



Turning Climate Data into Decisions

Enhancing Mediterranean Tourism Resilience with Seasonal Forecasts

Dr Christina Anagnostopoulou
Professor of Climatology, Aristotle University of Thessaloniki

Report Date: 2026-02-27





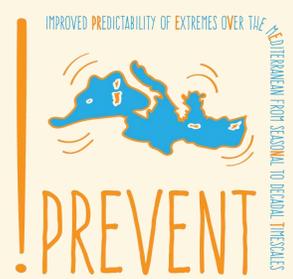
Why Tourism in the Mediterranean?

- Global tourism hotspot highly exposed to climate extremes
- Heatwaves, droughts, wildfires, and water scarcity affect destinations
- Climate variability influences comfort, safety, and infrastructure
- Need for climate-informed tourism planning



The Climate Challenge for Mediterranean Tourism

A global climate change "hotspot" facing structural disruption.



ECONOMIC IMPACT

\$420 Billion

4.8% of Regional GDP

EMPLOYMENT

11.5%

Of total regional workforce

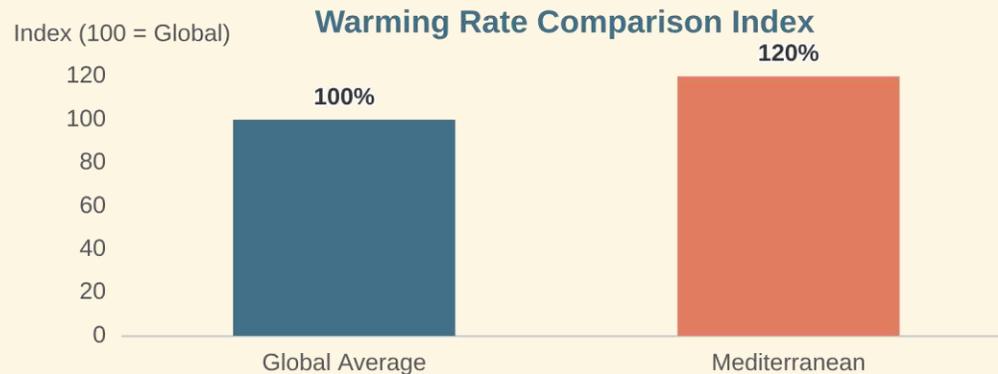
ANNUAL VISITORS

360 Million

International arrivals annually

Accelerated Warming Trends

The Mediterranean basin is warming **20% faster** than the global average. This rapid change threatens the traditional "sun-and-sea" model that generates 70% of coastal tourism value during peak summer months.



Seasonality Risk: Summer temperatures are projected to increase by up to 50% above the global average, potentially making peak seasons inhospitable.

Climate Extremes and Tourism Risk

- Rising frequency and intensity of extreme heat events
- Seasonal drought affecting water availability
- Wildfire smoke and safety perception
- Impacts on visitor flows and destination reputation



Primary Climate Risks: Heat and Water Stress

Dual threats undermining tourist comfort and operational viability by 2050.



Heat Stress

Projected to Double by 2050

Days with maximum temperatures exceeding **37°C** will double in southern Spain, North Africa, and Turkey, severely reducing thermal comfort for visitors.



Water Scarcity

10–25% Reduction Potential

Declining rainfall and increased evaporation will strain hotel operations, golf courses, and agriculture, with river runoff projected to drop by up to **70%** in some regions.



Synergistic Impact: Heat stress increases water demand for cooling and irrigation, creating a negative feedback loop for tourism infrastructure.



Coastal Vulnerability and Sea-Level Rise

Protecting beach assets and the livelihoods of 42 million people.



37%

COASTLINE AT HIGH RISK



42M

PEOPLE EXPOSED



1.1m

MAX RISE BY 2100

Accelerating Sea-Level Rise (Projected)



Impact on Infrastructure

Sea-level rise and storm surges threaten coastal roads, hotels, and heritage sites. In the Nile Delta alone, up to 2,600 km² could be flooded by 2100, undermining the foundation of regional tourism.



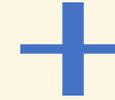
Eroded coastal road demonstrating the direct threat to tourism accessibility.

Addressing to "Mismatch of Scale"

Mapping Hotspot Areas



Regional Climate Change Index (RCCI)



MED-HOT index

Northern Italy (NIT)

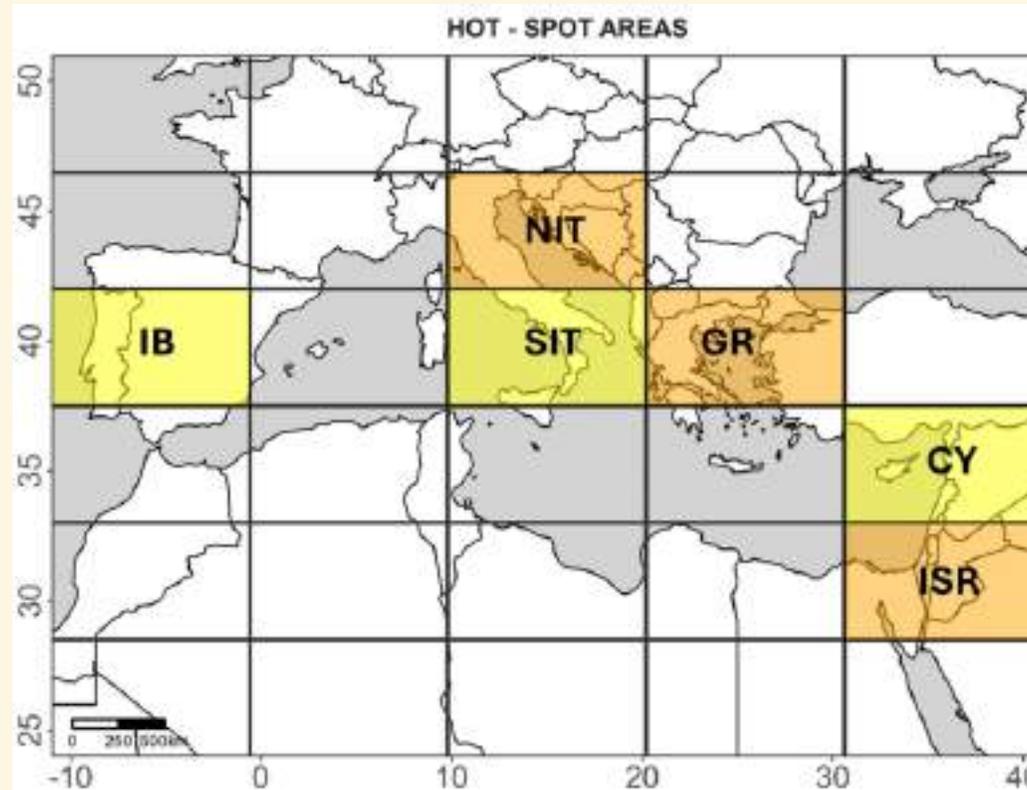
51.5% change in the frequency and intensity of maximum temperatures, resulting in both more frequent and higher maximum temperatures

Iberian Peninsula (IB)

Hot spot is mainly characterized by the change of the variance in precipitation during the dry period of the year (20.8%).

Southern Italy (SI)

Classified as high risk due to changes in mean climate (RCCI), SI is characterized by changes in rainfall and its variance during the wet period are the key characteristics of the hot spot region.



Hotspot areas according to the MED-HOT (orange) and RCCI (yellow) (Lazoglou et al., 2024)

Southeastern Mediterranean Cyprus (CY) –Israel (ISR)

Identified as high risk by both MED-HOT and RCCI, highlighting its vulnerability to both extreme events and long-term climate change.

Greece (GR)

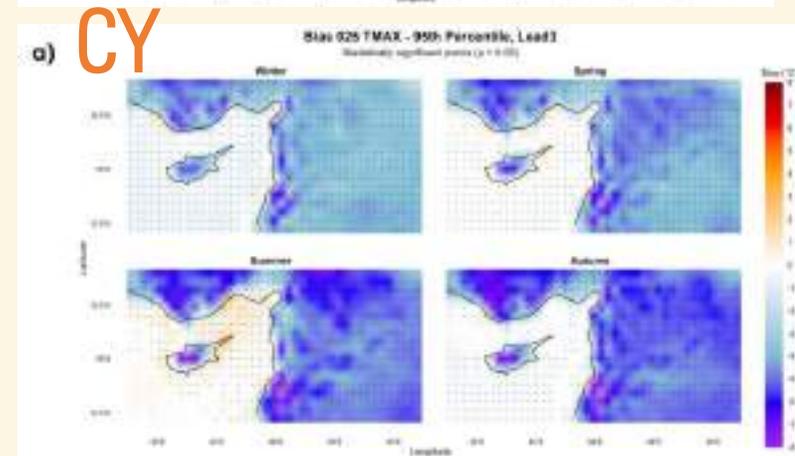
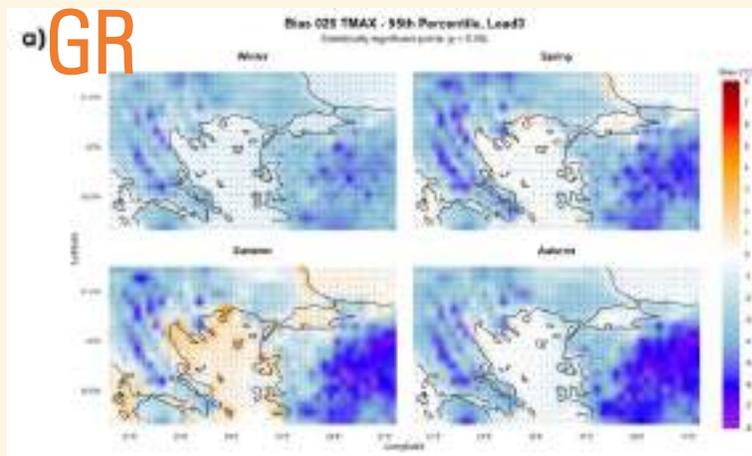
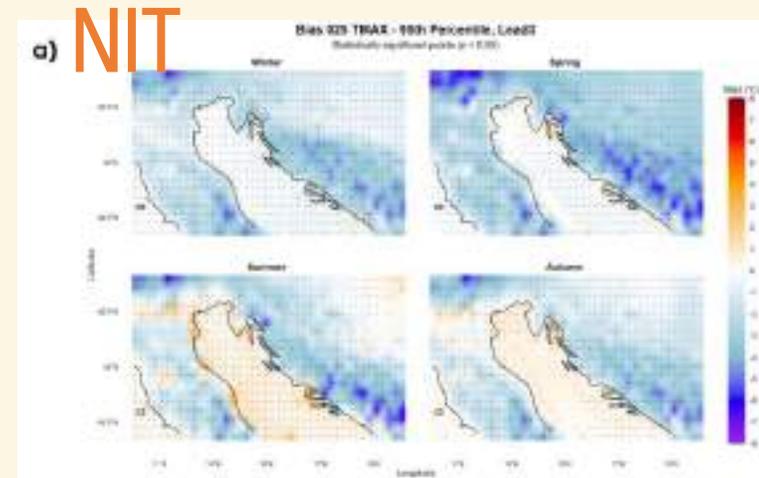
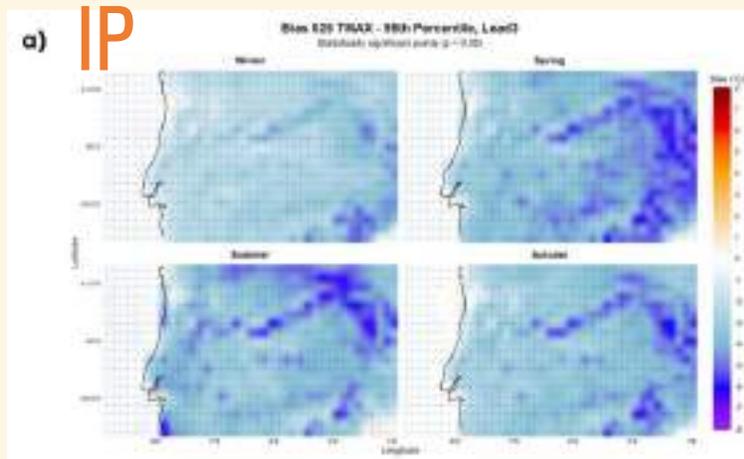
For Greece, it appears that the hot spot definition is based on changes in the maximum values of extreme temperatures (Tmax and Tmin), leading to warmer days and nights.



Addressing to "Variable Skill"

Different TIME scales and REGIONS

From Mediterranean to HOT SPOT regions



Addressing to " Low Predictability for Extremes"

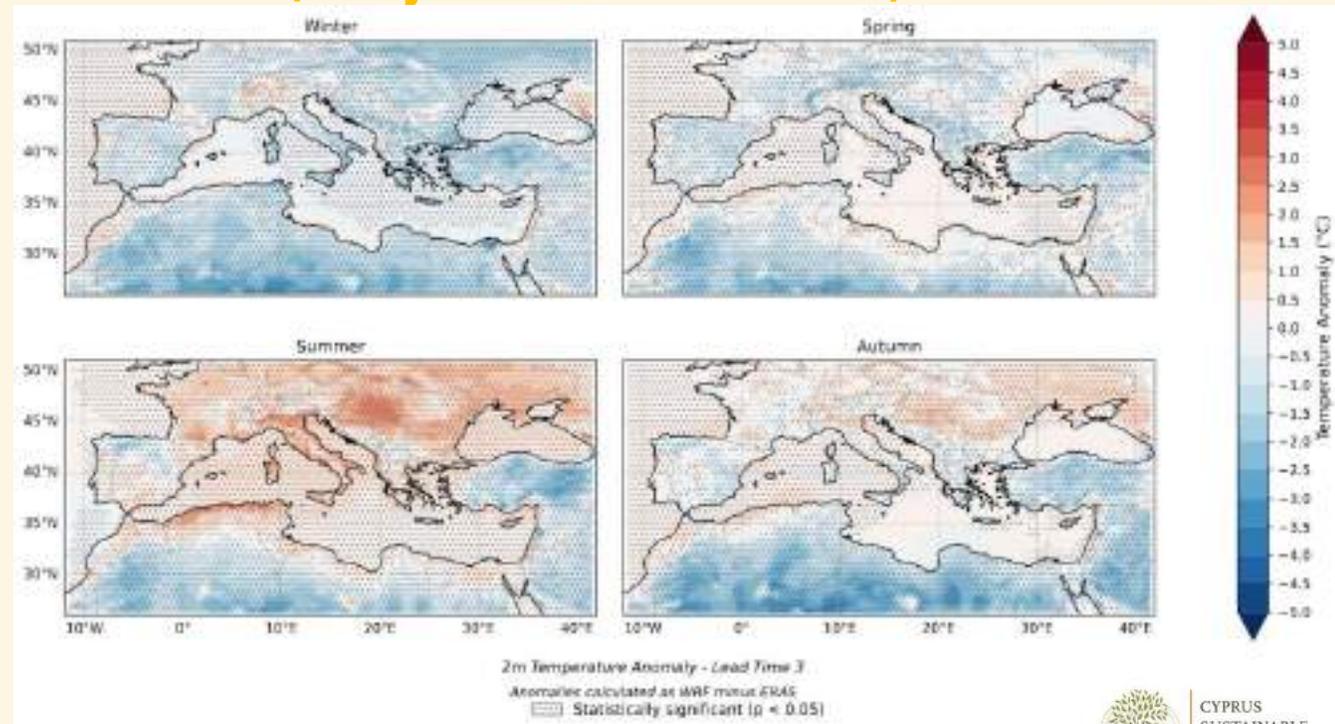
SELECTION and EVALUATION

EXPAND the evaluation to **extremes indices (not just mean climate)**



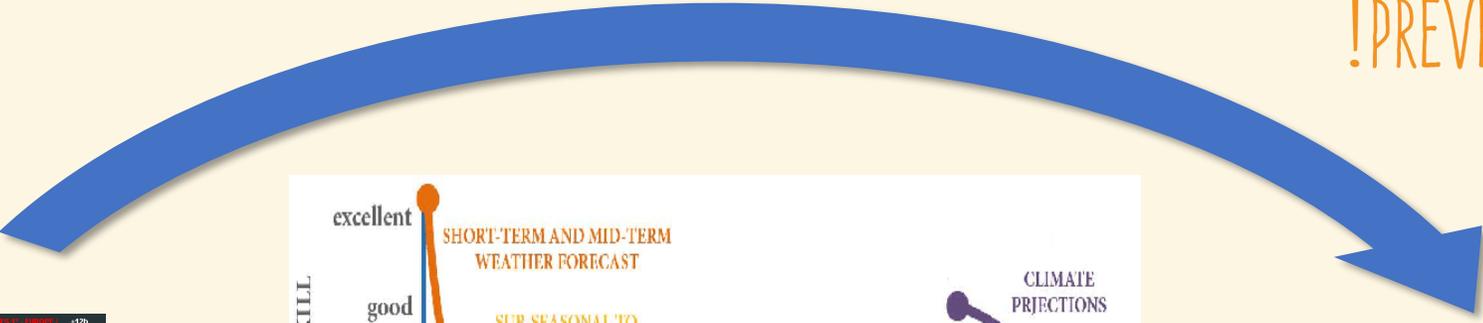
TRANSLATE extremes To indices

- ✓ 2m Maximum Temperature – 95th Percentile
- ✓ 2m Minimum Temperature – 95th Percentile
- ✓ 2m Minimum Temperature – 5th Percentile
- ✓ Extreme Precipitation – 95th Percentile
- ✓ Drought – CDD index (Consecutive Dry Days)

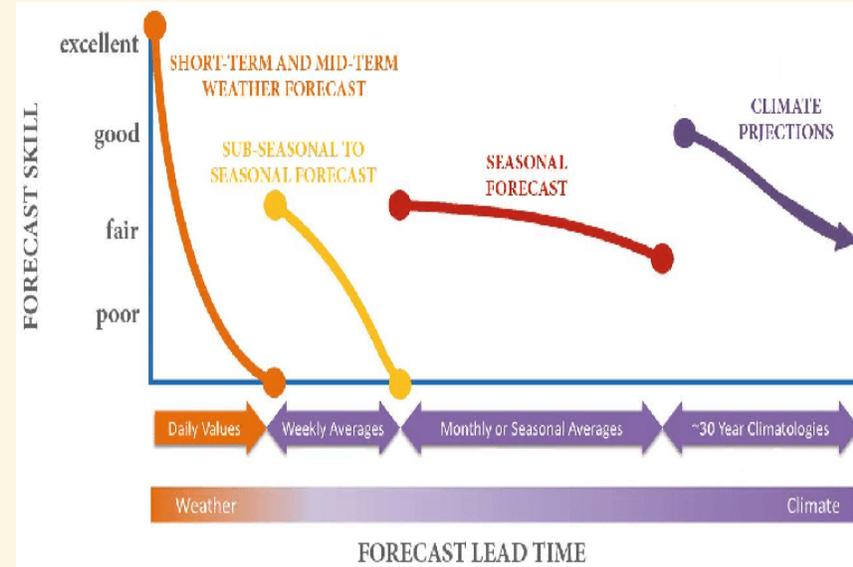
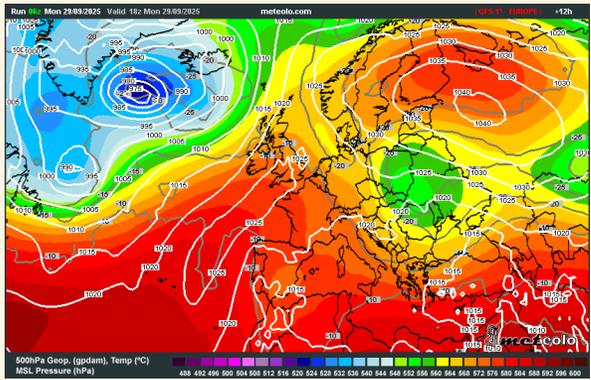


What is Seasonal Forecasting?

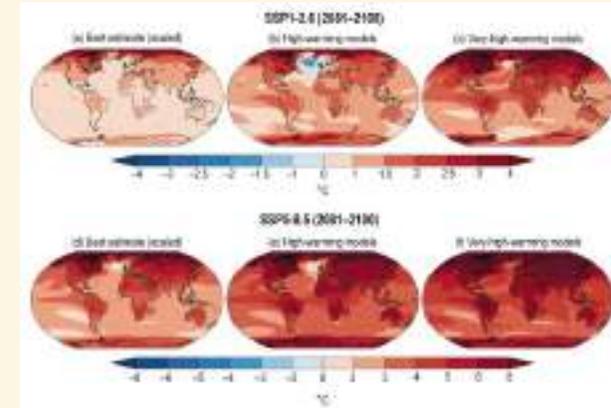
What is Seasonal Forecasting?



Weather forecasting



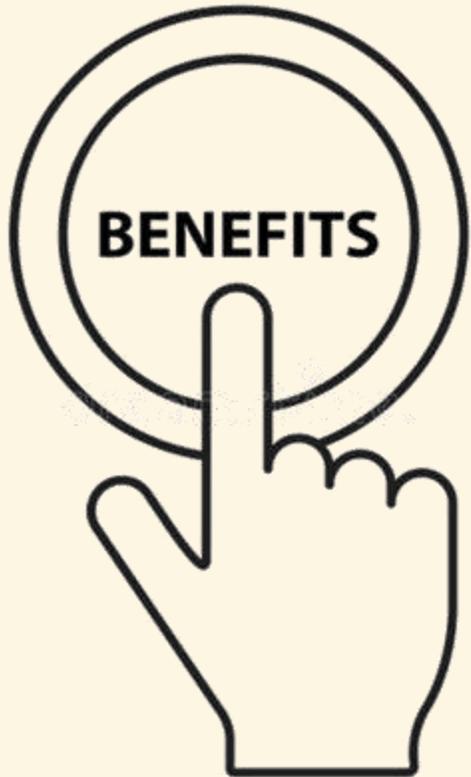
Climate Future Projections



Schematic representation of forecasting skill, from meteorological prediction to climate estimation, in relation to time (Porras et al., 2021)

Seasonal forecasting defines the expected statistical summary of climate conditions for a coming **3 to 6 month period**, predicting how factors like temperature and precipitation will likely compare to historical averages. These forecasts are crucial for planning in sectors like **tourism, agriculture, and water management etc.**

What is Seasonal Forecasting?



TOURISM

Optimizes business operations and marketing by anticipating tourist demand and climate risks months ahead.

Improves long-term water security by enabling smarter storage, distribution, and crisis planning

WATER RESOURCES

FOREST FIRES ECOSYSTEMS

Redirects fire management from suppression to prevention through early climate-informed resource mobilization

Shifts healthcare from reaction to prediction, safeguarding public well-being against seasonal climate risks.

HUMAN HEALTH INSURANCE

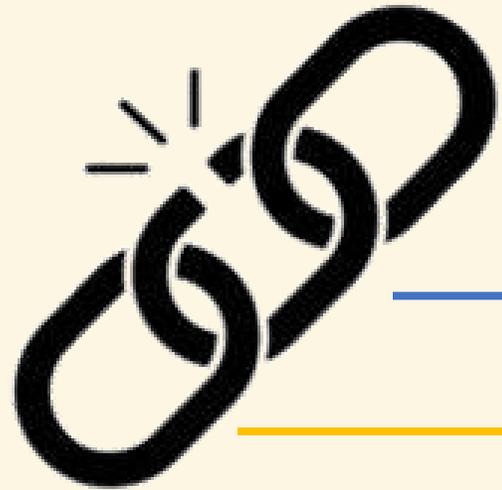
AGRICULTURE

Maximizes yields and minimizes loss by providing early warnings for drought, heatwaves, or excessive rainfall.

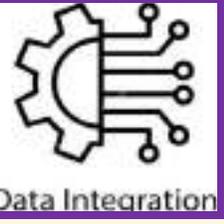
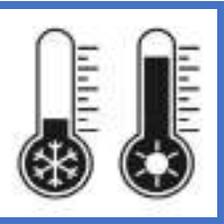
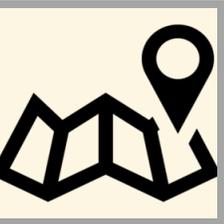
What is Seasonal Forecasting?



WEAKNESSES



- Inherent Model Uncertainty:** Climate models cannot perfectly represent Earth's complexity –chaotic nature, leading to uncertainty in long-term predictions.
- Mismatch of Scale:** Forecasts are made for **large regions**, making them difficult to apply at the local or farm level.
- Low Predictability for Extremes:** Forecasts predict average conditions, but struggle to accurately predict the timing or severity of critical events (like specific heatwaves or storms).
- Variable Skill:** Forecast reliability **varies significantly** by location and time of year.
- Lack of Integration:** Political and economic barriers often **prevent forecasts from being fully integrated** into concrete decision-making systems.

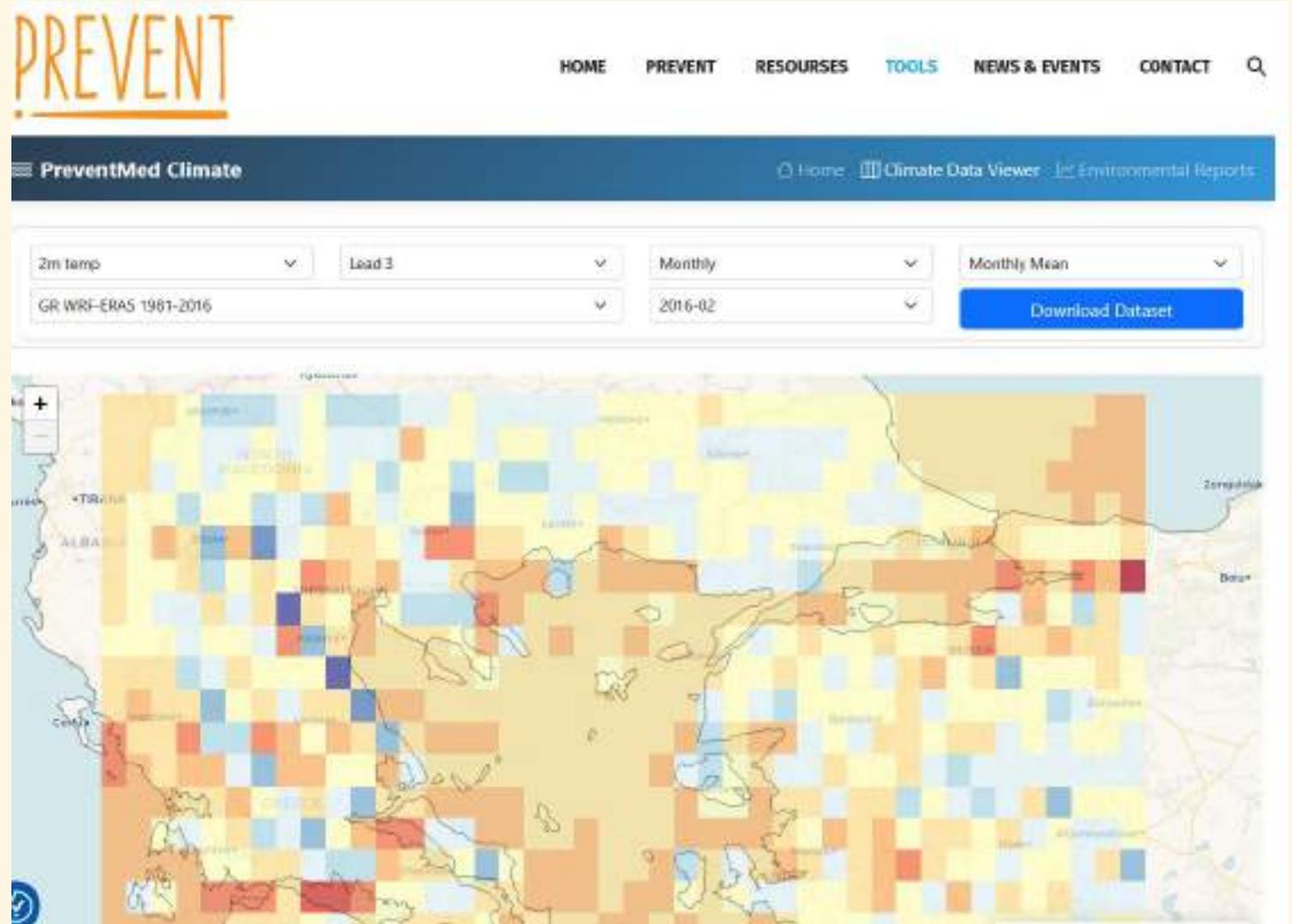
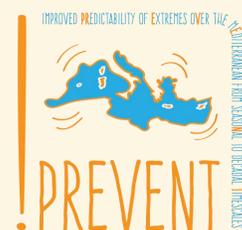


Addressing to "Lack of Integration"

From Science to SOCIETY: Closing the knowledge gap



<https://preventmed-climate.eu/tools/prevent-e-tool/>



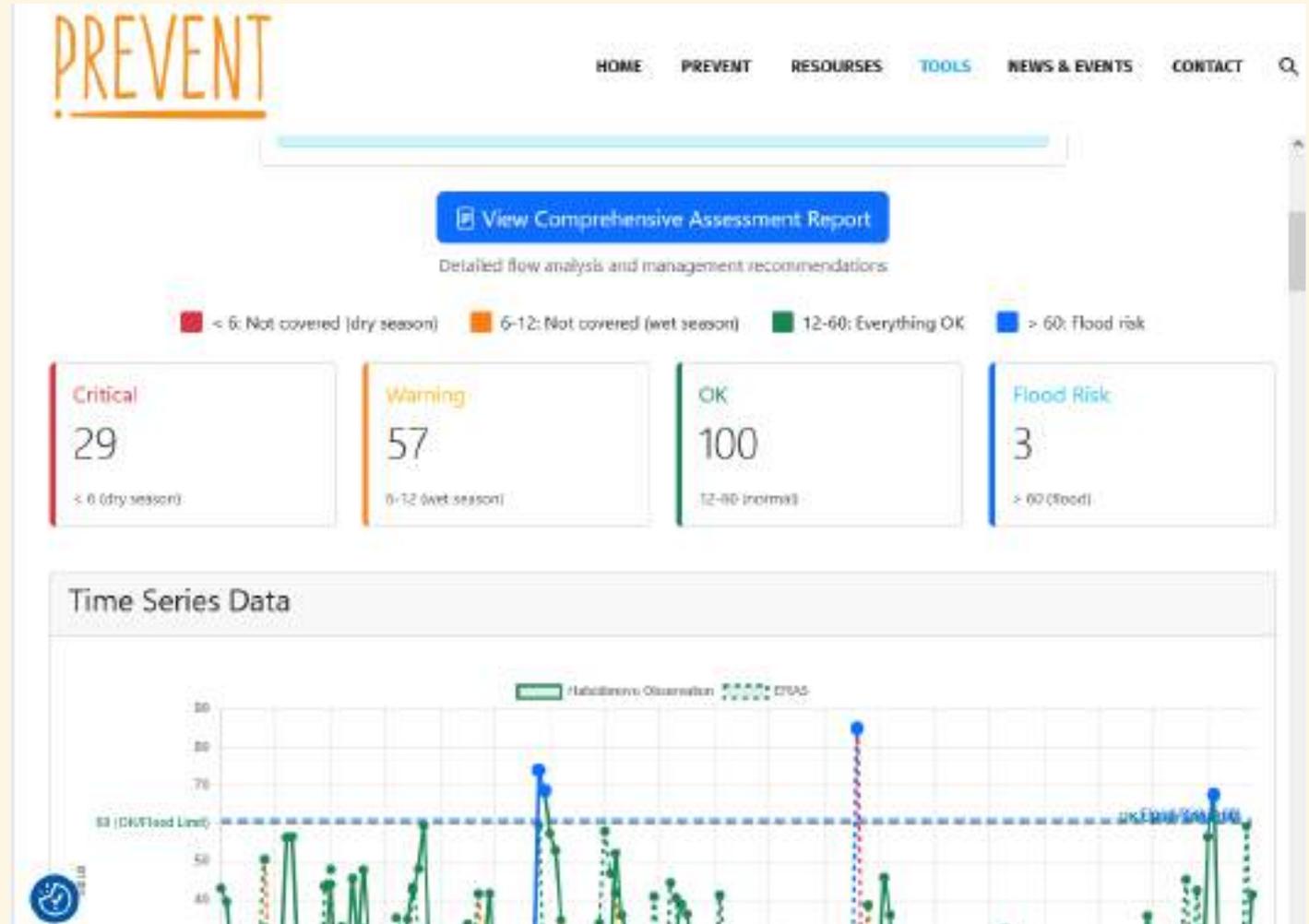
Addressing to "Lack of Integration"



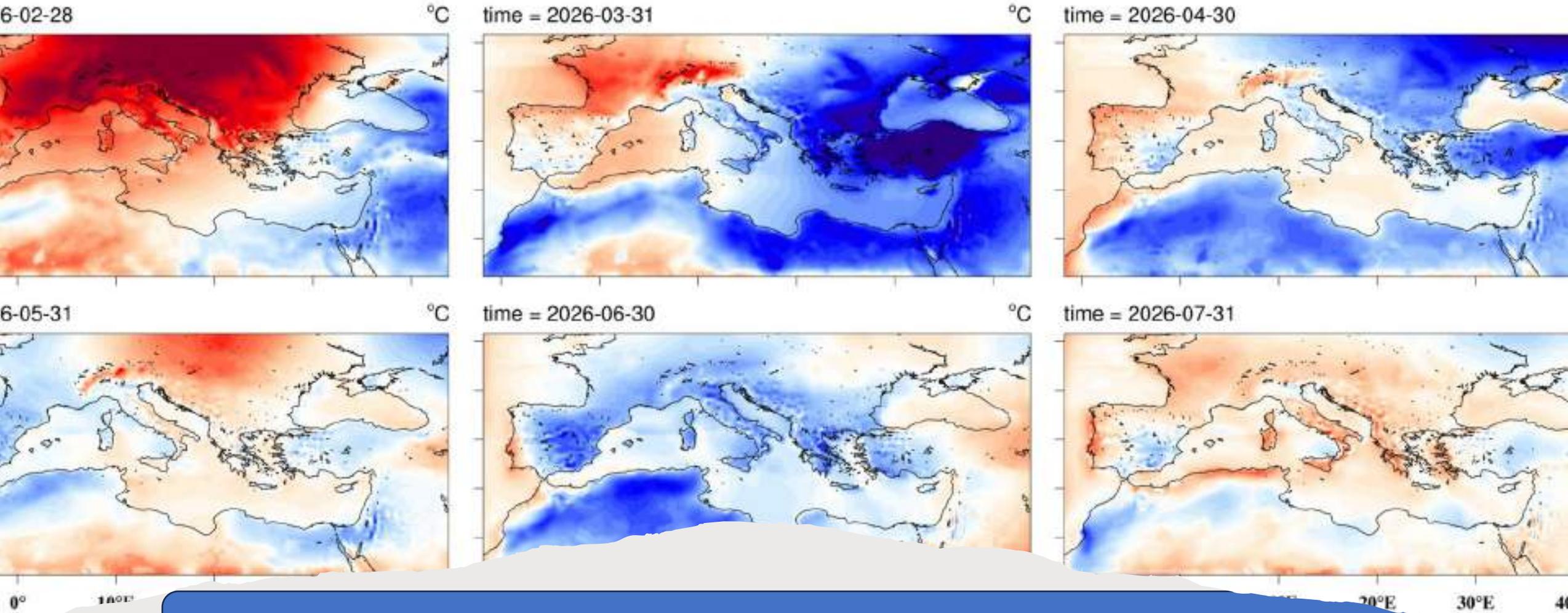
From Science to SOCIETY: Closing the knowledge gap



<https://preventmed-climate.eu/tools/prevent-e-tool/>



2m Temperature anomaly (°C) - Ensemble Mean Forecast Mediterranean

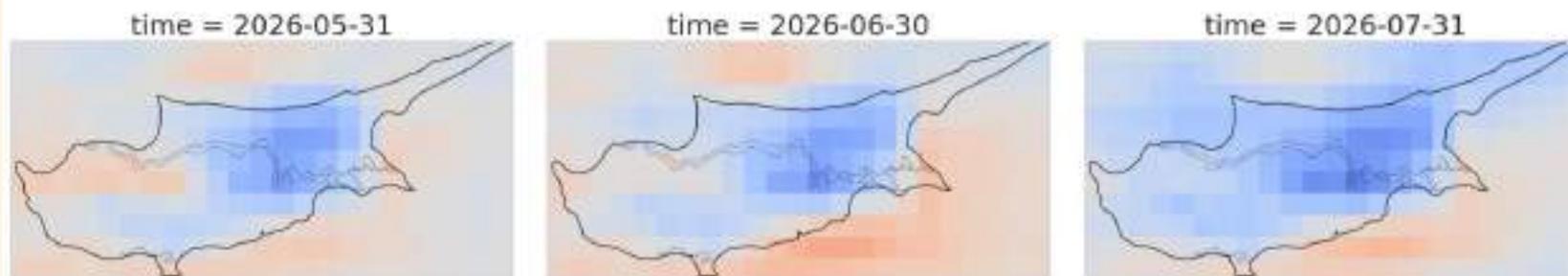


From Science to SOCIETY: Closing the knowledge gap

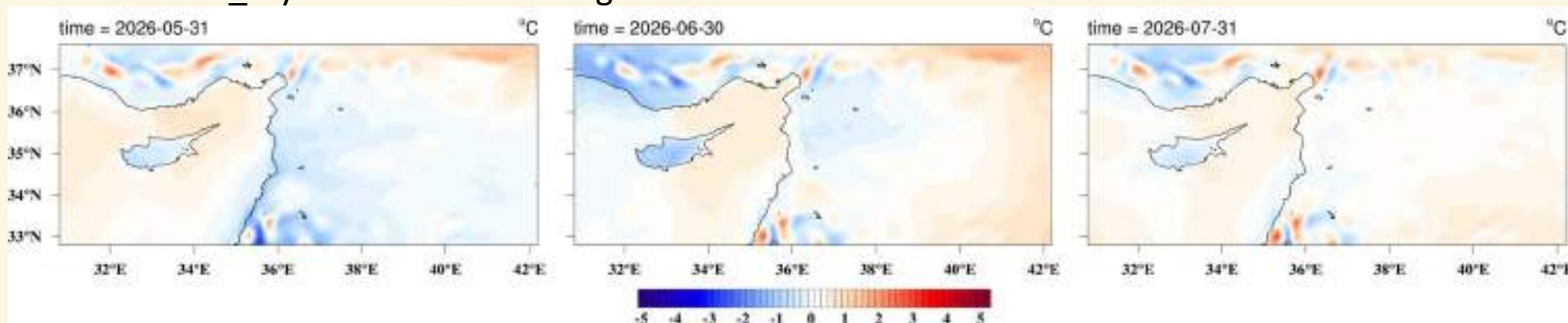


Anomalies of Mean Temperature (from May to July 2026)

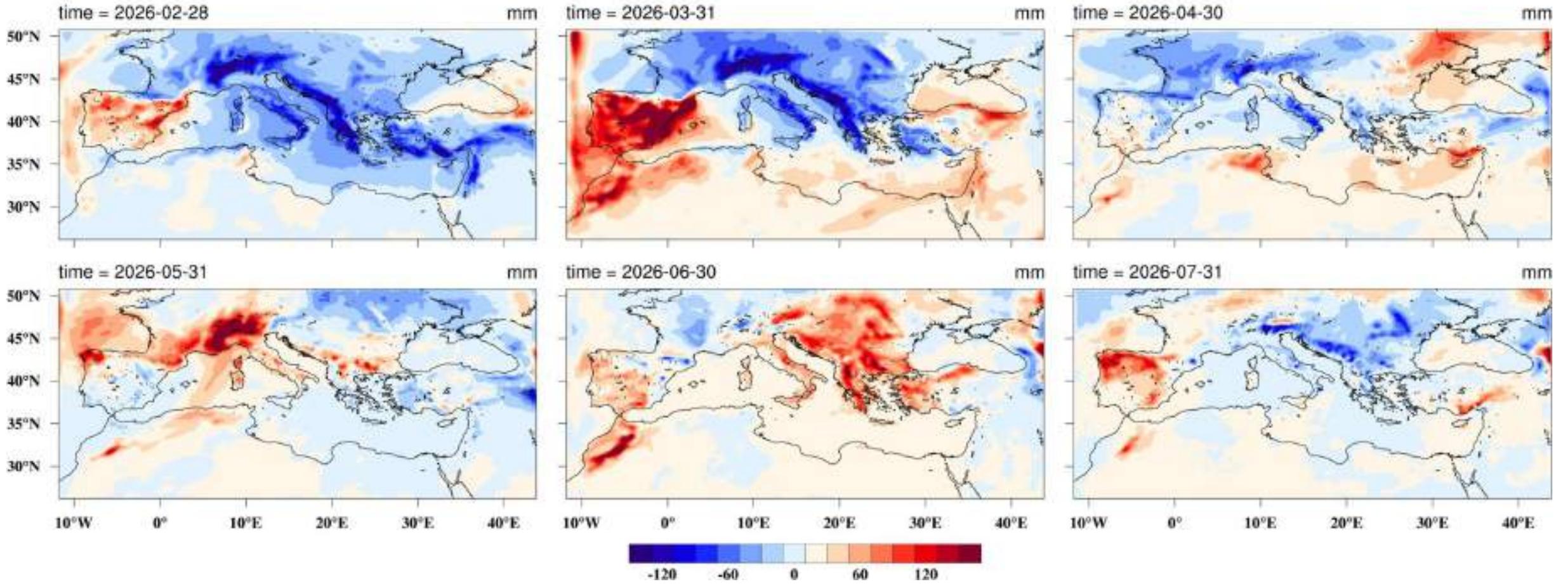
Model 1: Bias corrected - Statistical Downscaling



Model 2: WRF_Dynamical Downscaling

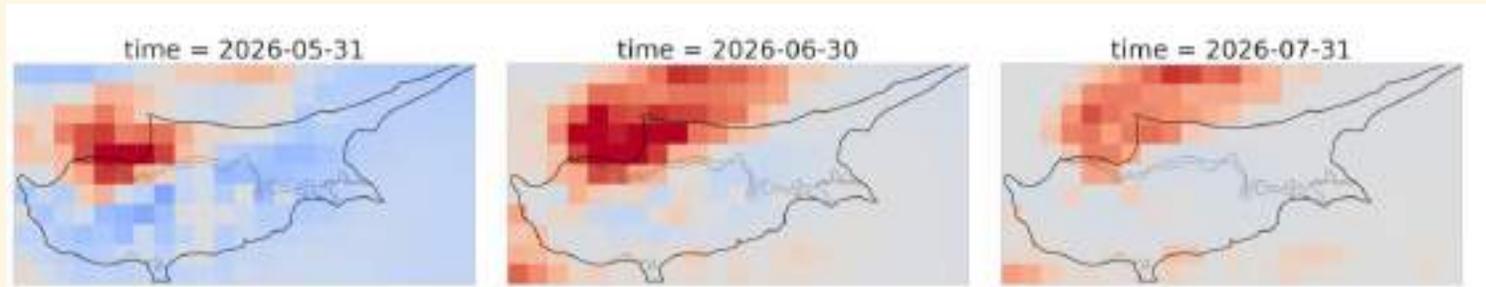


Precipitation anomaly (mm) - Ensemble Mean Forecast Mediterranean

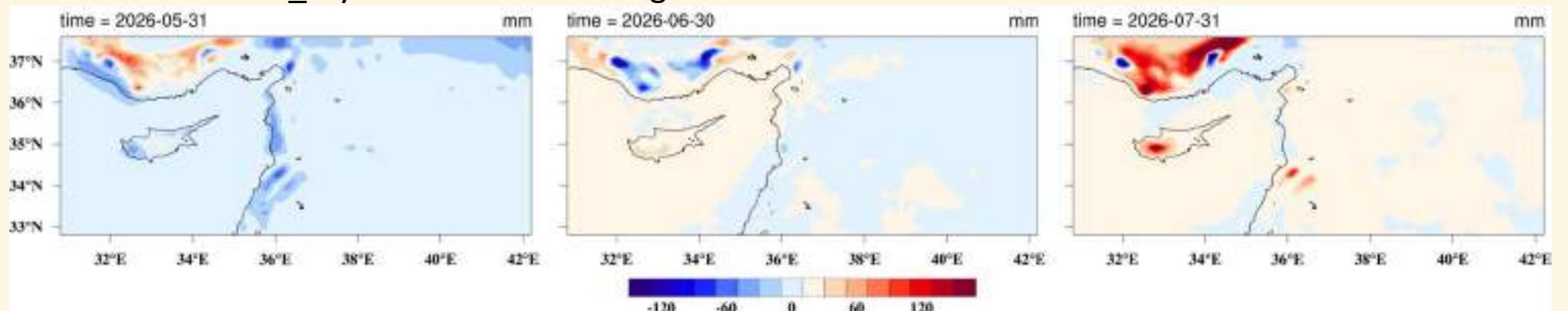


Anomalies of Mean Temperature (from May to July 2026)

Model 1: Bias corrected - Statistical Downscaling



Model 2: WRF_Dynamical Downscaling



Operationalizing Seasonal Climate Forecasts

Bridging the gap between climate science and destination management.



CORE DATA PLATFORMS

 **Copernicus Climate Change Service**
Global & regional probabilistic forecasts

 **PREVENT project**
regional probabilistic forecasts

FORECAST DATA (UP TO 6 MONTHS)

- ✓ Temperature Anomalies
- ✓ Precipitation Trends
- ✓ Extreme Event Probabilities
- ✓ Drought Indices

Strategic Applications

 Marketing Timeline Adjustment

 Event & Festival Scheduling

 Water & Resource Allocation

 Infrastructure Management

"Transforming scientific data into actionable management insights."

DECISION PARADIGM
Reactive Management



RESILIENT FUTURE
Proactive Adaptation

From Science to SOCIETY: Closing the knowledge gap



PREVENT

<https://preventmed-climate.eu/tools/prevent-e-tool/>

HOME PREVENT RESOURCES TOOLS NEWS & EVENTS CONTACT

PreventMed Climate

Home Climate Data Viewer Environmental Report Print

Thermal Discomfort Index Report

Cyprus — Seasonal WRF Forecast (CFSv2 driven)

Daily Thom's Discomfort Index analysis for the period January-July 2026

Region:
Cyprus

Analysis Period:
1 Jan - 31 Jul 2026

Data Points:
212 daily observations

Model:
WRF / CFSv2

Executive Summary Monthly Analysis Health Impact Recommendations

Executive Summary

Key Finding

Thermal discomfort conditions affect Cyprus for **47.6% of the forecast period** (101 out of 212 days). Severe heat stress conditions are recorded for **7 days in July**, approaching but not exceeding the medical-emergency threshold.

This report presents a daily analysis of Thom's Discomfort Index (DI) derived from a seasonal WRF forecast driven by CFSv2 boundary conditions. The index combines 2-m air temperature and relative humidity to estimate the level of thermal discomfort.

52.4%

No discomfort

111 days — Jan, Feb, Mar

8.5%

<50% feel discomfort

18 days — Apr-May



Conclusion: Building a Climate-Smart Future

By integrating **seasonal forecasts** and **collaborative strategies**, the Mediterranean can transform vulnerability into global leadership in sustainable tourism.



Data-Driven Decisions

Leveraging real-time climate services to shift from reactive crisis management to proactive adaptation.

Regional Collaboration

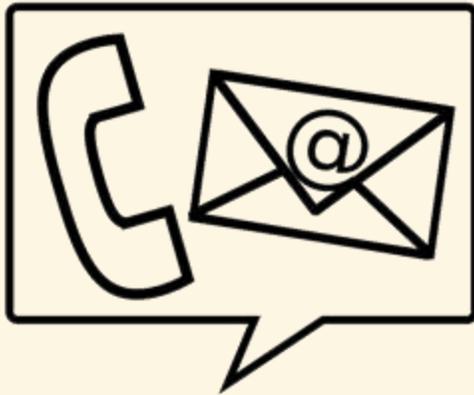
Harmonizing policies across the basin to ensure equity and safeguard ecosystems and livelihoods.

Global Leadership

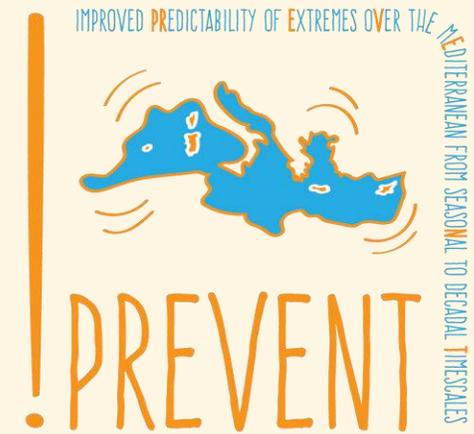
Positioning the Mediterranean as a world-class model for climate-resilient, year-round tourism.

THANK YOU for your attention!

*Part of this work was supported by the **PREVENT** project that has received funding from the European Union's Horizon Europe Research and Innovation Program under Grant Agreement No. 101081276*



Christina Anagnostopoulou- Professor
Department of Meteorology and Climatology,
School of Geology- AUTH
Tel: +2310998414
E-mail: chanag@geo.auth.gr
<https://people.auth.gr/chanag>



Visit our Web –Site for more...
<https://preventmed-climate.eu>