

The “Sub-regional Mediterranean Sea indicators” tool for the sustainable ocean management

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INTRODUCTION

- **International directives** (e.g. UN Decade of Ocean Science for Sustainable Development)
- Monitoring **Essential Ocean Variables** (GOOS, IOC-UNESCO, 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...)

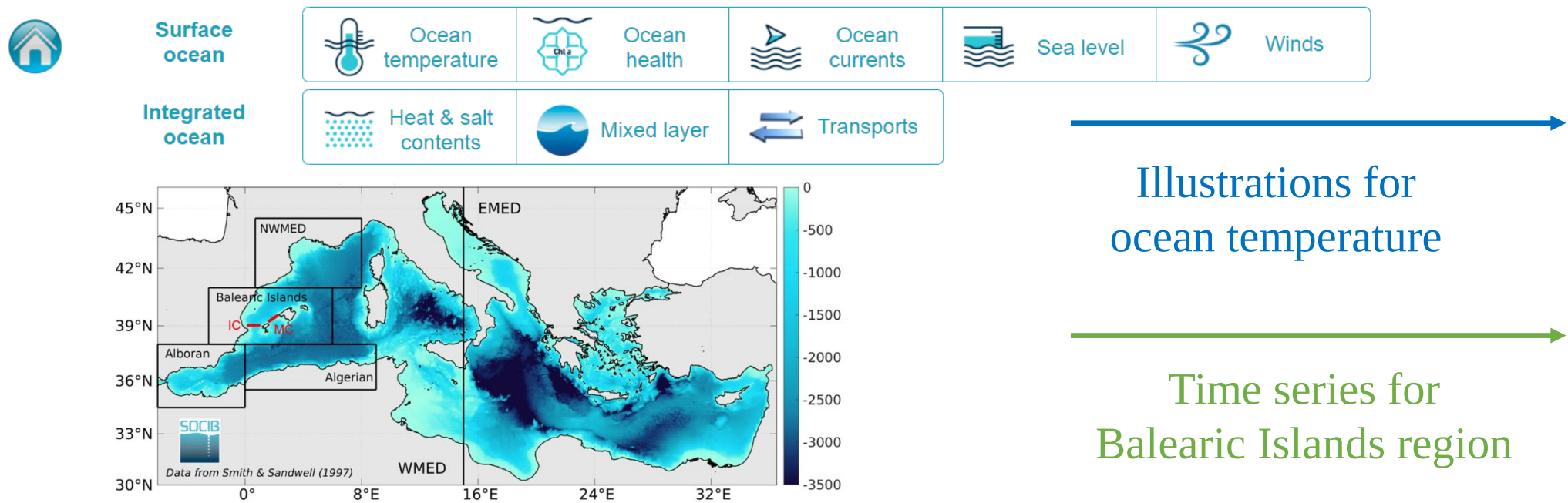
METHODOLOGY

- 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

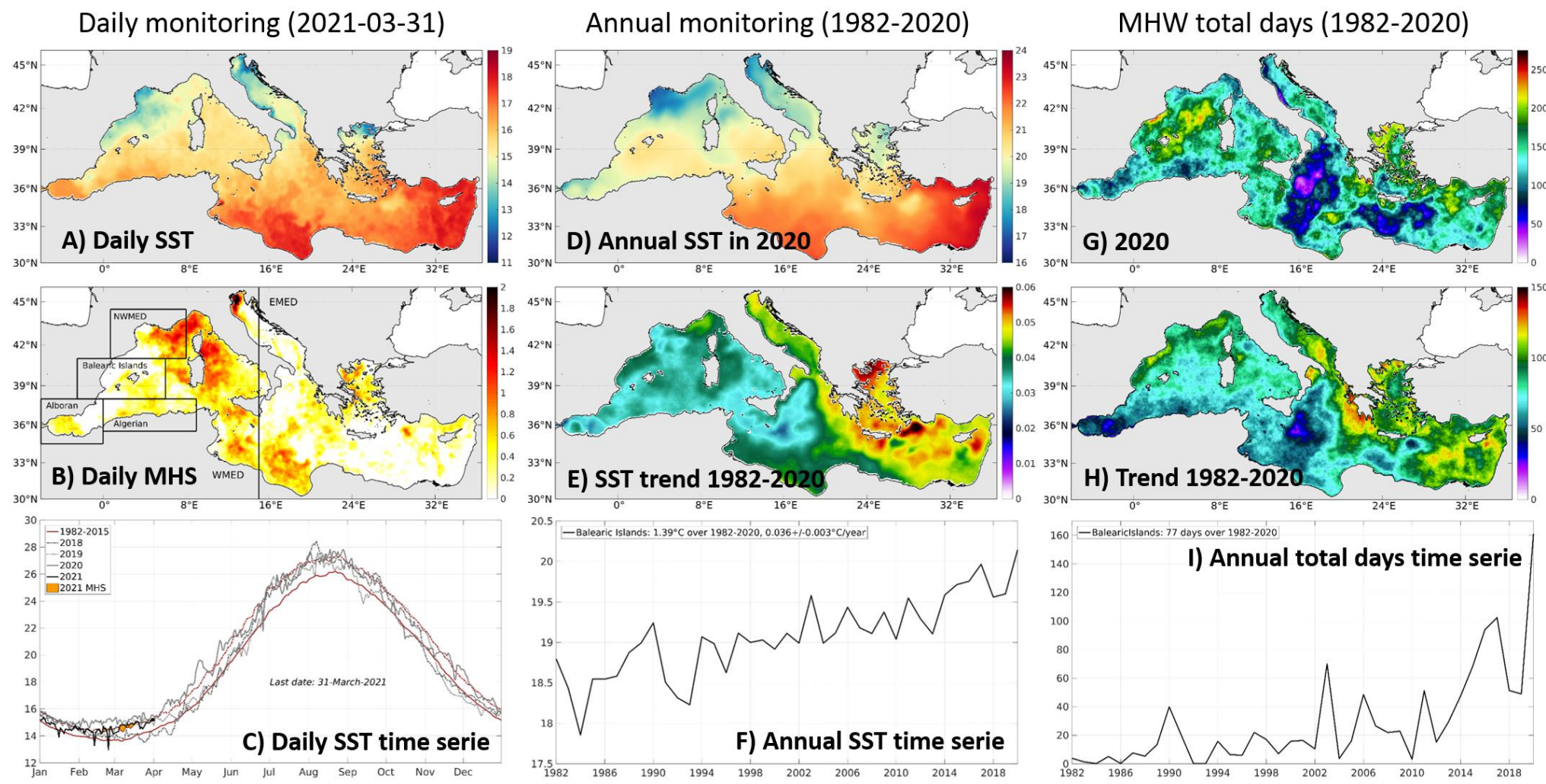
From event detection to climate change



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.
MHW 1982-2020	SST ₁₉₈₂₋₂₀₂₀ (°C/yr)	0.032+/-0.02	0.04 +/-0.02	0.033+/-0.02	0.06
	SLA ₁₉₉₃₋₂₀₂₀ (cm/yr)	0.28+/-0.002	0.29+/-0.003	0.25+/-0.03	0.5
	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