Air Pollution in Ukraine from space

Prague – Kyiv, 2020

Study based on the Copernicus Sentinel 5p satellite imagery and quality-controlled air pollution data from the Copernicus Atmosphere Monitoring Service

ARNIKA

WORLD FROM SPACE

ЧИСТЕ ПОВІТРЯ ДЛЯ УКРАЇНИ

TRANSITION
Transition Promotion Program

National Endowment for Democracy
Supporting freedom around the world

More information:
www.cleanair.org.ua


WORLD
FROM
SPACE

DATA-DRIVEN ANALYSIS

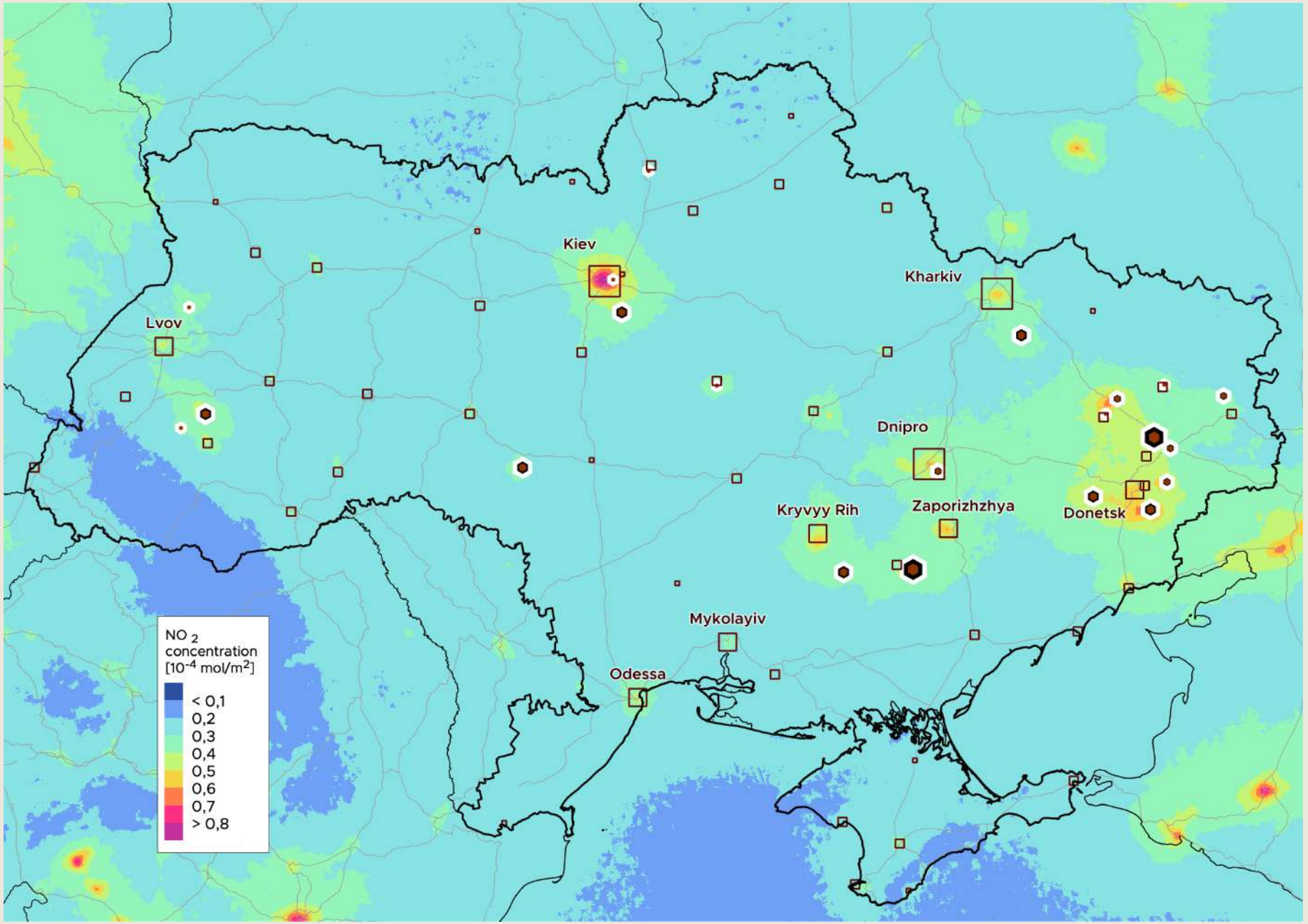
Atmosphere Monitoring Service

Data and methodology

- The EU Copernicus Programme
  - The space component - *satelite Sentinel-5P*
    - Atmosphere monitoring from space
    - NO2, CO, SO2, formaldehyde
    - 24h revisit;
    - downscaled to a regular grid 1 x 1km
  - The Copernicus Atmosphere Monitoring Service
    - Modeled data
    - PM2.5 and PM10
- Particular place x whole cover

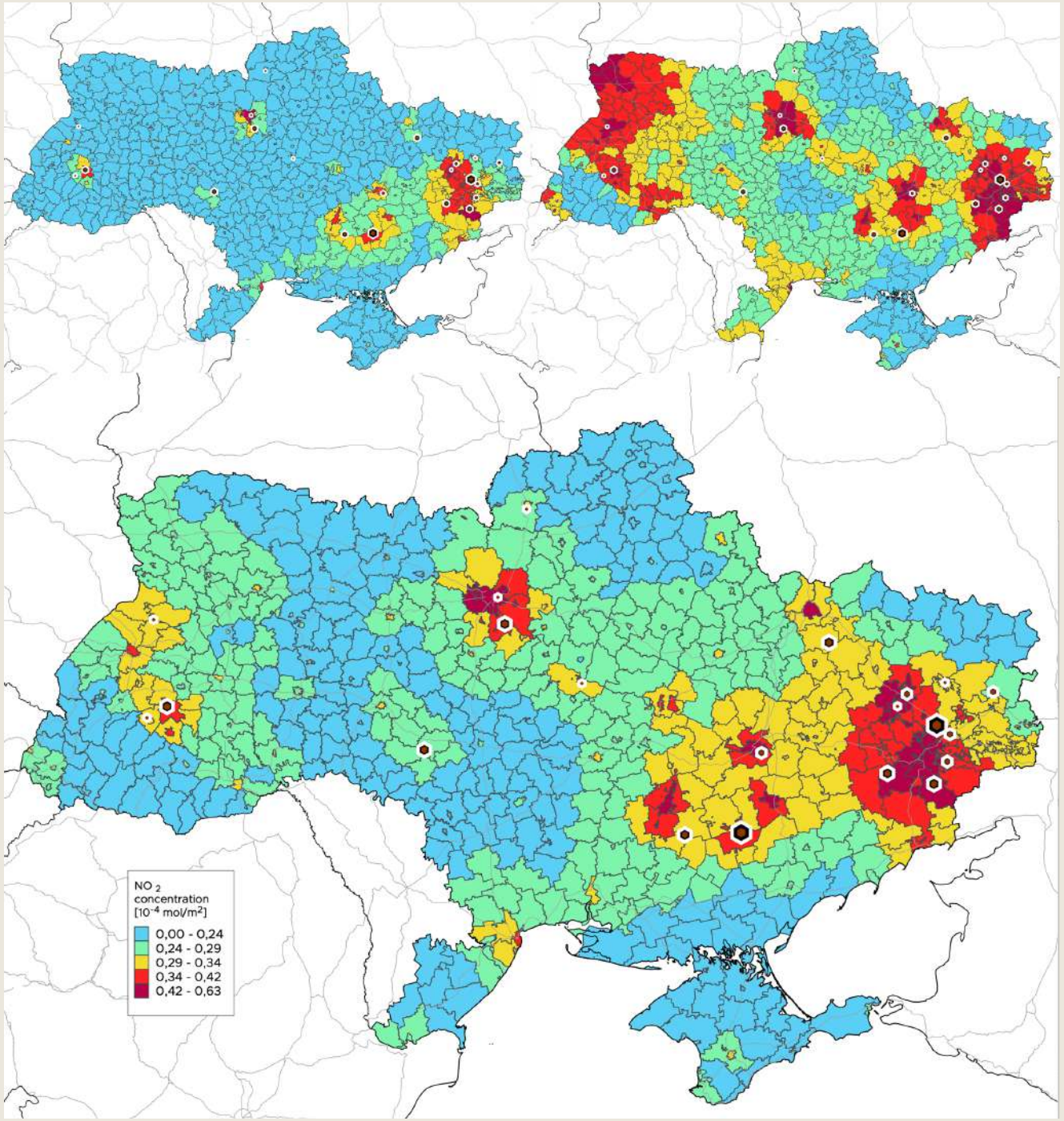
NO_2
Nitrogen dioxide

- even pollution but…
- largest urban areas and industrial and coal mining regions
- Kyiv, Donetsk, Dnipro, Kryvyi Rih, Zaporizhia



NO_2
Nitrogen dioxide

- Seasonality
- Increase in winter
  - Significant intake of NO_2 from Poland
  - Heating in urban areas

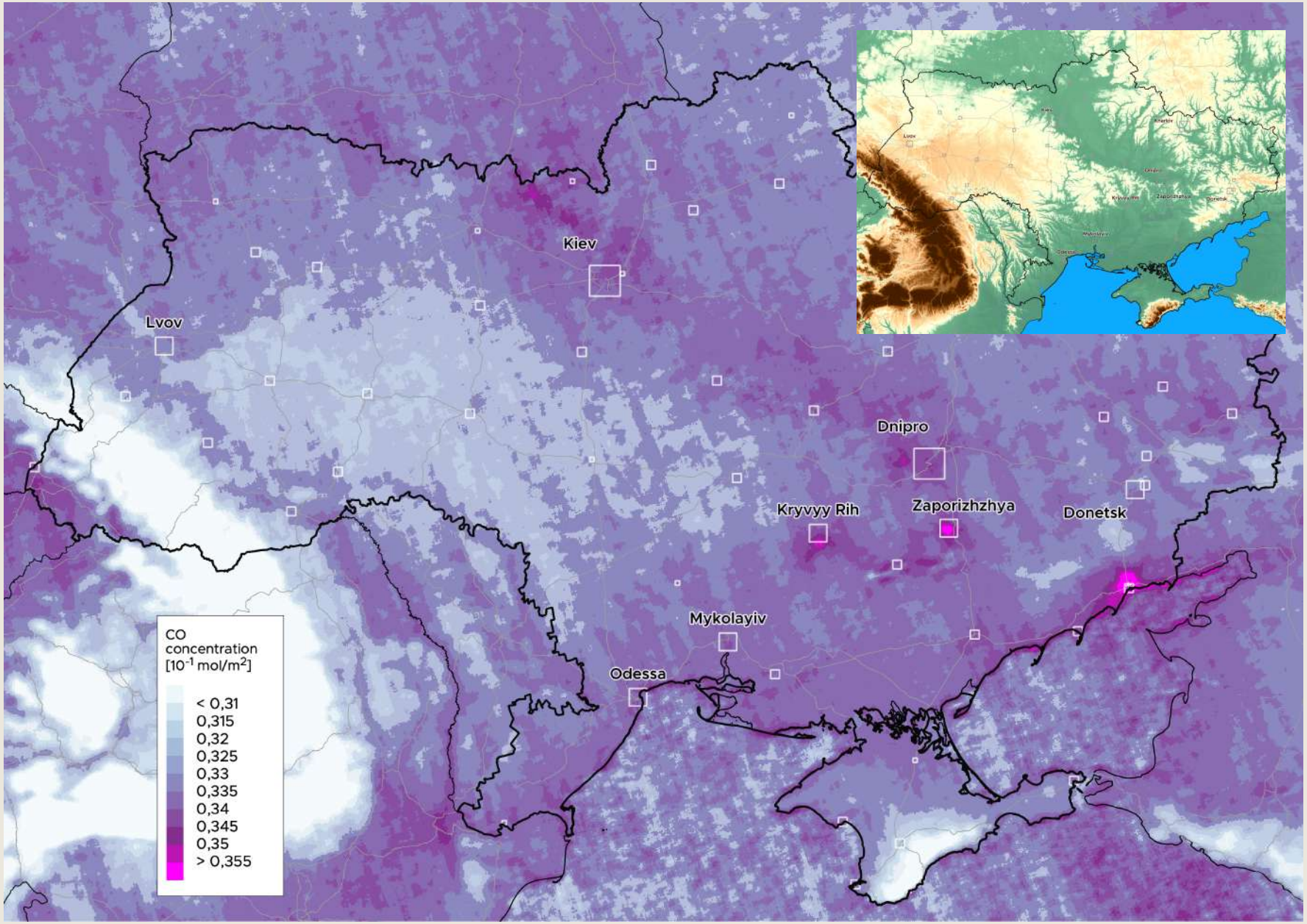


Summer (left), winter (right), bottom AVG

CO

Carbon monoxide

- Correlation between CO and elevation
- Major steel production centers
- Fire around the Chernobyl Nuclear Power Plant (April 2020)

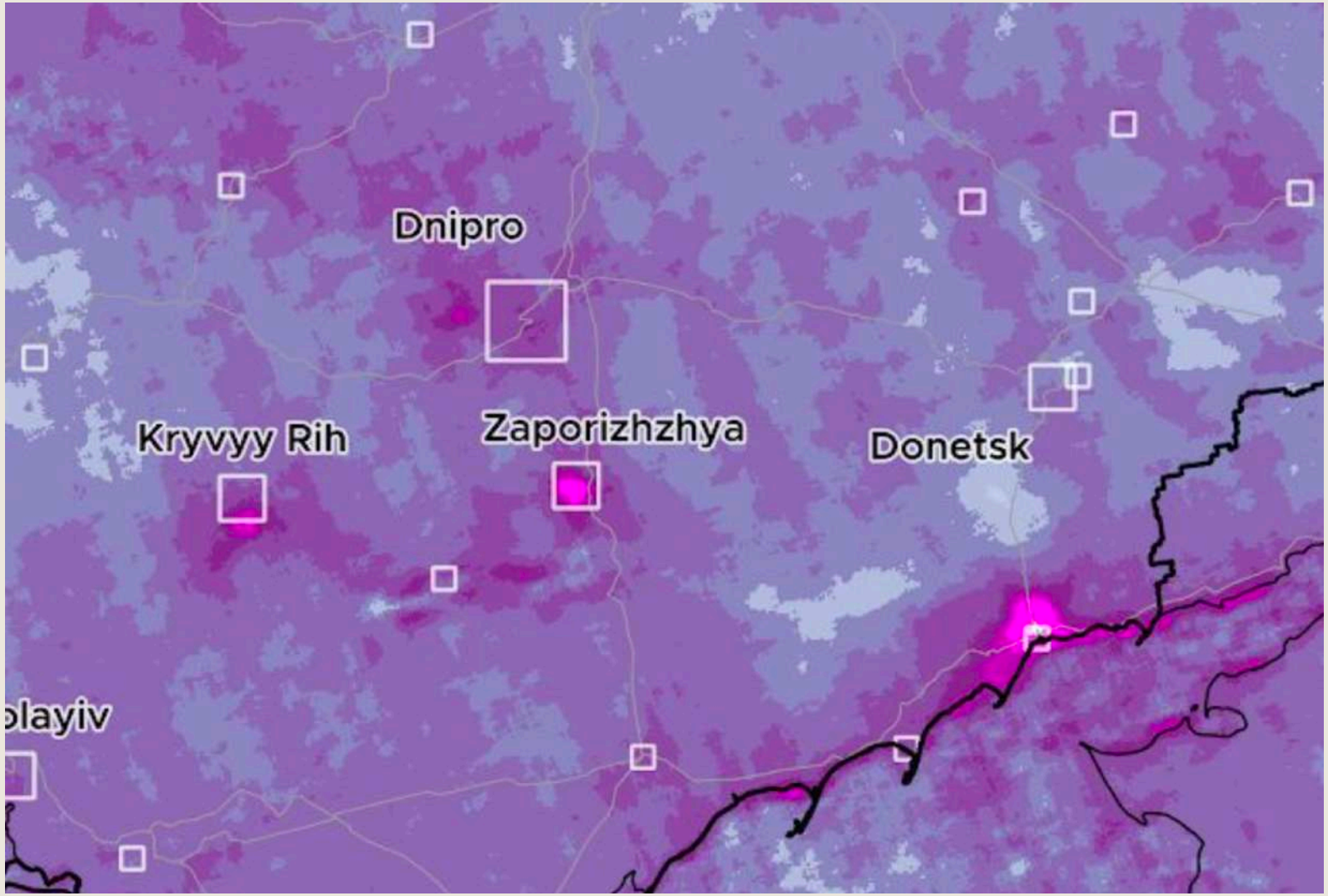


Major steel production centers

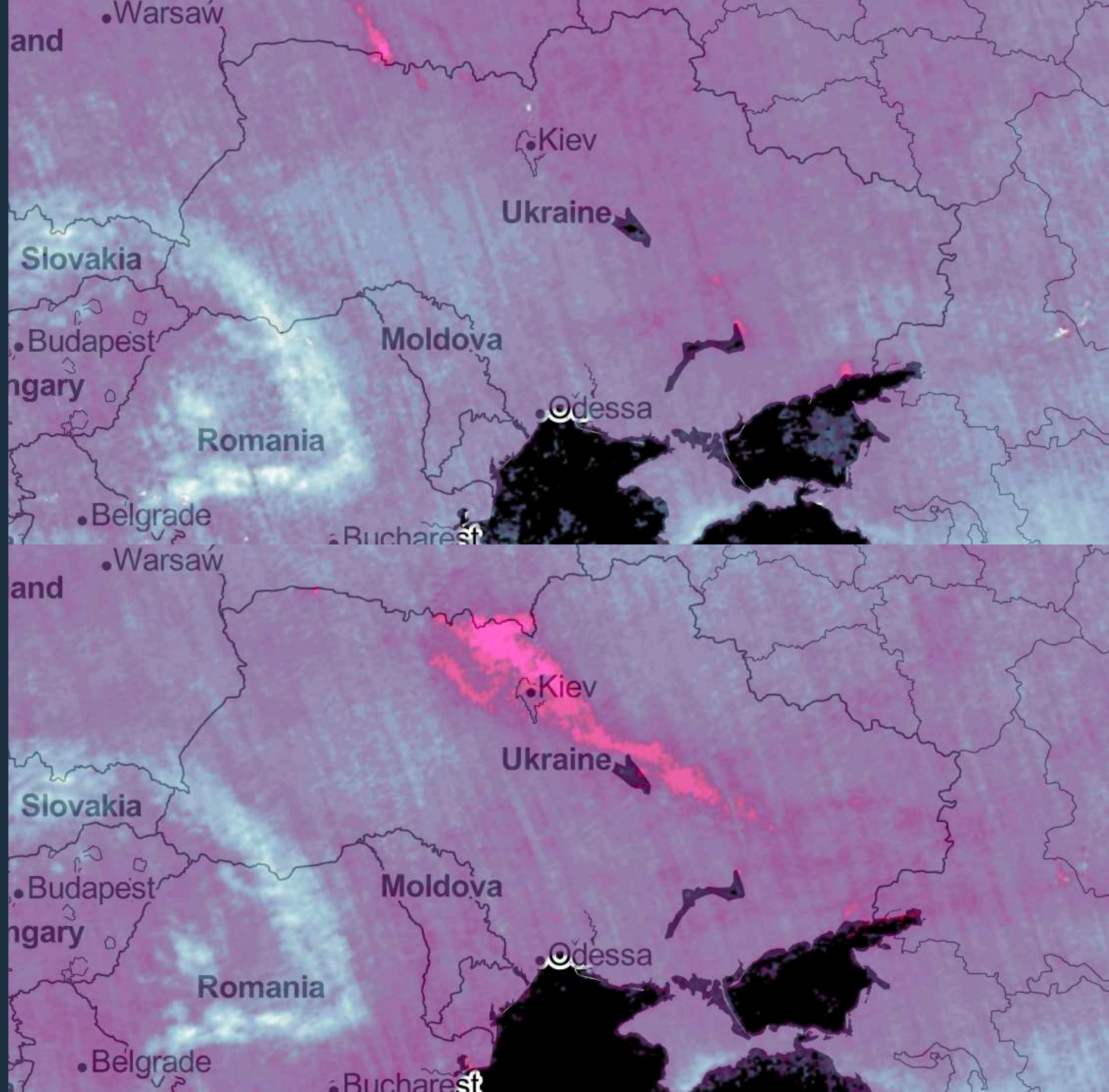
- CO is product of incomplete combustion → steel production

Increses CO concentration

- Mariupol, Zaporizhia, Kryvyi Rih and Kamianske

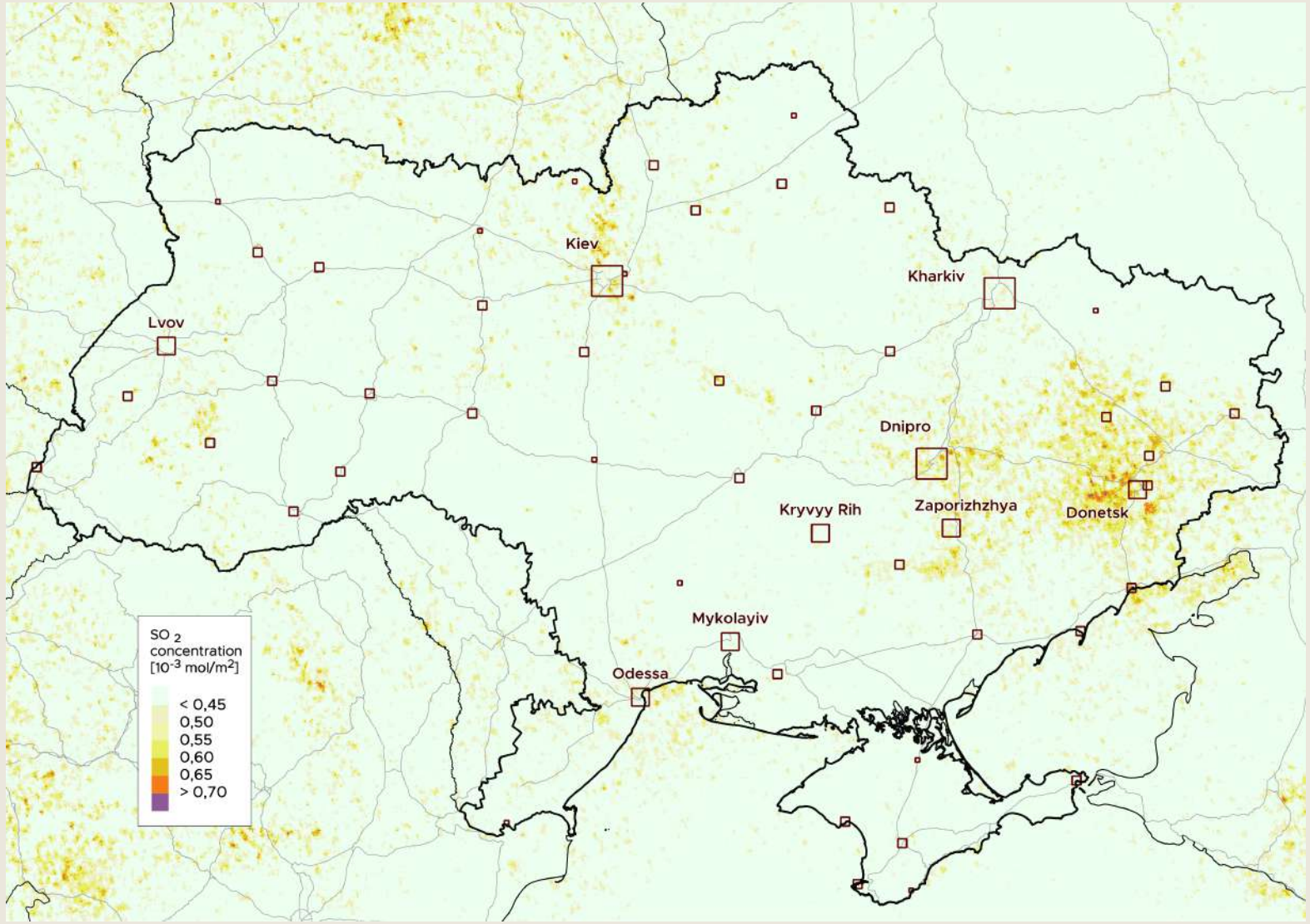


FIRE AROUND THE CHERNOBYL NUCLEAR POWER PLANT (APRIL 2020)



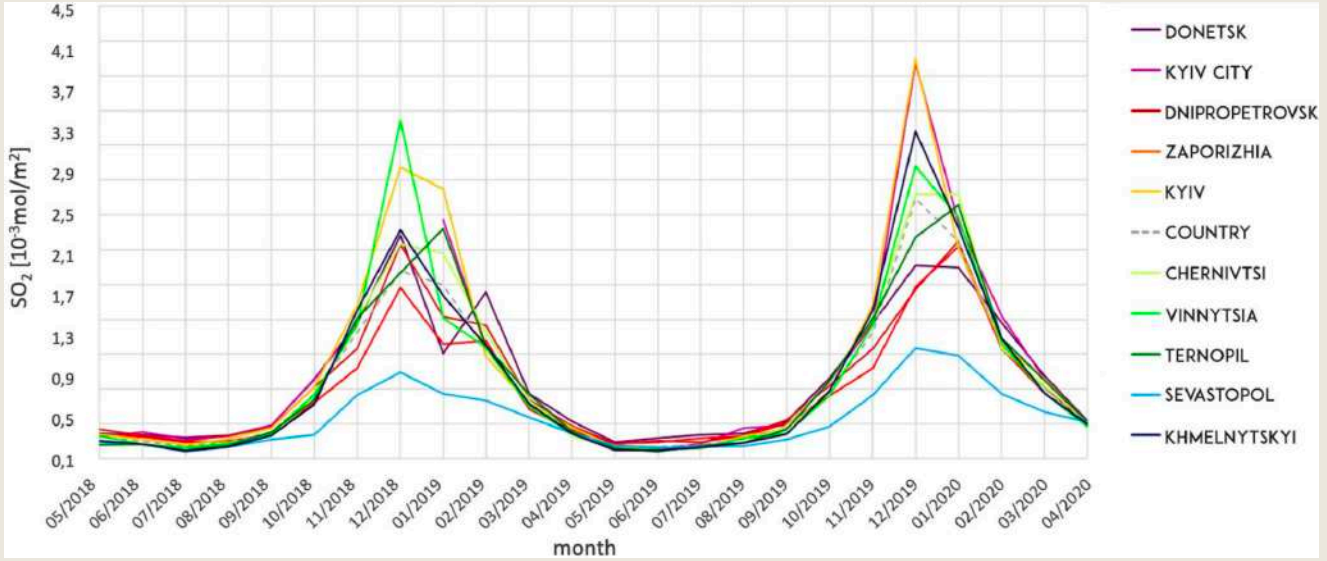
SO_2
Sulfur dioxide

- Small pollution in comparison to the global hotspots
- Anthropogenic SO_2
  - *Technical limits in measurements*
- Higher concentrations are located around urban areas and industrial centres



SO_2 Seasonality

- Strongly peaking between November and January with five times higher values than in summer
- Natural and human factors



HCHO

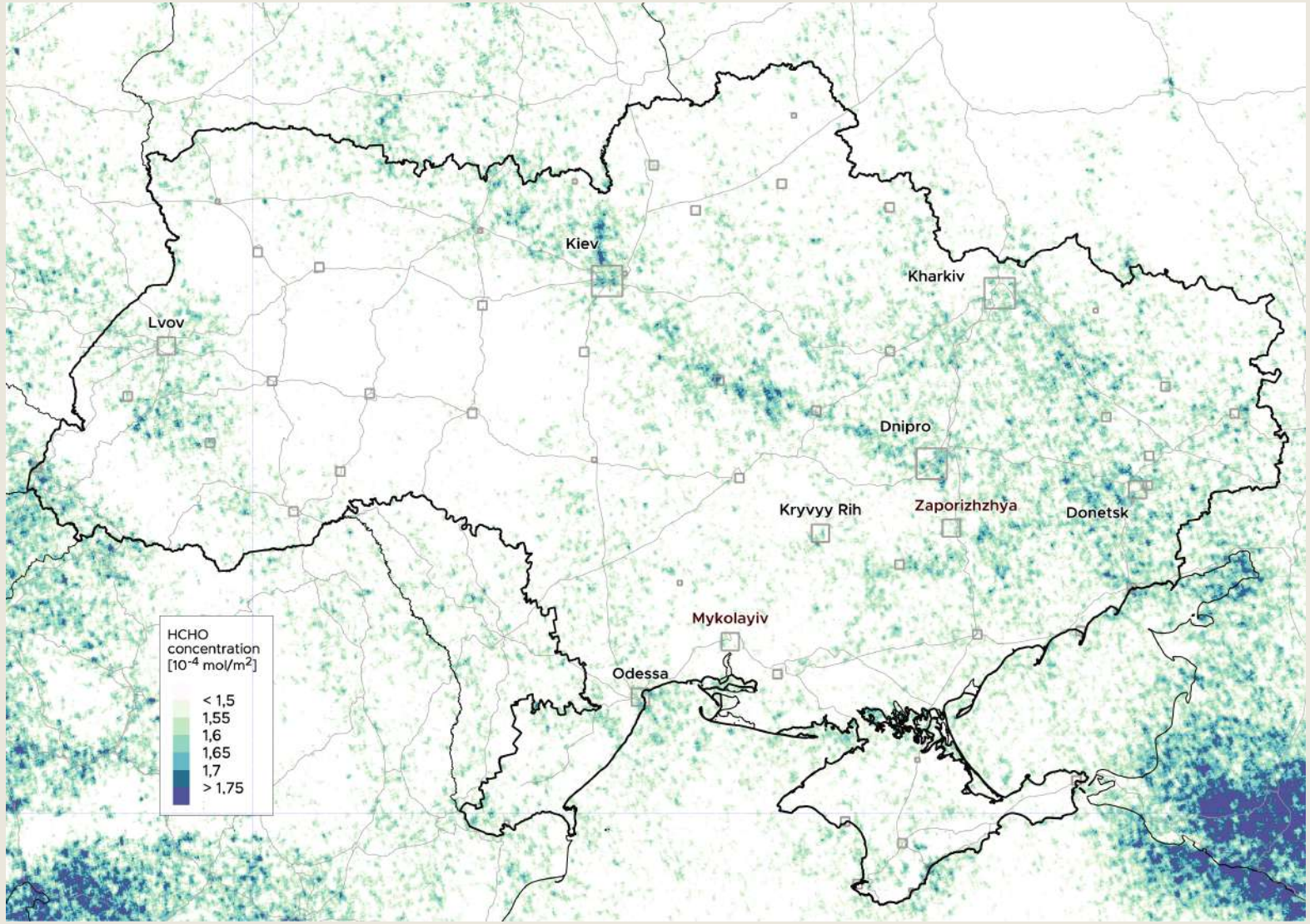
Formaldehyde

- similar throughout the country
- Lifetime in the atmosphere

is only a few hours

- Major part – natural sources
- Industrial and petrochemical

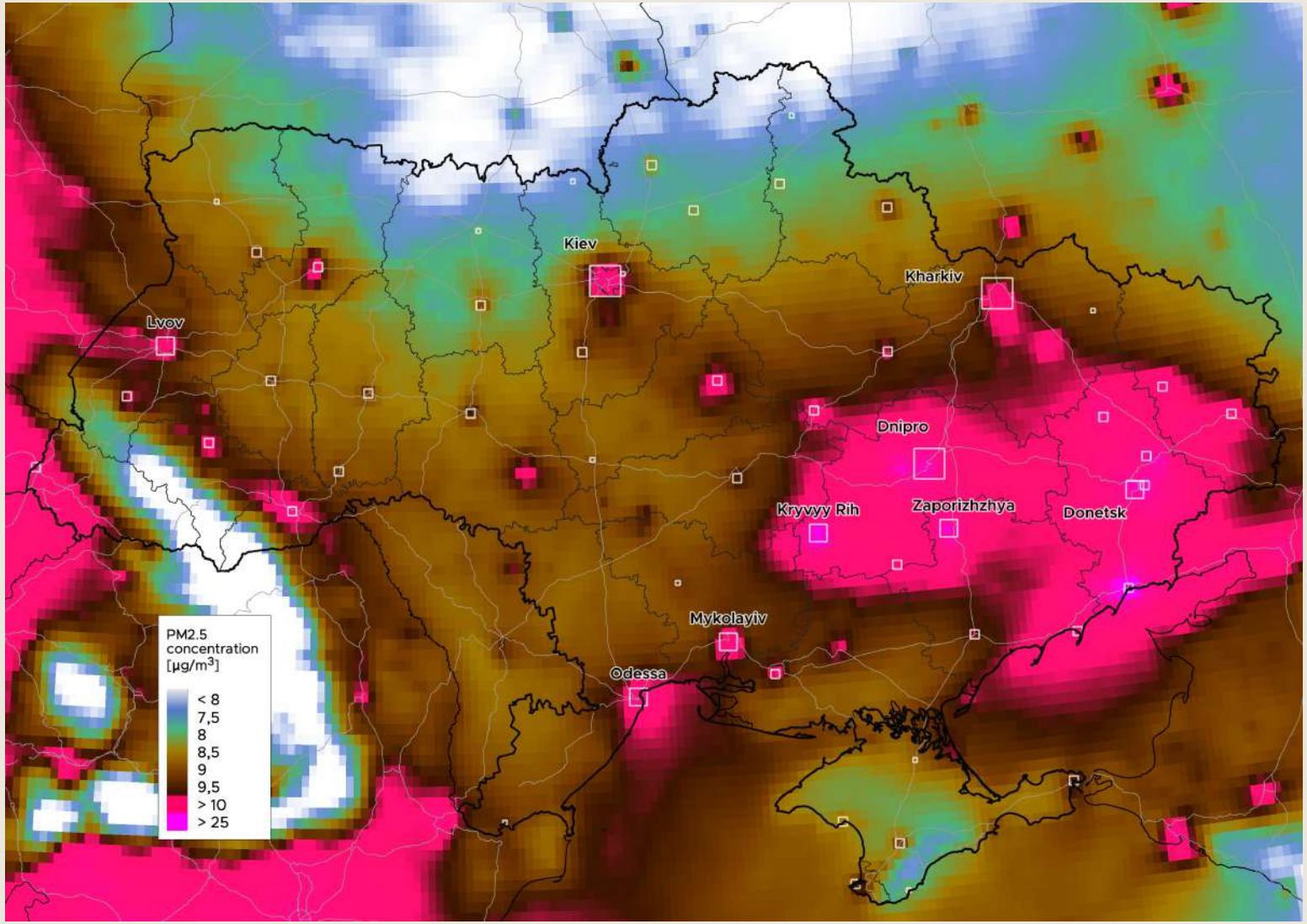
industrial sources



$PM_{2.5}$

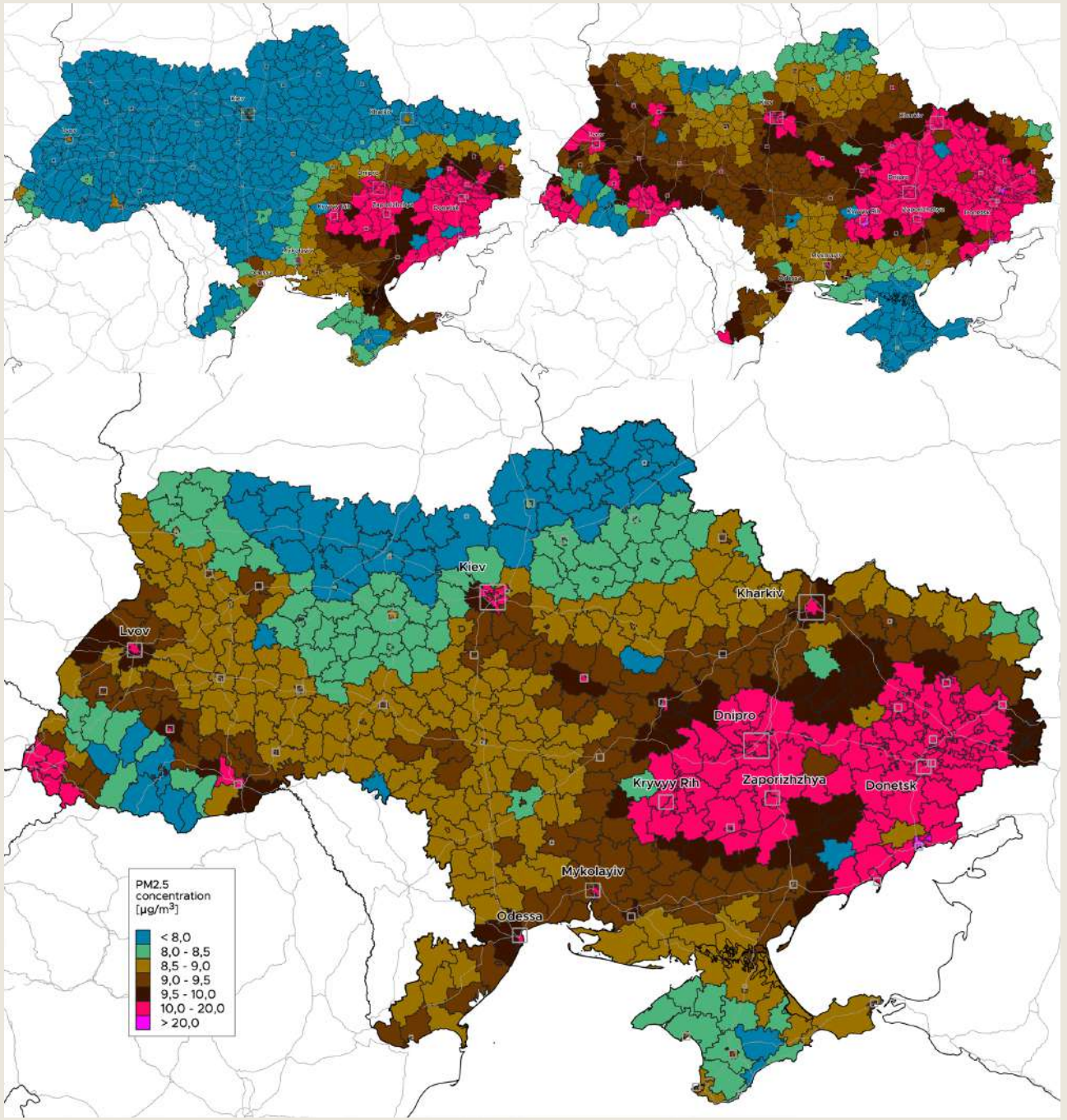
- AVG concentartion of PM 2.5 exceeds WHO limits in 127 districts

- Most effected Donetsk and Dnipropetrovsk, Kyiv (city) regions



$PM_{2.5}$ Seasonality

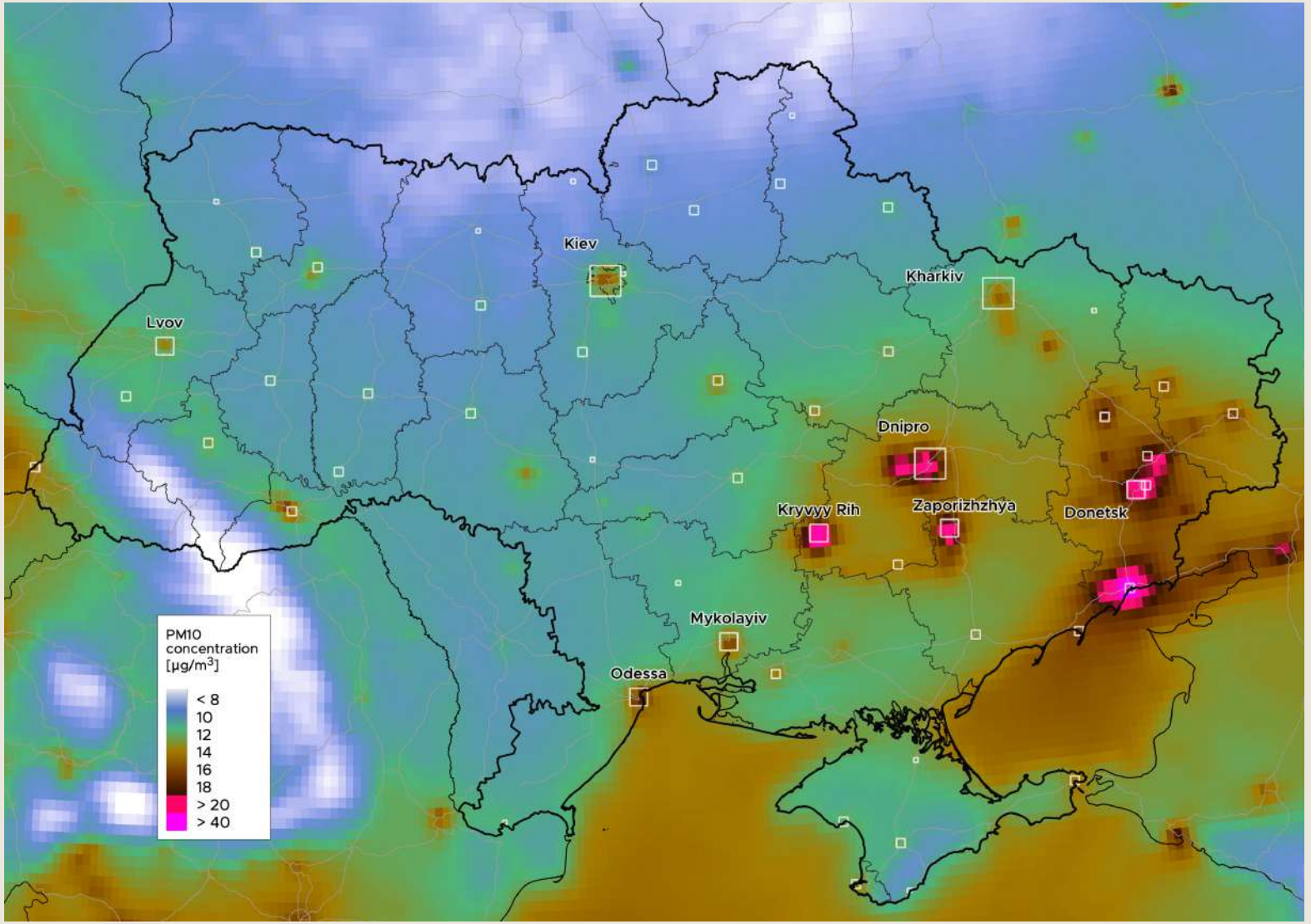
- Decreases in most of the regions during the summer season
  - *Only industrial districts*
- Significant increase in the winter
- AVG - decreases from south to north of the country



Summer (left), winter (right), bottom AVG

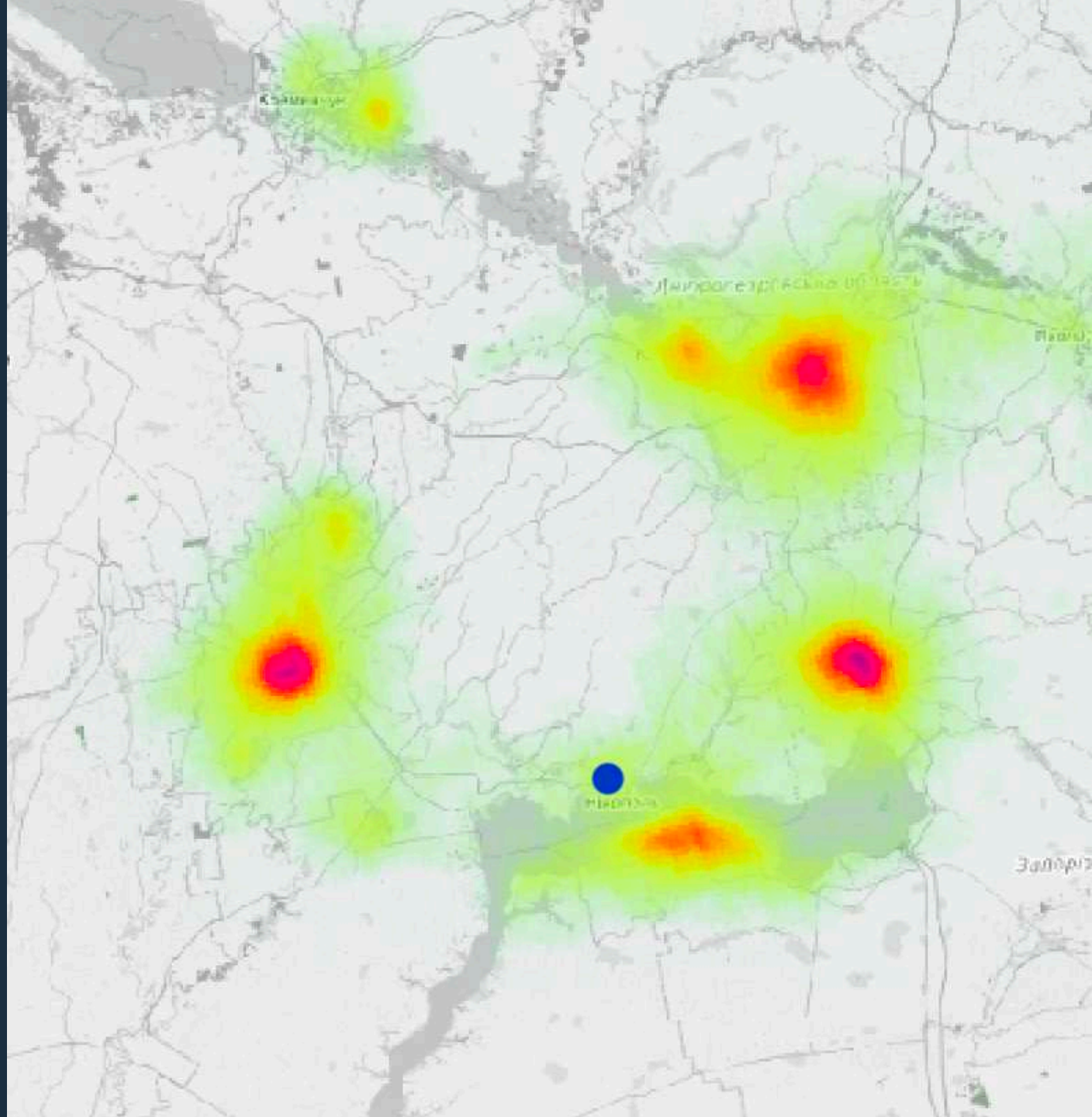
PM_{10}

- AVG concentartion of PM10 exceeds WHO limits in 5 cities
  - ***Mariupol****, Kryvyi Rih, Dnipro, Zaporizhia and Donetsk*
- Black sea – natural source
- The country average reached the WHO PM10 limit in September 2018 and March 2020



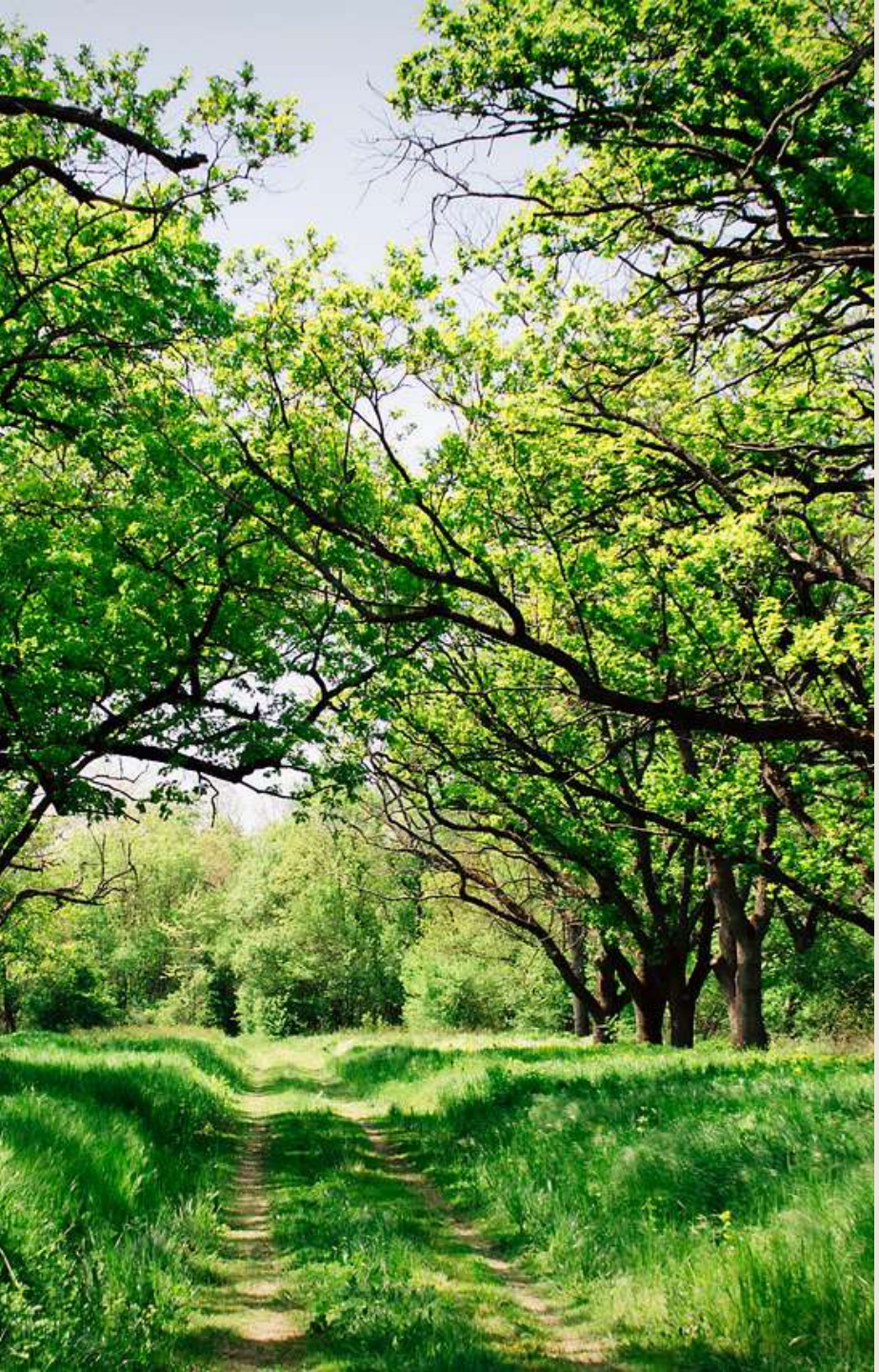
Nikopol surroundings NO_2

- Nuclear and coal power plants in Enerhodar
- Industrial cities Zaporizhia and Kryvyi Rih



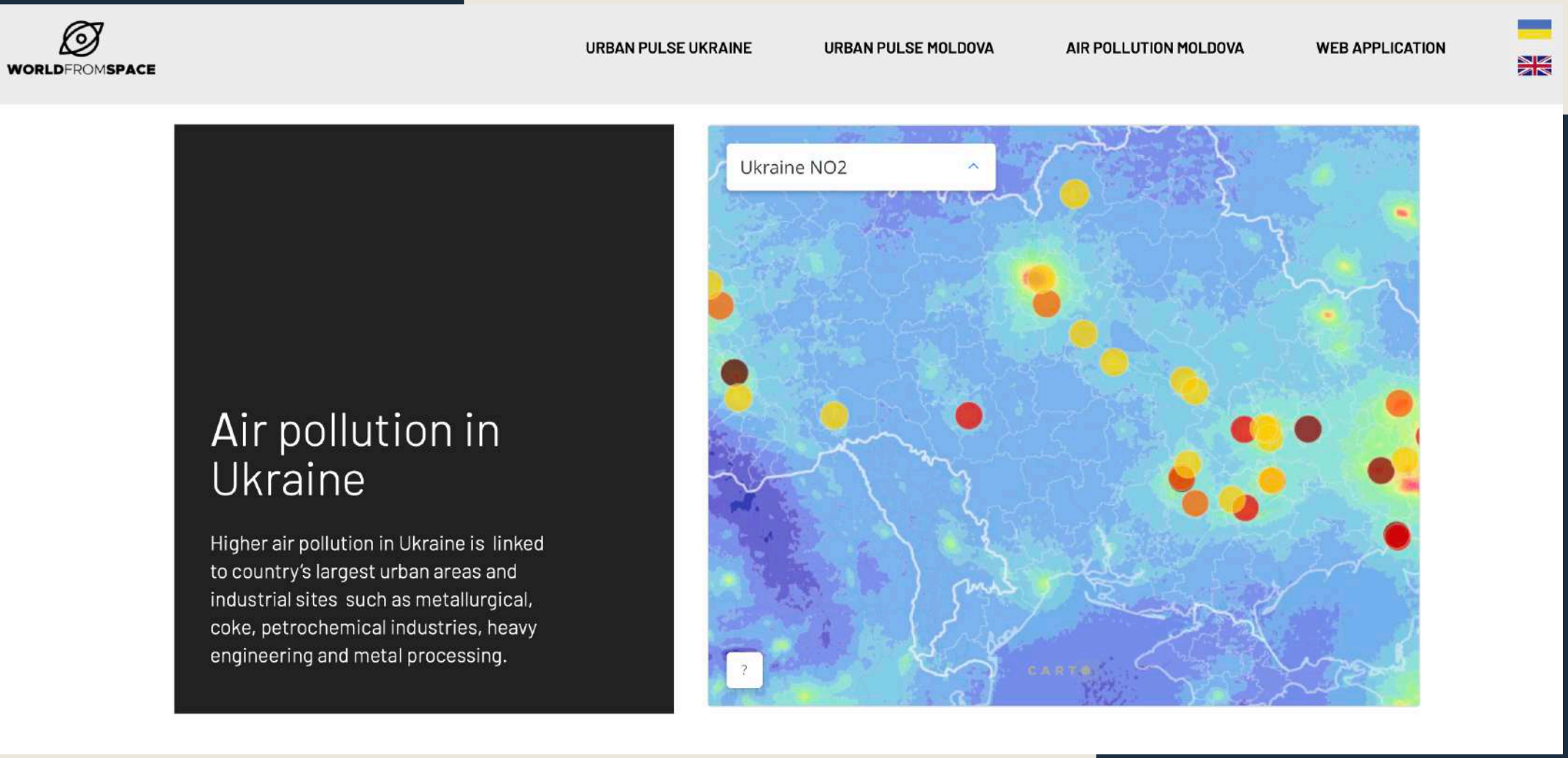
Conclusion

- Current air quality situation is diverse in Ukraine
- It reflects the distribution of main urban and industrial centers.
- Dnipropetrovsk, Donetsk, Kyiv, Luhansk, and Zaporizhia regions are most seriously affected by air pollution.
- From a city perspective it is Dnipro, Donetsk, Kryvyi Rih, Kyiv, Mariupol, and Zaporizhia.



Recommendations

- Monitoring
- Emissions inventories
- Management Change
- Public involvement



http://stories.worldfrom.space/poluters_ua/

Thank you for your attention!

Jan Labohy
labohy@worldfrom.space

Simona Bockova
simona@worldfrom.space

World from Space
www.worldfrom.space

Arnika
Delnicka 13, 170 000 Prague 7, Czechia

More details:

www.cleanair.org.ua

ARNIKA

ЧИСТЕ ПОВІТРЯ ДЛЯ УКРАЇНИ

WORLD FROM SPACE

NED National Endowment for Democracy
Supporting freedom around the world

TRANSITION
Ministry of Foreign Affairs of the Czech Republic