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Interreg – IPA CBC

EUROPEAN UNION

Greece - Republic of North Macedonia

# Preven-T

**PREVEN-T DELIVERABLE Del.4.1**

| | |
|---|---|
| **Authors:** | International Hellenic University [IHU] |
| **Status:** | Final report |
| **Due Date:** | 31/10/2023 |
| **Version:** | 1.0 |
| **Dissemination Level:** | PU |

# PREVEN-T Project Profile

**Grant Agreement No.:** PREVEN-T – CN2 – SO2.4 – SC049

| | |
|---|---|
| **Acronym:** | PREVEN-T |
| **Title:** | PREVEN-T – Modern Tools for wildfires' and Floods' Risk punctual forecast and monitoring and innovative techniques for citizens' safeguard awareness and preparedness |
| **URL:** | http://www.preven-t.eu/ - http://prevent.the.ihu.gr/ (NOT OFFICIAL - temporal) |
| **Start Date:** | 03/03/2022 |
| **Duration:** | 18 months |

## Partners

| | | |
|---|---|---|
| INTERNATIONAL HELLENIC UNIVERSITY | International Hellenic University (IHU) | Greece |
| | Military Academy "General Mihailo Apostolski" (MAGMA) | RNM |
| | National Park Pelister | RNM |

# Document History

| Version | Date | Author (Partner) | Remarks/Changes |
|---|---|---|---|
| 0.1 | 20/07/2022 | Kalliopi Kravari (IHU) | Table of Contents |
| 0.2 | 20/10/2023 | Panagiotis T. Nastos | 1st Draft ready for internal review |
| 0.3 | | | 2nd Draft ready for quality control |
| 1.0 | | | FINAL VERSION TO BE SUBMITTED |

# Abbreviations and acronyms

| | |
|---|---|
| Deliverable | D |
| Expected Outcomes | EO |
| International Hellenic University | IHU |
| Non-governmental organization | NGO |

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# List of Figures & Tables

# 1 WP 4.1 "High resolution weather forecast model"

## 1.1 Validation of the WRF-CHEM modeling system

Atmospheric modeling simulations for the area of interest are performed on an operational daily basis with the WRF_v4.1 modeling system. The model is configured in a 3:1 nesting domain structure allowing higher resolution up to 1.5×1.5 km over the area of interest as shown in Figure 6.

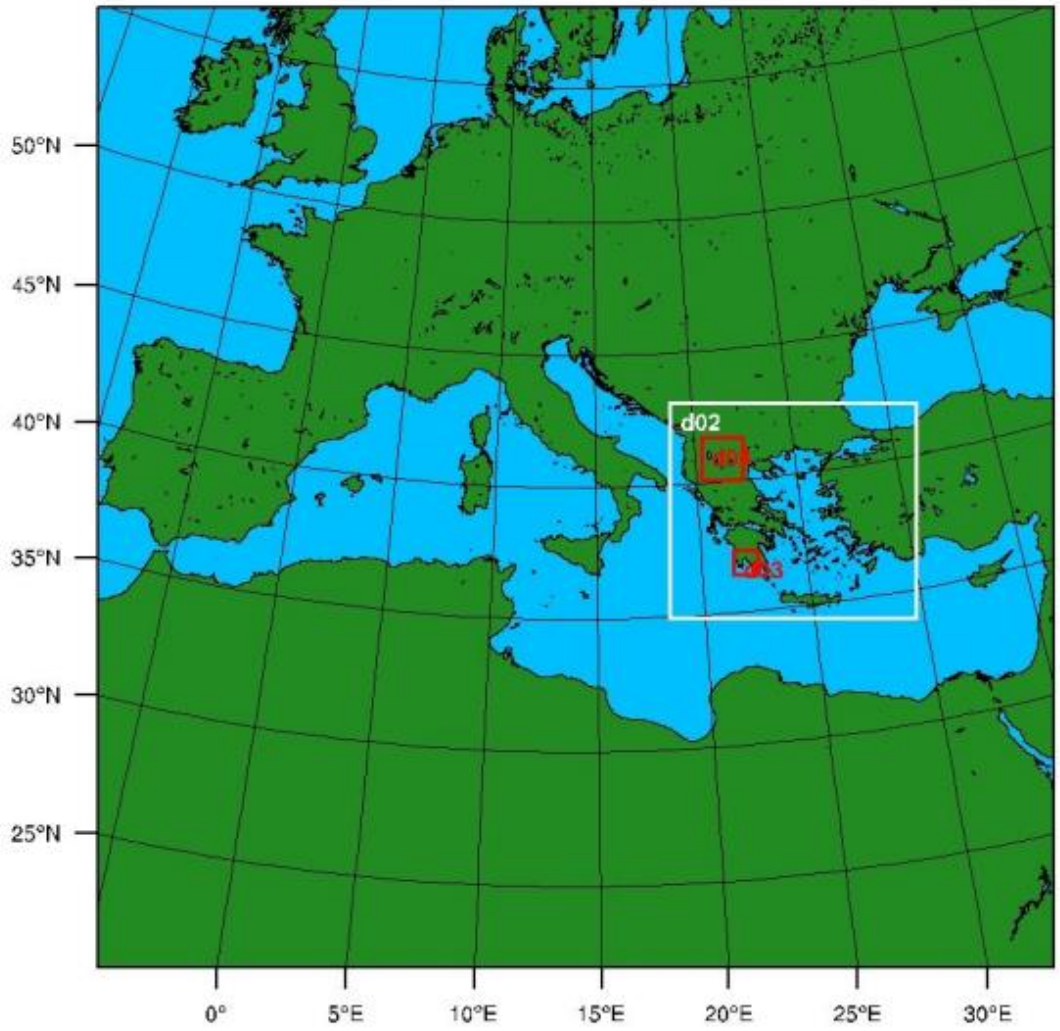


**Figure 1 WRF domain configuration. D01: 13.5×13.5 km, D02: 4.5×4.5 km, D03:1.5×1.5 km**

The high-resolution nesting structure provides advantages for the description of atmospheric flows over complex terrains (e.g. mountainous surfaces, terrain slopes, and coastal areas where the proper resolving of local flows becomes crucial). Under such circumstances the increased mechanical mixing and the elevated sensible heat sources during daytime result in an accordingly complex spatial distribution of PBL heights, a feature that cannot be easily reproduced in mesoscale model resolutions. The inner finest grid allows the detailed resolving of convective scale motions and cloud-precipitation processes by the explicit scheme of the model. The vertical structure of the model is configured with 41 terrain-following levels. Initial and boundary conditions are from the NCEP GFS at 0.5°×0.5° resolution and daily updated SST is taken from the NCEP analysis.

## 1.2 Operational forecasts and continuous feed of observations over the target area of Greece and Northern Macedonia.

The atmospheric modeling system for PREVEN-T is running on a daily operational mode. The daily model output exceeds 200 Gb and is analyzed by in-house developed suite of tools (bash scripting, FORTRAN, Python, NCL) to compute the forecasting meteorological maps and surface fields to support the needs of the project. Examples from the operational modeling system are presented in the following figures.

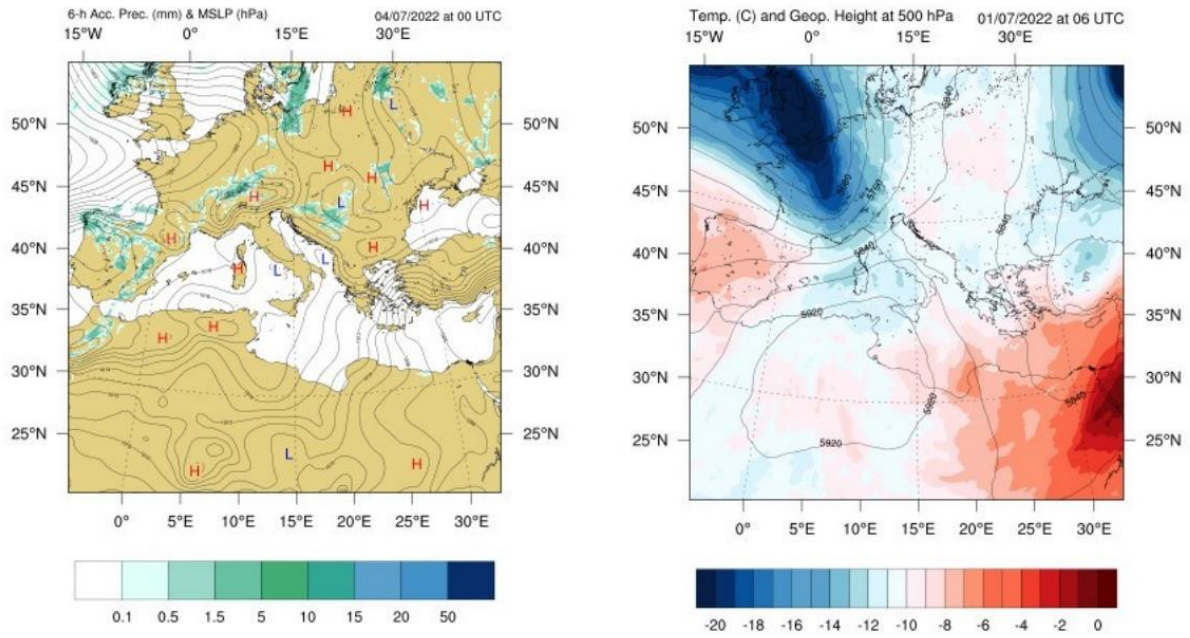


**Figure 2 Left: Accumulated 6-h precipitation (mm) and mean sea level pressure (hPa) at the external WRF domain. Right: Temperature (°C) and geopotential height (m) at 500 hPa.**

The forecasted variables include : Accumulated precipitation (mm), Incoming Shortwave Radiation ($W/m^2$), Sea Level Pressure (hPa), Wind Speed at 10m ( m/s), Air Temperature at 2m (in °C), Air Temperature (in °C) at 500hPa and 850 hPa, Geopotential Height (in m) at 500hPa and 850 hPa, Total Cloud Cover (%), Wind Speed (m/s) at 200 hPa, 500 hPa and 850 hPa.

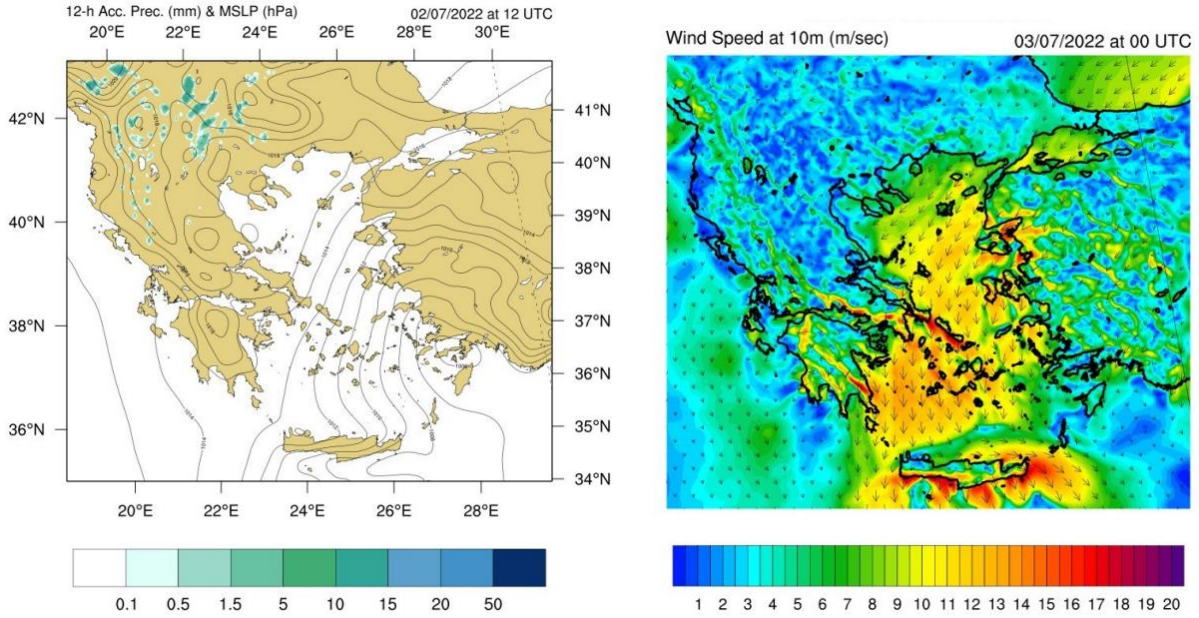


**Figure 3 Left: Accumulated 6-h precipitation (mm) and mean sea level pressure (hPa) and Right: wind speed at 10m (m/s) at the intermediate WRF domain**

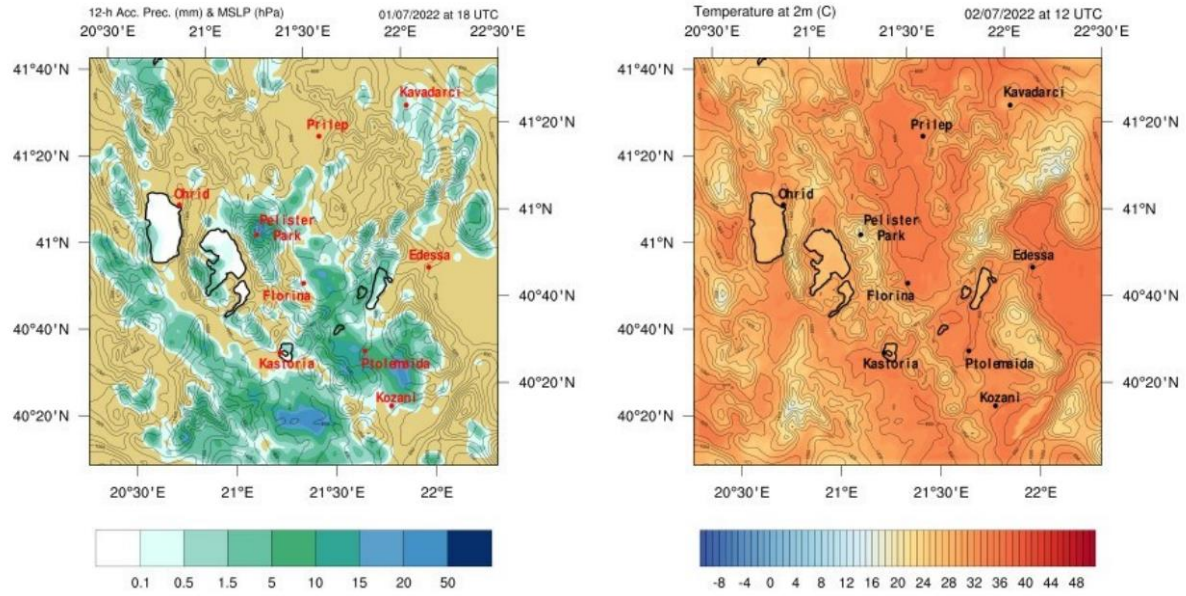


**Figure 4 Left: Accumulated 6-h precipitation (mm) and topography (m) and Right: Temperature at 2m (°C) and topography (m) at finest WRF domain over the area of interest.**

Finally, in Figure 5, one can see an indicative forecast for the wider area during June, 2-6, 2020, when a flash flood event occurred in Bitola city on June 4th, due to torrential rain contributing to urban flooding in the surrounding area[1].

[1] https://english.republika.mk/news/macedonia/streets-flooded-in-bitola-after-a-torrential-rain/

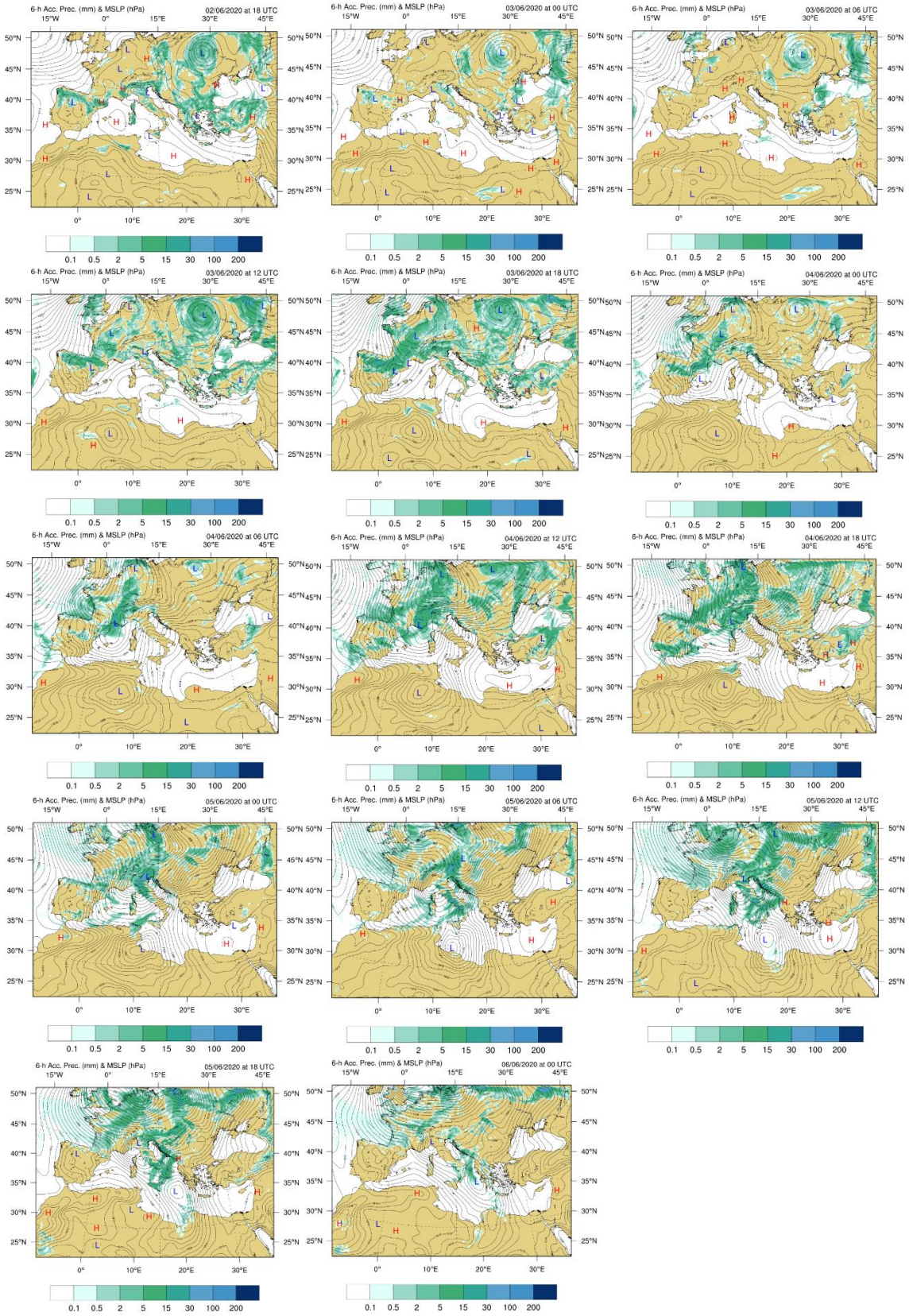


**Figure 5 Forecast (accumulated 6-h precipitation (mm) and mean sea level pressure (hPa) for 2-6/7/2020.**

# References

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