

## INTRODUCTION

- **International directives** (e.g. UN Decade of Ocean Science for Sustainable Development)
- Monitoring **Essential Ocean Variables** (GOOS, IOC-UNESCO, [www.goosocean.org/eov](http://www.goosocean.org/eov)) in support to ocean health, climate & operational services
- **Ocean indicators** to estimate state & variability from global to regional - local scales
- Environmental monitoring tools for **transfer of knowledge** to diverse ocean stakeholders (e.g. scientists, educators, environmental agencies, decision-makers...)

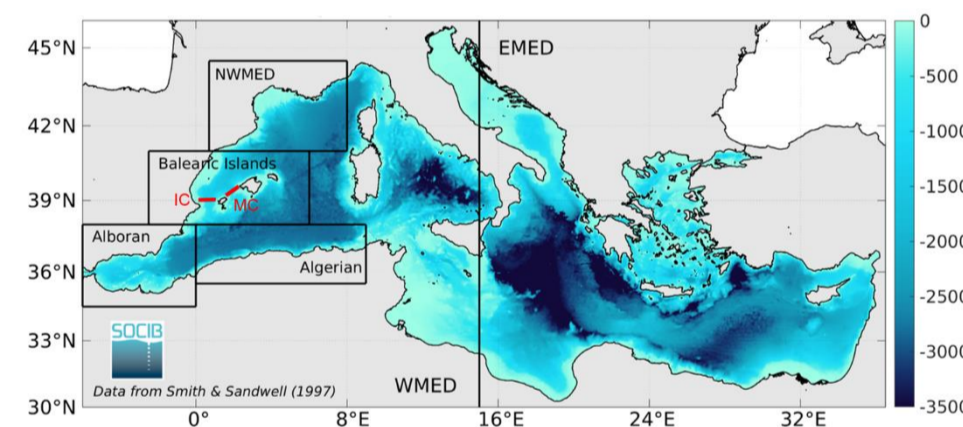
## METHODOLOGY

- Near real time & historical **free, open access & quality-controlled data** (satellite products from CMEMS + *in situ* observations from Met-Office & SOCIB)
- **Sub-regional approach** to consider sub-regional variations of the Mediterranean
- **Multi-scale** (daily, monthly/seasonal, annual) monitoring in real time of **multivariate** ocean indicators at surface & in vertically integrated ocean
- Marine heat wave (Hodby *et al.*, 2016): daily bulletin & long-term evolution

## VISUALIZATION TOOL

### SUB-REGIONAL MEDITERRANEAN SEA INDICATORS

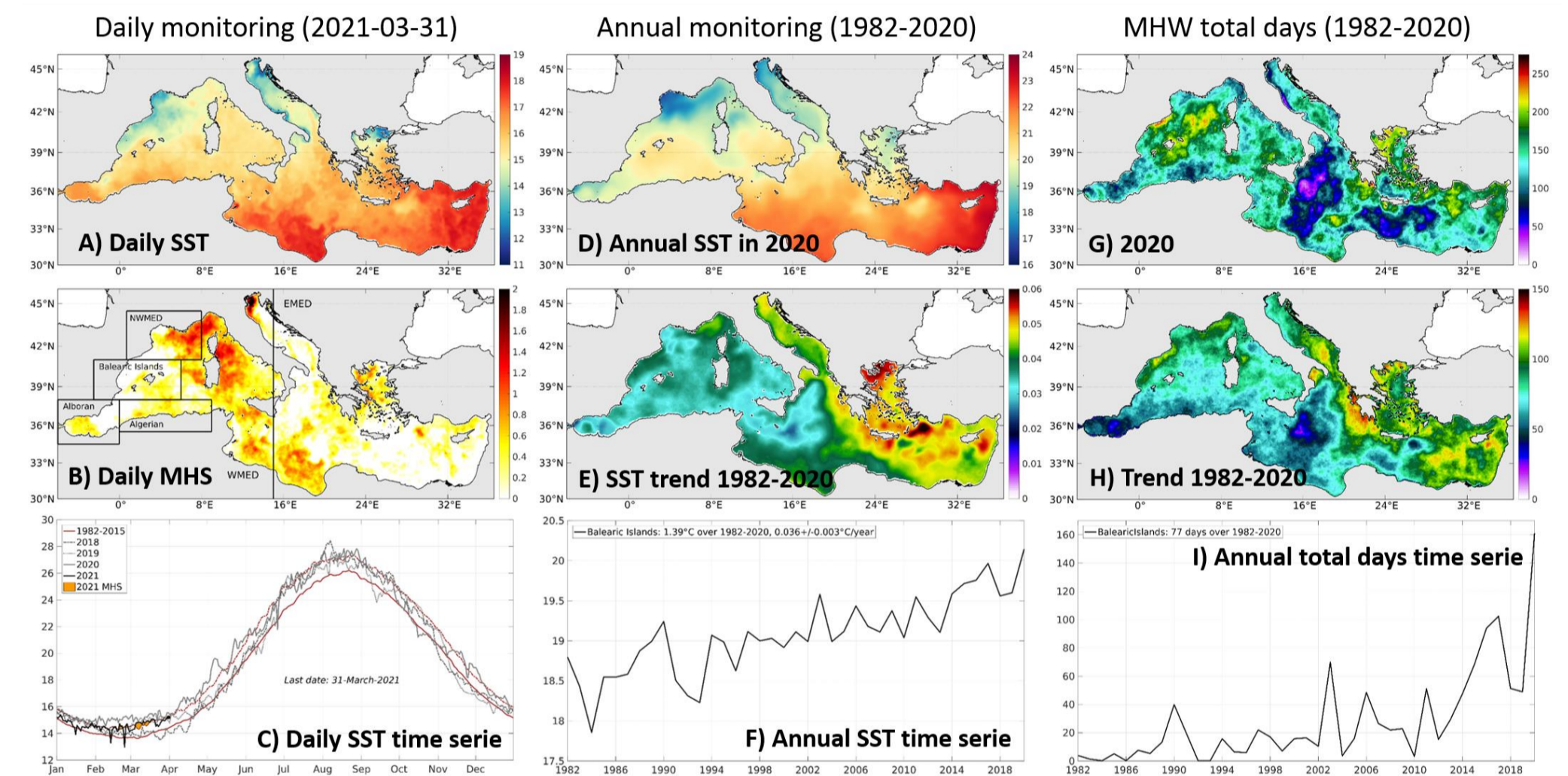
From event detection to climate change



Illustrations for ocean temperature

Time series for Balearic Islands region

<https://apps.socib.es/subregmed-indicators> (Juza & Tintoré, 2021)



## MAIN RESULTS (MEDITERRANEAN SEA)

- **Spatio-temporal variability:** ocean warming & marine heat wave, ecosystem activity variations, sea level rise, ocean circulation & hydrographic properties variability
- The daily monitoring allows the sub-regional & local **event detection in real time** (e.g. marine heat wave, river discharge, deep convection, mesoscale activities)
- The annual monitoring informs on the interannual variability & sub-regional **long-term variations in response to climate change** (e.g. ocean warming, sea level rise)
- Positive trends in **marine heat wave intensity, duration & frequency** in all sub-regions

|                                  | Linear trend              | WMed         | EMed         | Balearic Isl. | Local max. |
|----------------------------------|---------------------------|--------------|--------------|---------------|------------|
| SST <sub>1982-2020</sub> (°C/yr) |                           | 0.032+/-0.02 | 0.04 +/-0.02 | 0.033+/-0.02  | 0.06       |
| SLA <sub>1993-2020</sub> (cm/yr) |                           | 0.28+/-0.002 | 0.29+/-0.003 | 0.25+/-0.03   | 0.5        |
| MHW <sub>1982-2020</sub>         | Total days (/100yr)       | 174          | 243          | 197           | 260        |
|                                  | Mean amplitude (°C/100yr) | 0.79         | 0.79         | 0.79          | 1.4        |
|                                  | Max intensity (°C/100yr)  | 3.33         | 3.44         | 3.08          | 5          |
|                                  | Mean duration (day/100yr) | 10           | 20           | 14            | 76         |
|                                  | Frequency (event/100yr)   | 15           | 18           | 15            | 50         |

## CONCLUSIONS

- User-friendly interface to monitor, visualize & communicate ocean information relevant for transdisciplinary sectors, applications & regional end-users
- Society-aligned science & sub-regional information to support national/local decision-makings, implement specific actions & address worldwide environ. challenges
- Evolutive tool (sub-regions & MPAs, coastal observations & models, relevant indicators for policy & stakeholders) considering end-user requests & feedbacks