
СОФИЙСКИ УНИВЕРСИТЕТ -
МАРКЕР ЗА ИНОВАЦИОН И ТЕХНОЛОГИЧЕН ТРАНСФЕР

# Research group 3.1.13 ”Climate, Weather and Natural Risks” CW&NR report 2023

Research area ”Earth and related environmental sciences”

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SUMMIT Annual Conference 2024,
23 April 2024, Sofia University, Sofia Bulgaria

# Motivation: Climate, Weather and Natural Risks

- Climate change & extreme weather main threats to society in 21 century
- For 20 years: 500 000 casualties & over $2 trillion economic losses due to extreme weather
- World economic forum: ”leading threat to global society is failure to achieve climate change mitigation and adaptation goals”
- South-east Europe & Bulgaria: high sensitivity to extreme weather
- Flood 2 September 2022 over €15 000 000 loses

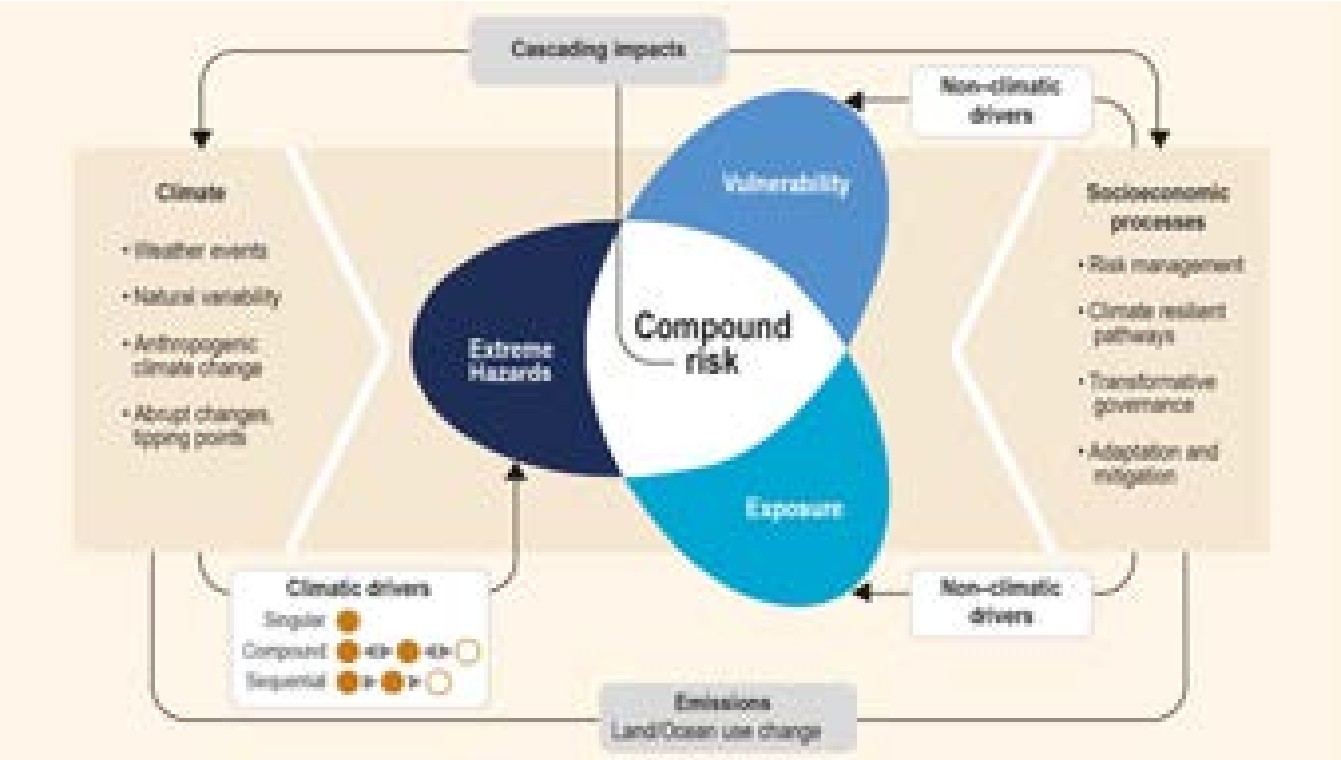



Figure from: https://www.ipcc.ch/srocc/chapter/chapter-6/

# Work Programme CW&NR 2023-2026

- WP 1 Extreme weather and climate phenomena
  - 1.1 Severe weather forecasting and nowcasting
  - 1.2 Air-quality monitoring and modelling
  - 1.3 Climate feedbacks in Balkan-Black Sea region
- WP 2 Geospatial modeling, assessment and mapping of climate and natural risks
  - 2.1 Climate hazards and risks
  - 2.2 Natural hazards and risks
  - 2.3 Geospatial modeling and mapping approaches and methods

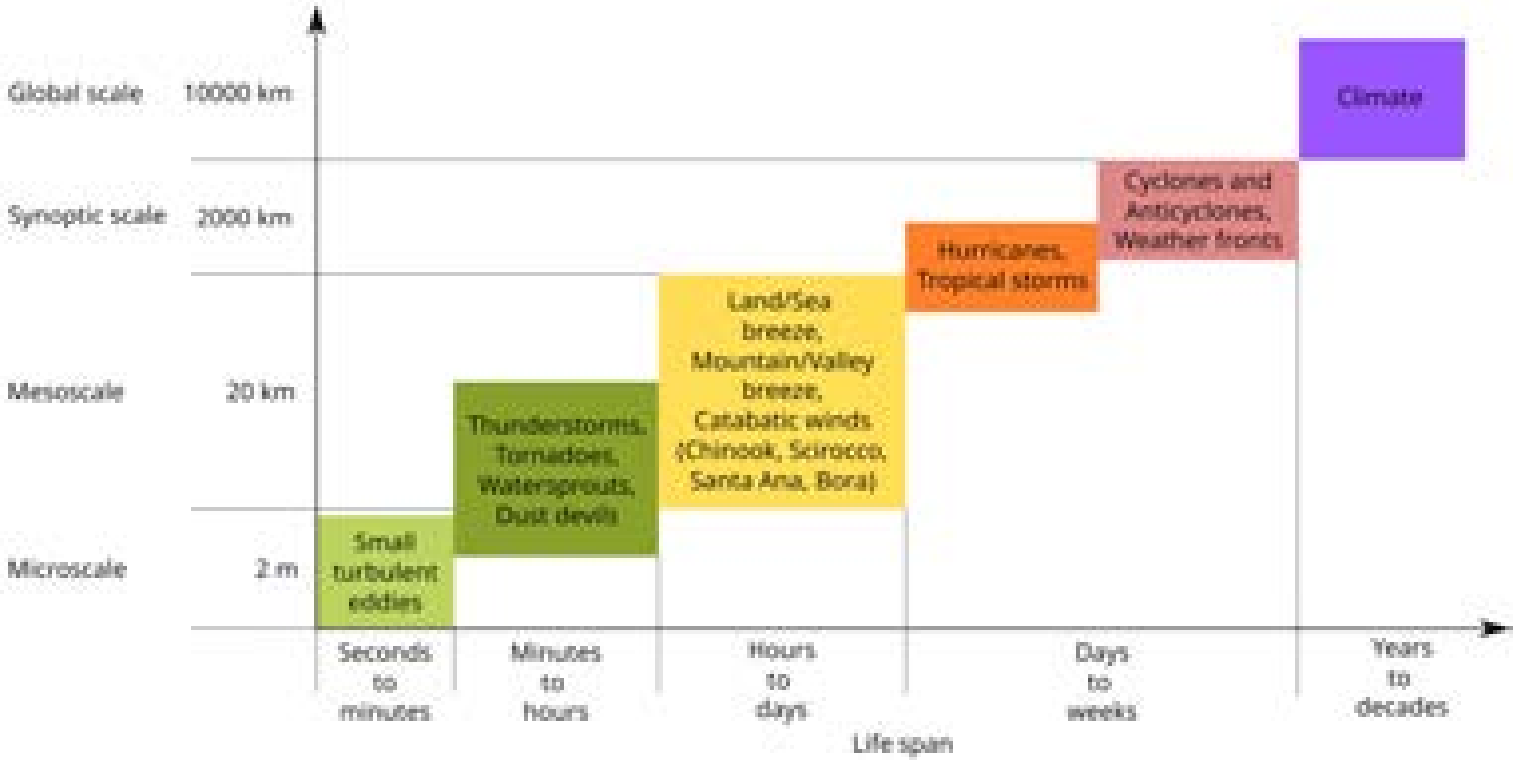
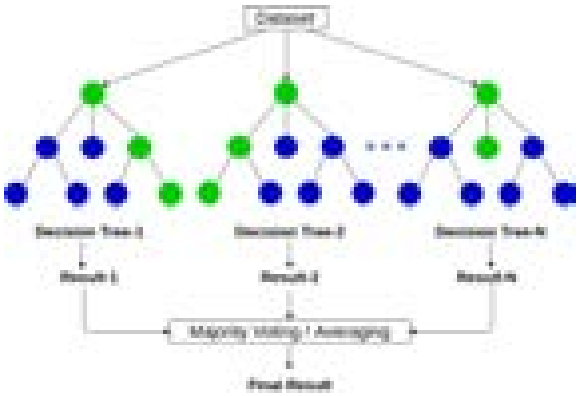



Figure from dr. Tzvetan Simoenov, DWD.

# 1.1 Severe weather forecasting and nowcasting 2023

- WMO nowcasting ”detailed description of current weather and forecasts 0 to +6 h”
- phenomena: 1) convective storms 2) mesoscale events associated with extra-tropical & tropical storms 3) fog & low visibility 4) locally forced precipitation events 5) sand & dust storms 6) snow, ice, glazed frost, blizzards, avalanches 7) wildfires 8) air pollution
- benefits: 1) fatalities & injuries reduction 2) private, public, industrial property damage reduction 3) savings for industry, transportation/aviation, agriculture



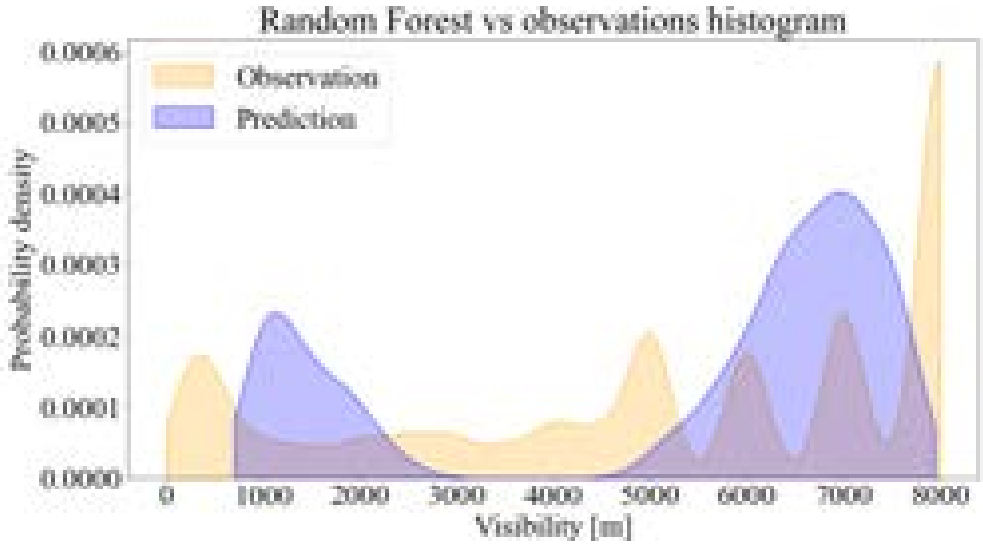



Figure from: Penov, N. and Guerova, G., 2023. Sofia Airport Visibility Estimation with Two Machine-Learning Techniques. Remote Sensing, 15 (19), 4799.

# 1.3 Climate feedbacks in Balkan-Black Sea region 2023

- influence of the warming Black Sea surface on the weather and climate of the surrounding area
- determination of the expected changes for the 21st century over the Black Sea and the Balkan regarding the essential climate variables (temperature, rainfall, air pressure, wind) and the frequency of some events in the Black Sea (freezing, coastal upwelling, etc.)

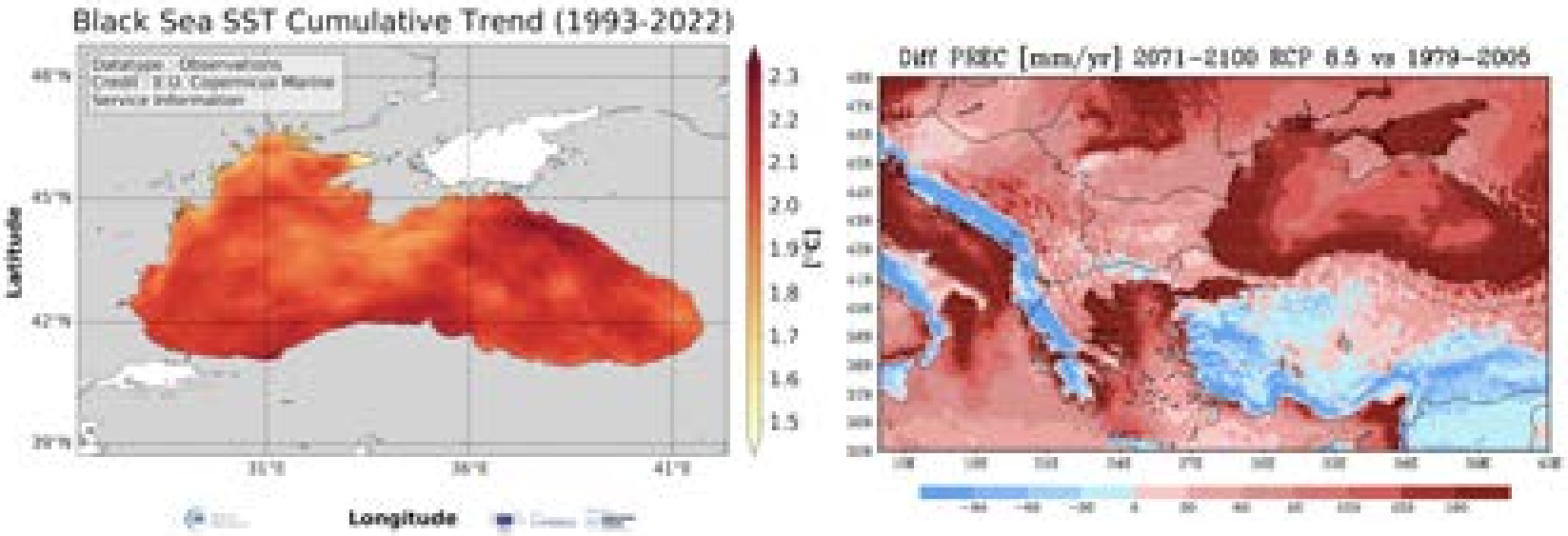



Figure from: Copernicus marine service for Black sea. marine.copernicus.eu

# 2.1 Climate hazards and risks 2023

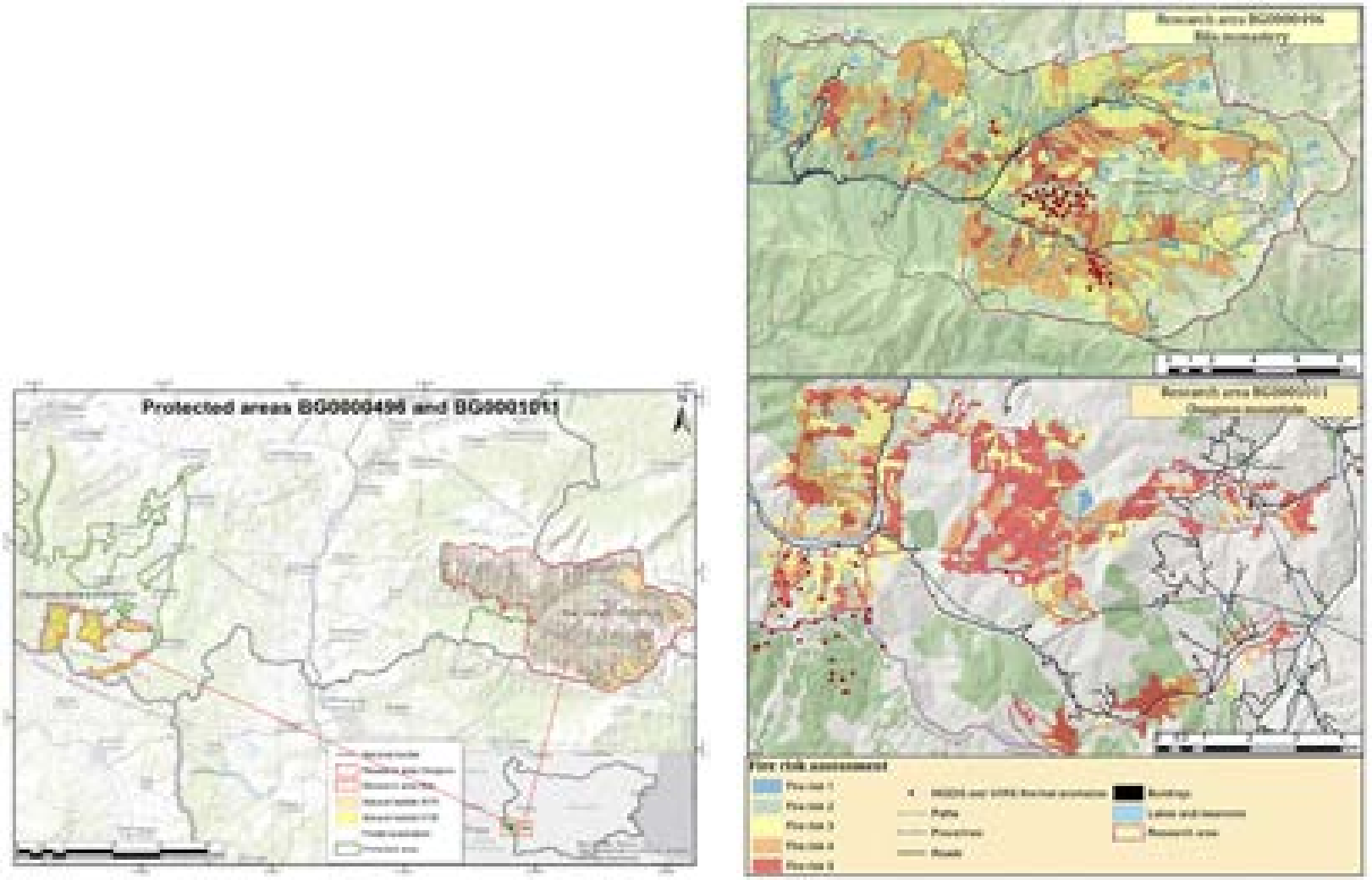



Figure from: Borisova, B., E. Todorova, I. Ihtimanski, M. Glushkova, M. Zhiyanski, M. Georgieva, T. Stoyanov, M. Bozhilova, M. Atanasova, and S. Dimitrov. ”Wildfire risk assessment and mapping–an approach for Natura 2000 forest sites.” Trees, Forests and People (2024): 100532.

# 2.2 Natural hazards and risks 2023

- chemical and mineralogical properties and the technical parameters of clay materials from NW Bulgaria for geological and geotechnical assessments related to natural hazards and risks

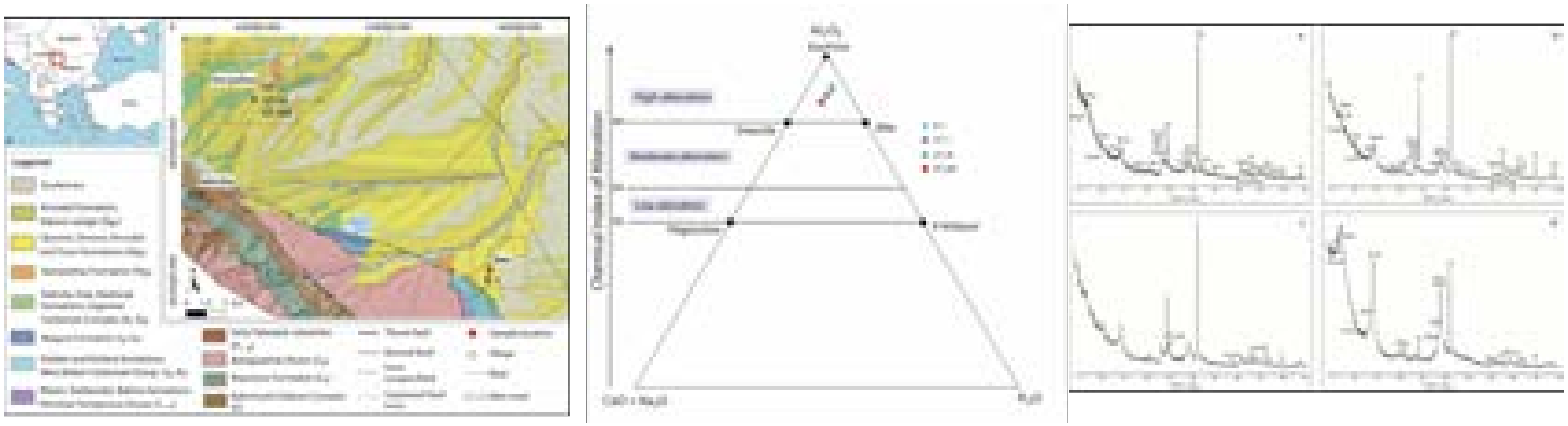


Figure from: Dotseva, Z., Stanimirova, Ts., Vangelov, D. 2023. Characteristics of Neogene clay materials in Northwest Bulgaria– new data for the area near Bella and Staropatitsa villages. Geologica Balcanica, 3, 52, 73-79.

# 2.3 Geospatial modeling and mapping approaches and methods 2023

- Urban Heat Island (UHI) - example of the impact of cities on the environment
- UHI is characterized by positive temperature differences between the city and its surroundings (maximum after sunset)
- Unmanned Aerial Systems (UAS) to study local phenomena in dynamic and operational manner with high spatiotemporal resolution

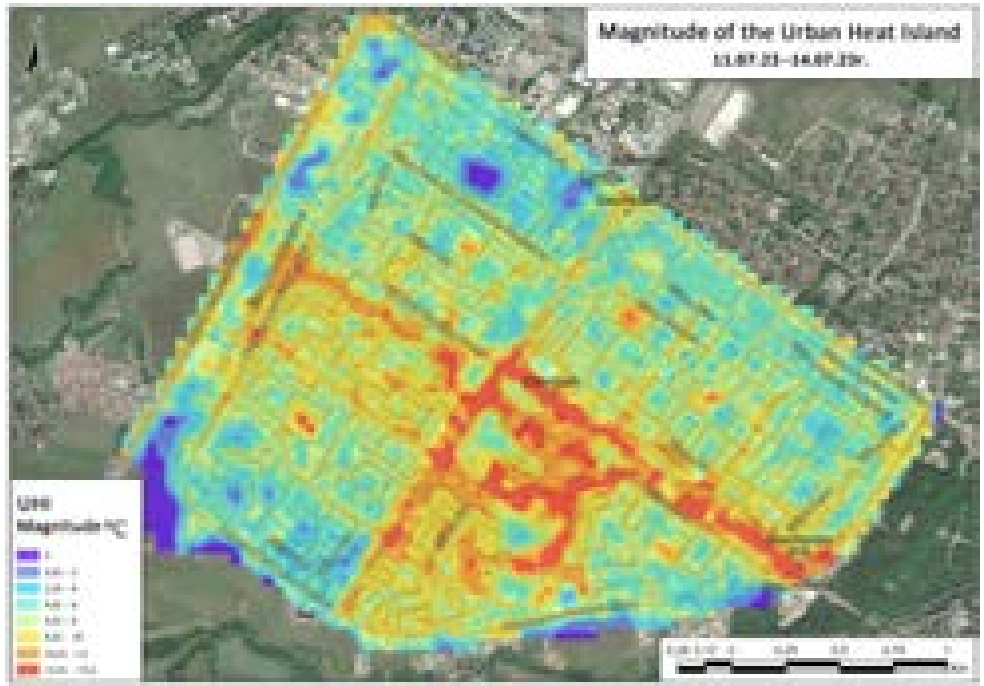



Figure from: Dimitrov, S., Martin I., B. Borisova, L. Semerdzhieva, and S. Petrov. 2024. "UAS-Based Thermal Photogrammetry for Microscale Surface Urban Heat Island Intensity Assessment in Support of Sustainable Urban Development (A Case Study of Lyulin Housing Complex, Sofia City, Bulgaria)" Sustainability 16, no. 5: 1766.

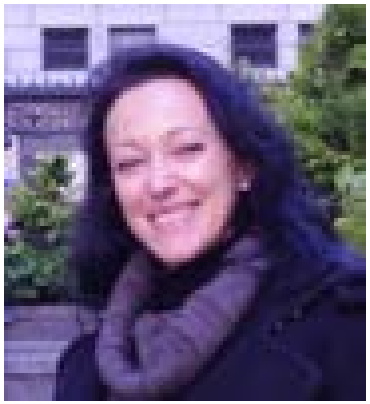
# Publication list 2023-2024


- Penov, N. and G. Guerova, 2023. Sofia Airport Visibility Estimation with Two Machine-Learning Techniques. Remote Sensing, 15 (19), 4799.
- Penov N., A. Stoycheva and G. Guerova, 2023. Fog at Sofia 2010-2019: objective circulation classification and fog indices. Atmosphere, 14 (5), 773.
- Stojanovic, M., R. Sorí, G. Guerova, M. Vázquez, R. Nieto, L. Gimeno, 2023. Vegetation Greenness Sensitivity to Precipitation and Its Oceanic and Terrestrial Component in Selected Biomes and Ecoregions of the World. Remote Sensing 2023, 15, 4706.
- Dimitrov, S., M. Iliev, B. Borisova, L. Semerdzhieva, and S. Petrov. 2024. "UAS-Based Thermal Photogrammetry for Microscale Surface Urban Heat Island Intensity Assessment in Support of Sustainable Urban Development (A Case Study of Lyulin Housing Complex, Sofia City, Bulgaria)" Sustainability 16, no. 5: 1766.
- Borisova, B., E. Todorova, I. Ihtimanski, M. Glushkova, M. Zhiyanski, M. Georgieva, T. Stoyanov, M. Bozhilova, M. Atanasova, and S. Dimitrov. "Wildfire risk assessment and mapping–an approach for Natura 2000 forest sites." Trees, Forests and People (2024): 100532.

# ”Climate, Weather and Natural Risks” 24 April 2024, Room 45

- WP 1 Extreme weather and climate phenomena
  - 9:00-9:30 Severe weather forecasting and nowcasting - Guergana Guerova
  - 9:30-10:00 Climate feedbacks in Balkan-Black Sea region - Elisaveta Peneva
- WP 2 Geospatial modeling, assessment and mapping of climate and natural risks
  - 10:00-10:30 Climate hazards and risks - Biliana Borisowa
  - 10:30-11:00 Natural hazards and risks - Kliment Naidenov/Ianko Gerdjikov
  - 11:00-11:30 Geospatial modeling and mapping approaches and methods - Stelian Dimitrov
  - 11:30-12:00 Discussion




# Thank you!

## THANK YOU FOR THE ATTENTION!

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