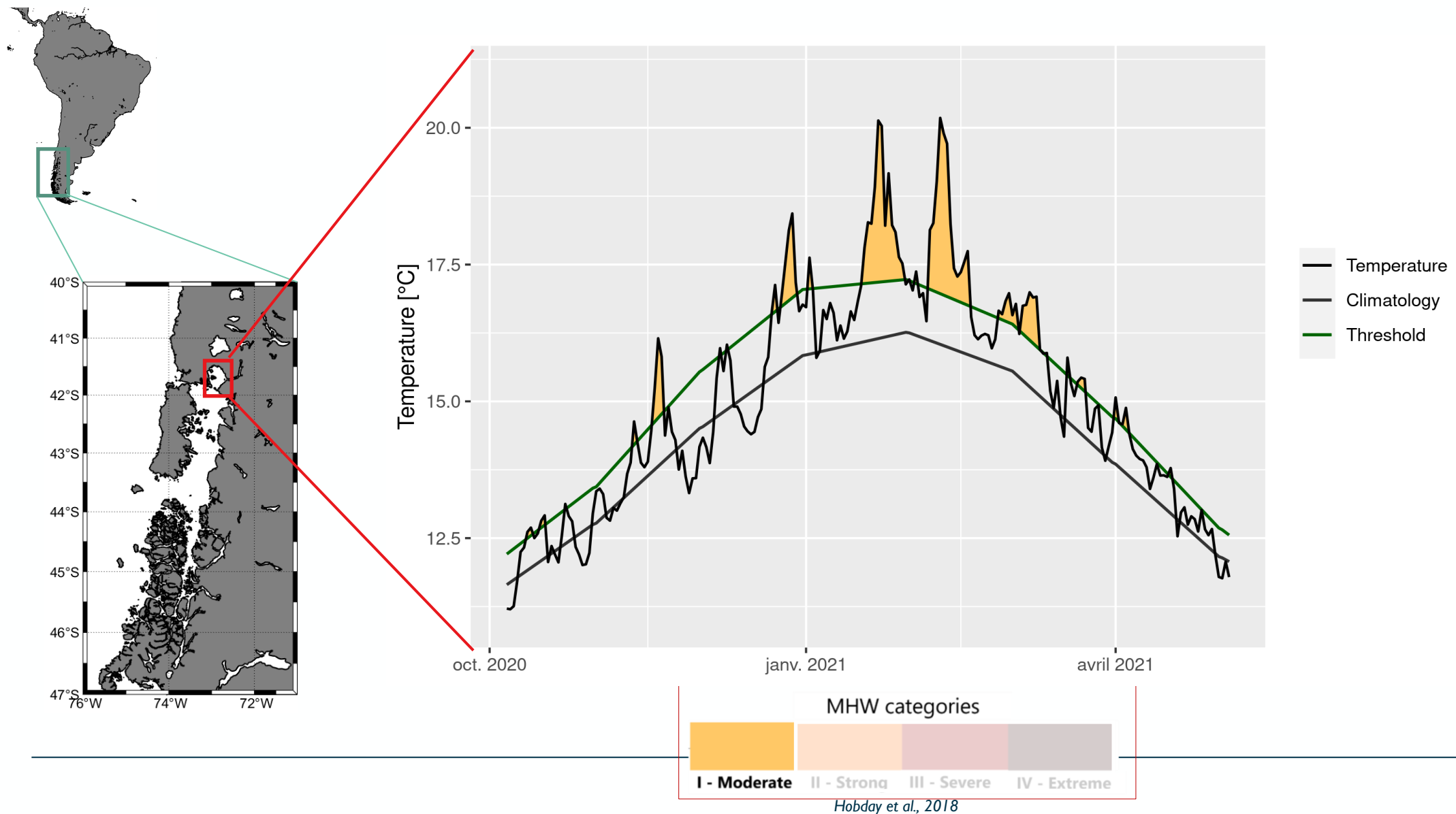
Detection of the MHWs



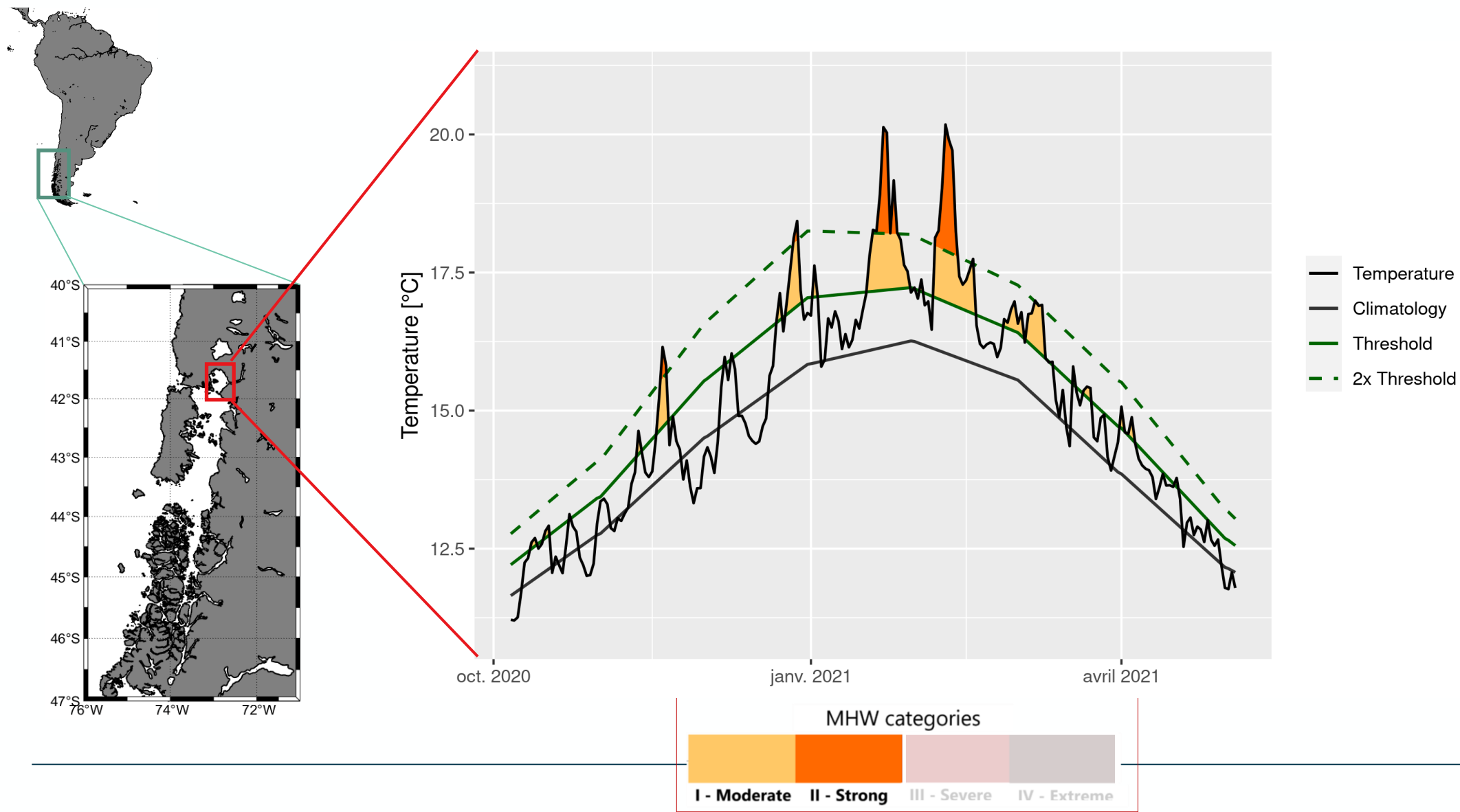
Detection of the MHWs



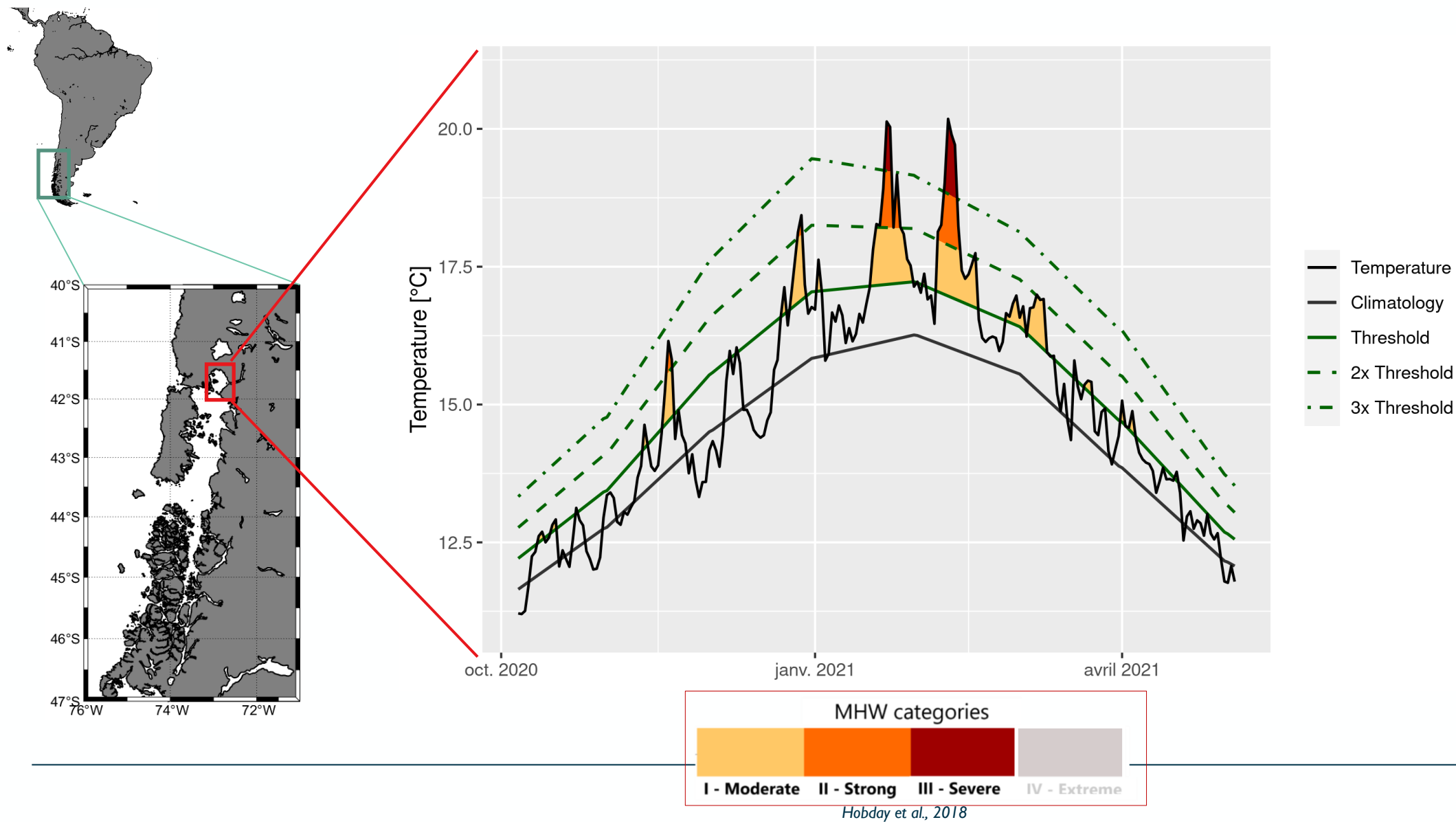
Detection of the MHWs



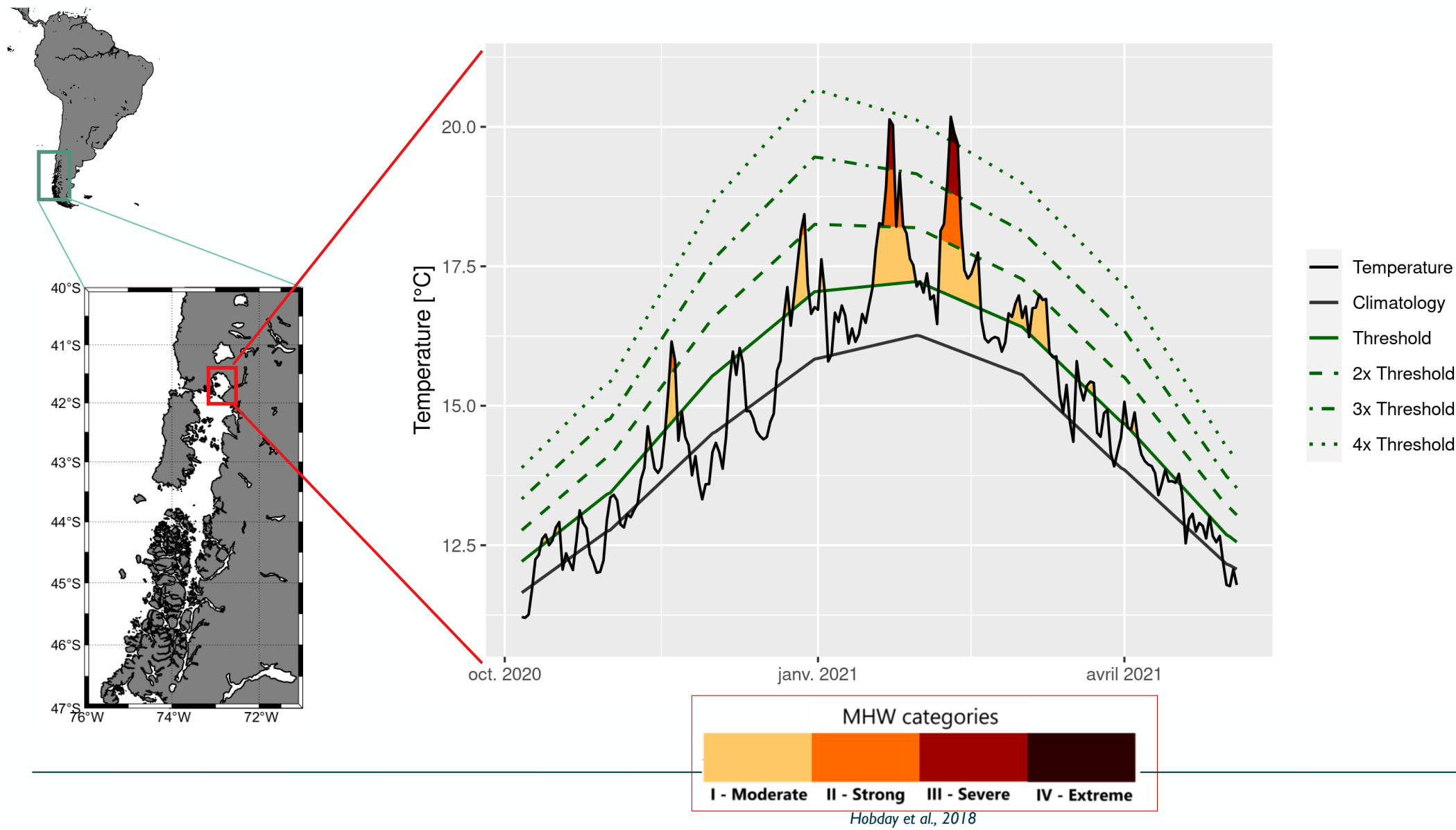
Detection of the MHWs



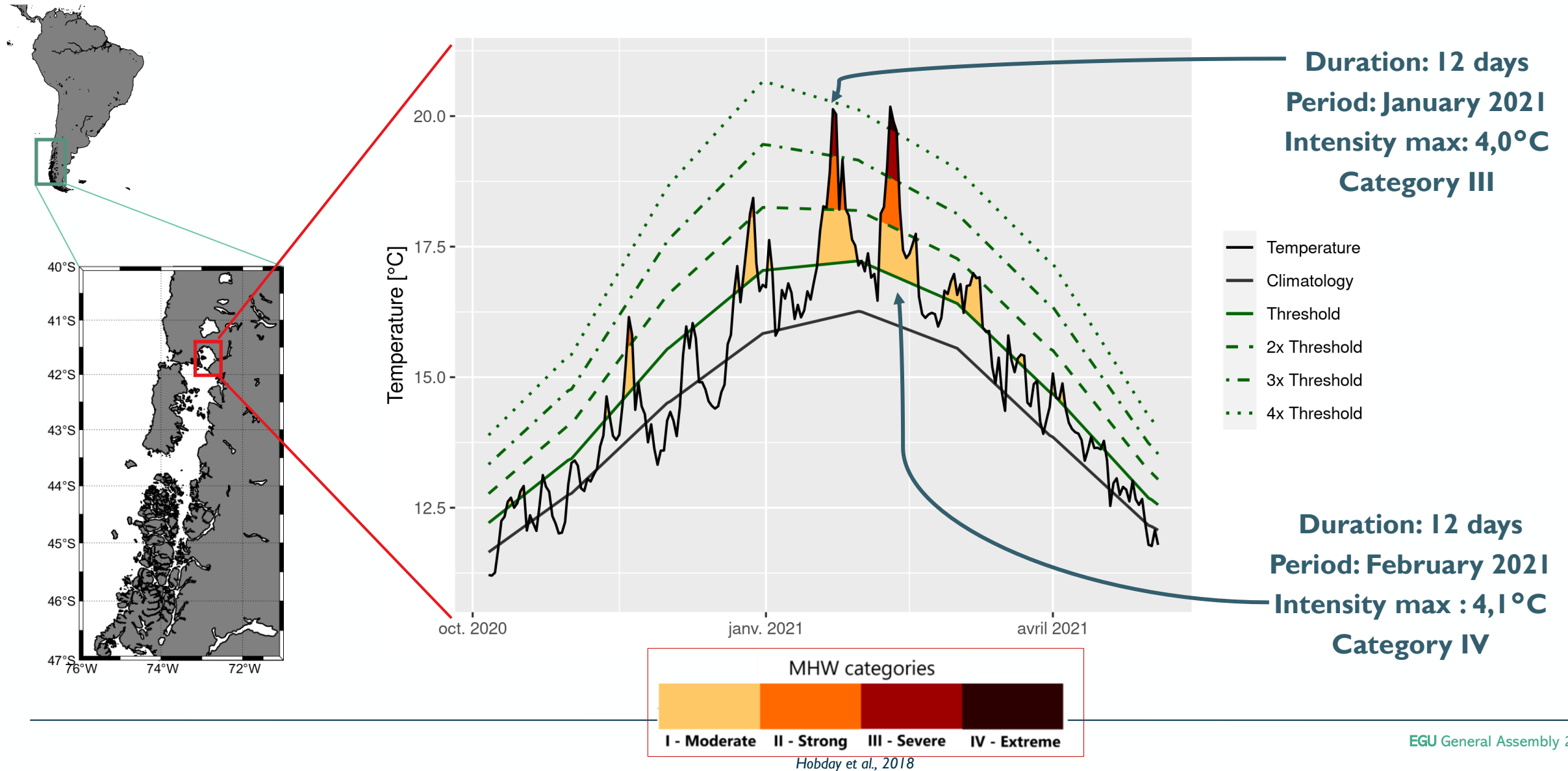
Detection of the MHWs



Detection of the MHWs



Detection of the MHWs



Ongoing work...

Detect the MHWs in the Puyuhuapi Fjord using an anchored buoy

Detect the MHWs in the largest parts of the sea of Chiloé using satellite data

Connection between MHWs observed offshore Chile and in the Sea of Chiloé ?

Impacts of MHWs on ocean properties