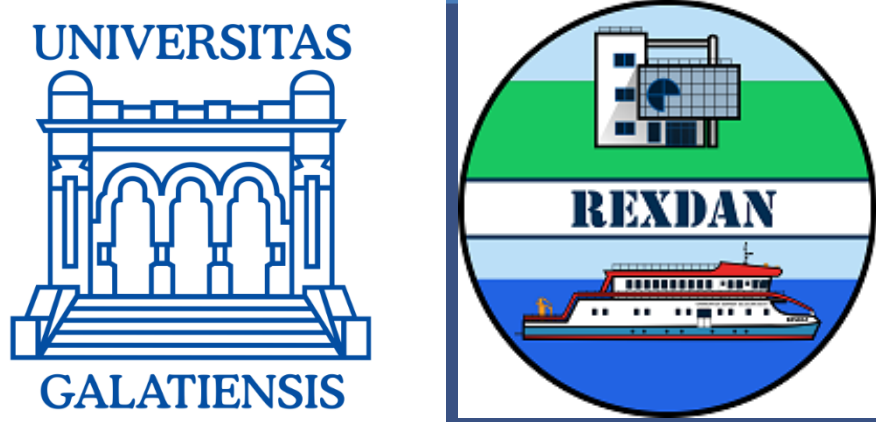
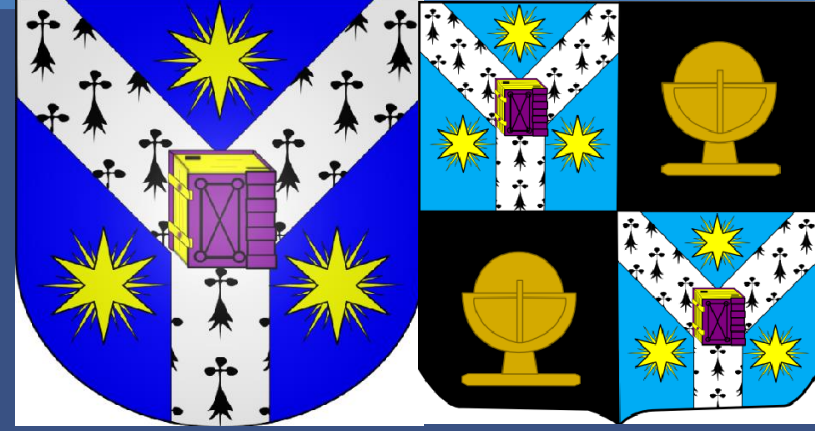


# The first air quality observations in Romania using the REXDAN research vessel on Danube Delta



Daniel-Eduard CONSTANTIN, Adrian ROȘU, Mirela VOICULESCU, Cătălina ITICESCU, Lucian GEORGESCU  
 REXDAN Research Center, Faculty of Sciences and Environment,  
 Dunarea de Jos University of Galati, Domneasca Street, No.47, Galati, Romania  
 daniel.constantin@ugal.ro



XIX-th edition - 7-9 JUNE 2024,  
 Iași, Romania

## Abstract

This work presents the first observations on air quality performed on the Danube Delta using the REXDAN research vessel. The observations were performed on the Danube river in the winter of 2024. The expedition started from Galati city and reached the city of Sulina on the same day in a trip that lasted about 10 hours. Throughout the expedition, observations were made on the following trace gases: nitrogen dioxide, sulfur dioxide, ozone, carbon monoxide, carbon dioxide, suspended particles (PM1, PM2.5, PM4, PM10) and weather parameters. The observations obtained were compared to air quality forecasting models.

## Materials and methods



Figure 1. The REXDAN research vessel

The REXDAN research vessel is the largest inland water research vessel in Europe. The REXDAN research vessel undertakes research activities in: chemistry, biology, physics, environmental science, ecology, bathymetry, topography, atmospheric chemistry, sustainable development, related to water, sediments, soil, air, biodiversity, bathymetry, hydromorphology and covers a wide geographical area (2000 km of the Danube navigable sector including wide coastal areas).



Figure 2. The System for air quality monitoring on board the REXDAN research vessel.



Figure 3. The route used on the Galati-Sulina research mission

Mission area: Danube Delta  
 Distance travelled ~300km  
 Cruise speed: ~20km/h  
 Time interval: 14-15 Feb.2024



Figure 4. UAV used for air quality observations

Analyzer Ecotech Serinus 40 Nox, NO, NO2  
 Analyzer Ecotech Serinus 51 H2S/ SO2  
 Analyzer Ecotech Serinus 30 CO cu senzor de CO2  
 Analyzer Ecotech Serinus 10 O3  
 PM Analyzer (PM1, PM2.5, PM4, PM10) FIDAS20  
 AURORA 1000 - integrating nephelometer  
 Weather station (wind direction, wind speed, temperature, air relative humidity, barometer, solar radiation, precipitation)

## Results and Discussion (preliminary)

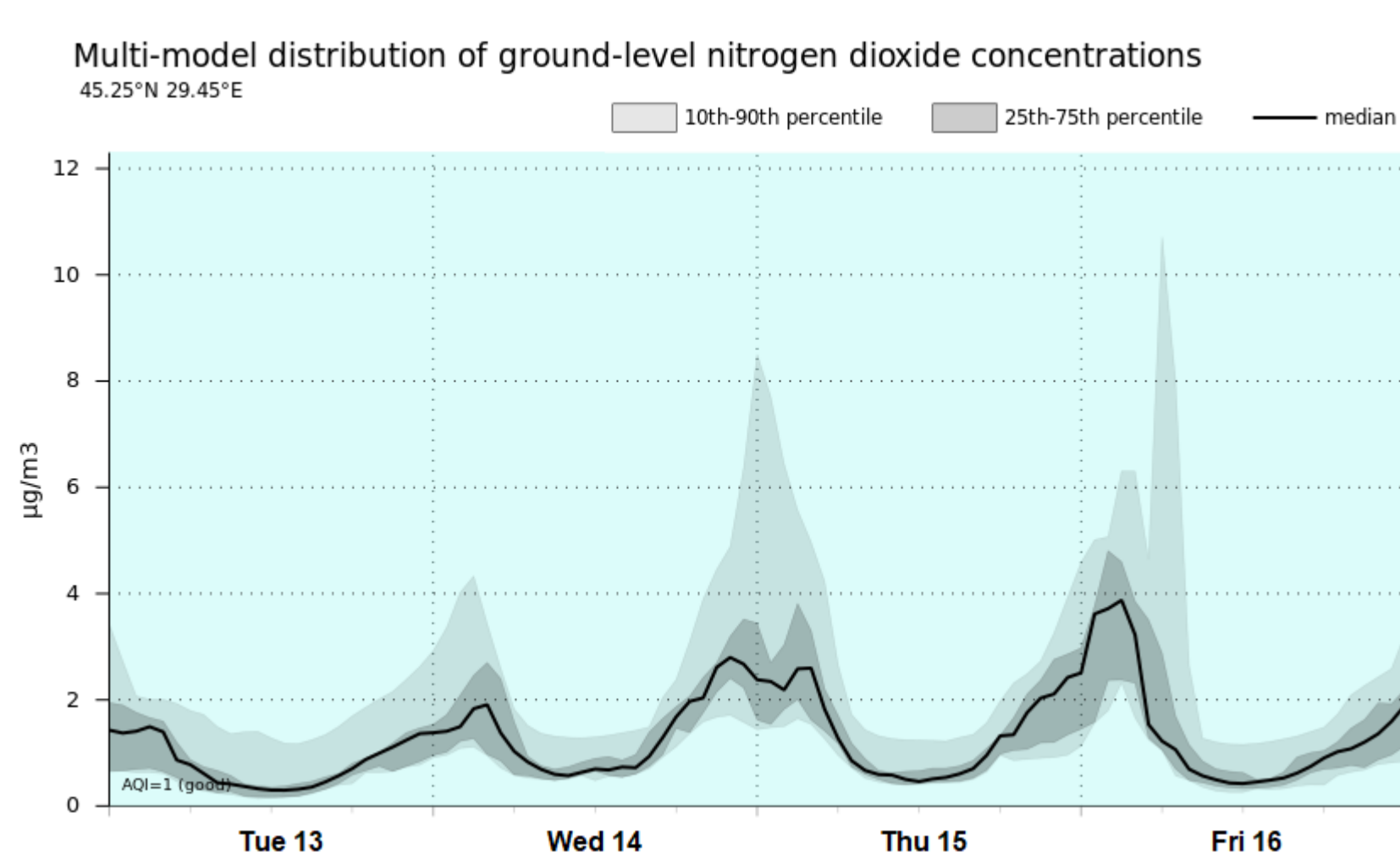


Figure 5. CAMS air quality forecasts – NO2 (Crisan- Danube Delta)

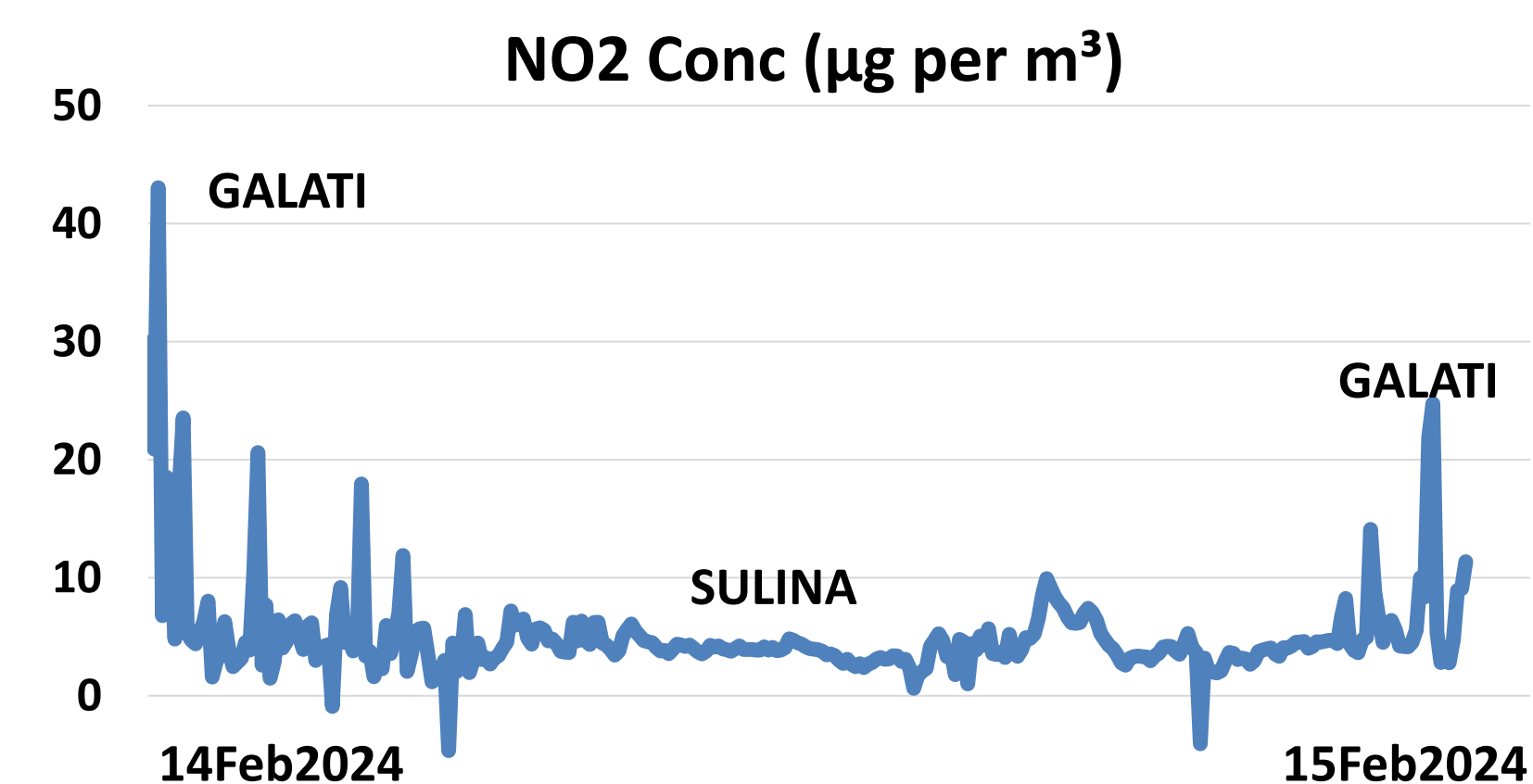


Figure 8. In situ NO2 measured during the expedition

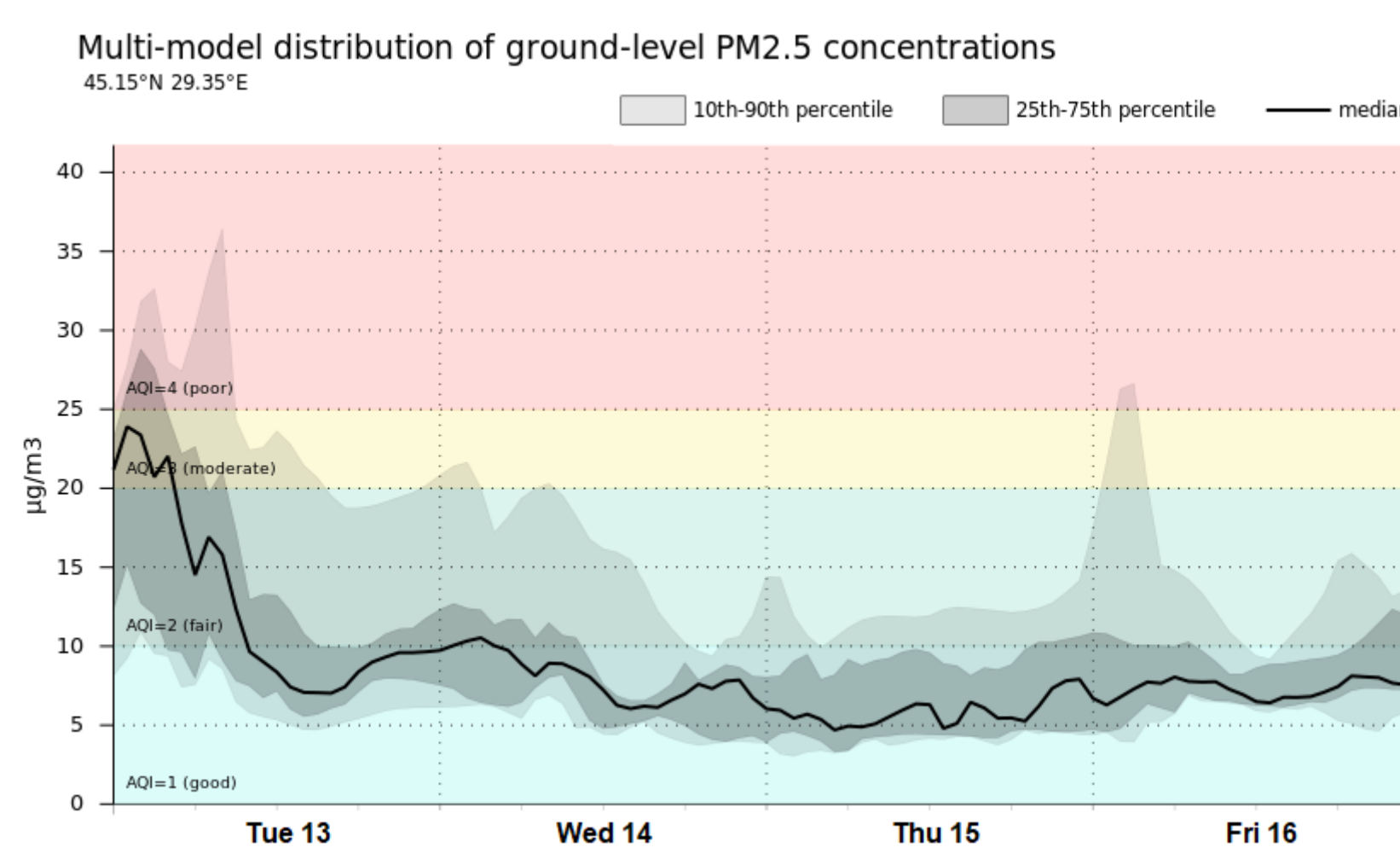


Figure 6. CAMS air quality forecasts – PM2.5 (Crisan- Danube Delta)

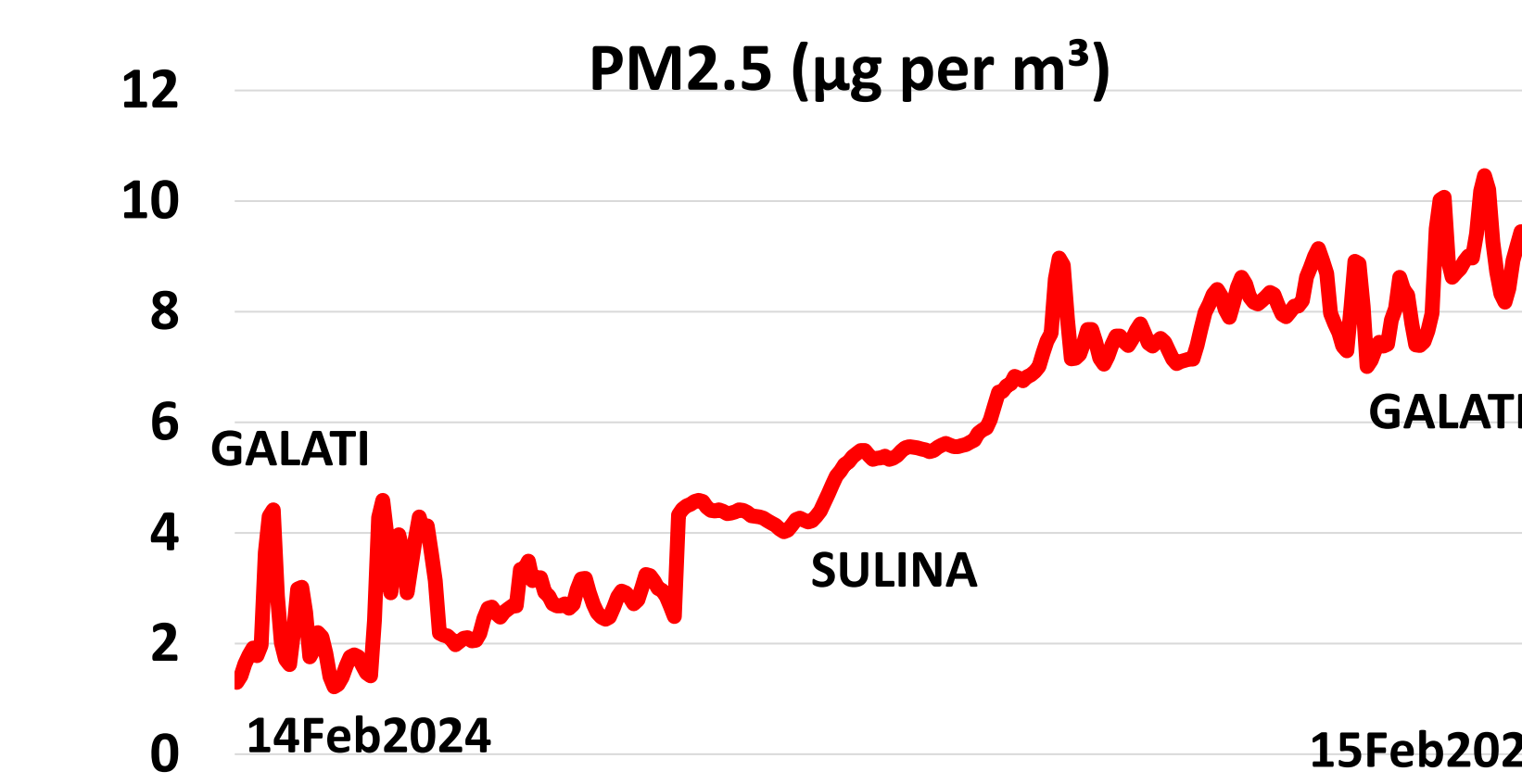


Figure 9. In situ PM2.5 measured during the expedition

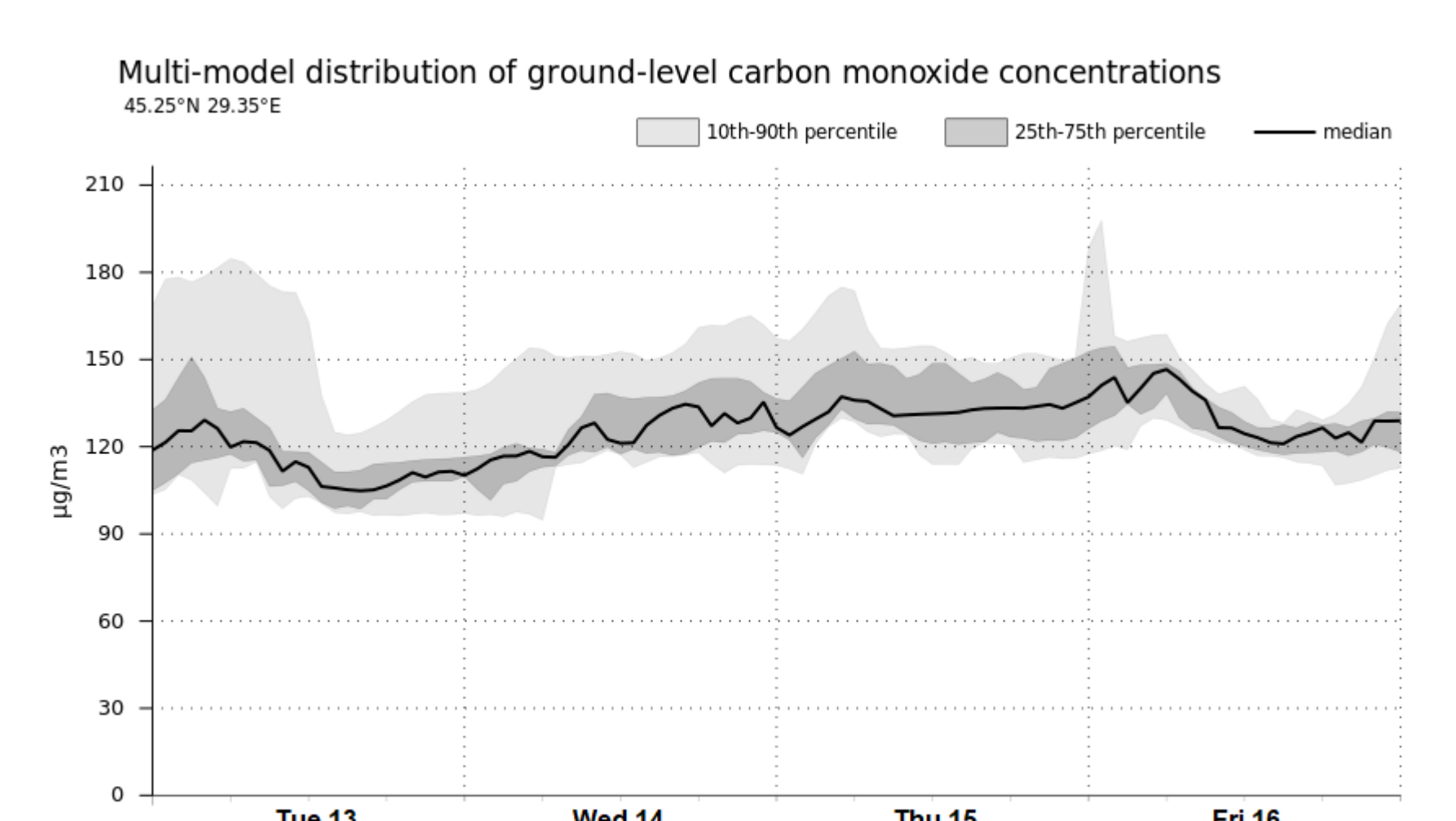


Figure 7. CAMS air quality forecasts – CO (Crisan- Danube Delta)

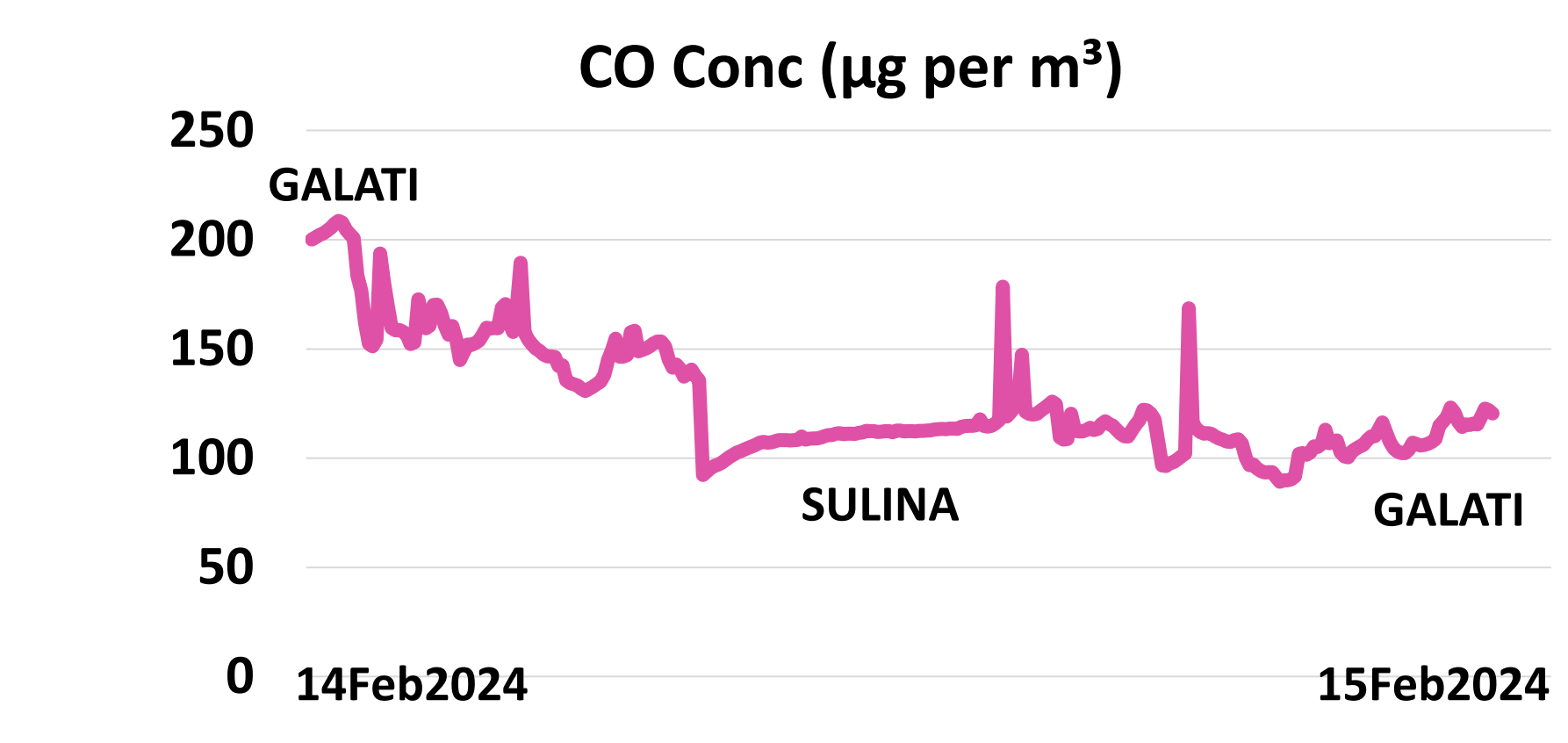


Figure 10. In situ CO measured during the expedition

## Conclusions (preliminary)

Even though the Danube Delta is considered a protected green area, being a UNESCO heritage, can not be protected against atmospheric pollutants. Even if the main source of air pollution is represented by naval traffic, pollution due to other causes such as fires or various human activities, or even transboundary air pollutants are not unheard of in this protected area. The Danube Delta is a remote area, mostly inaccessible, realistic determinations of air quality are almost impossible. The air quality observations performed with the REXDAN research vessel represent an international first in terms of determining air quality with high-precision scientific equipment. As a preliminary conclusion, after comparing the data from the CAMS model with the in-situ data determined on board the REXDAN research vessel, it can be stated that the data provided by the two types of observations are close in value for the three determined parameters: NO2, PM2.5 and CO.

## References

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## Acknowledgement

The research of D.E. Constantin was supported by the project "Excellence and involvement in intelligent development based on research and innovation at the "Dunarea de Jos" University of Galati—DINAMIC", ID 536/2021. The infrastructure used is part of the project "An Integrated System for the Complex Environmental Research and Monitoring in the Danube River Area, REXDAN", SMIS code 127065, co-financed by the European Regional Development Fund through the Competitiveness Operational Programme 2014-2020, contract no. 309/10.07.2021. The work of C. Iticescu was supported by the project "DALIA: Danube Region Water Lighthouse Action", Registration number: 101094070, Call: HORIZON-MISS-2021-OCEAN-02.