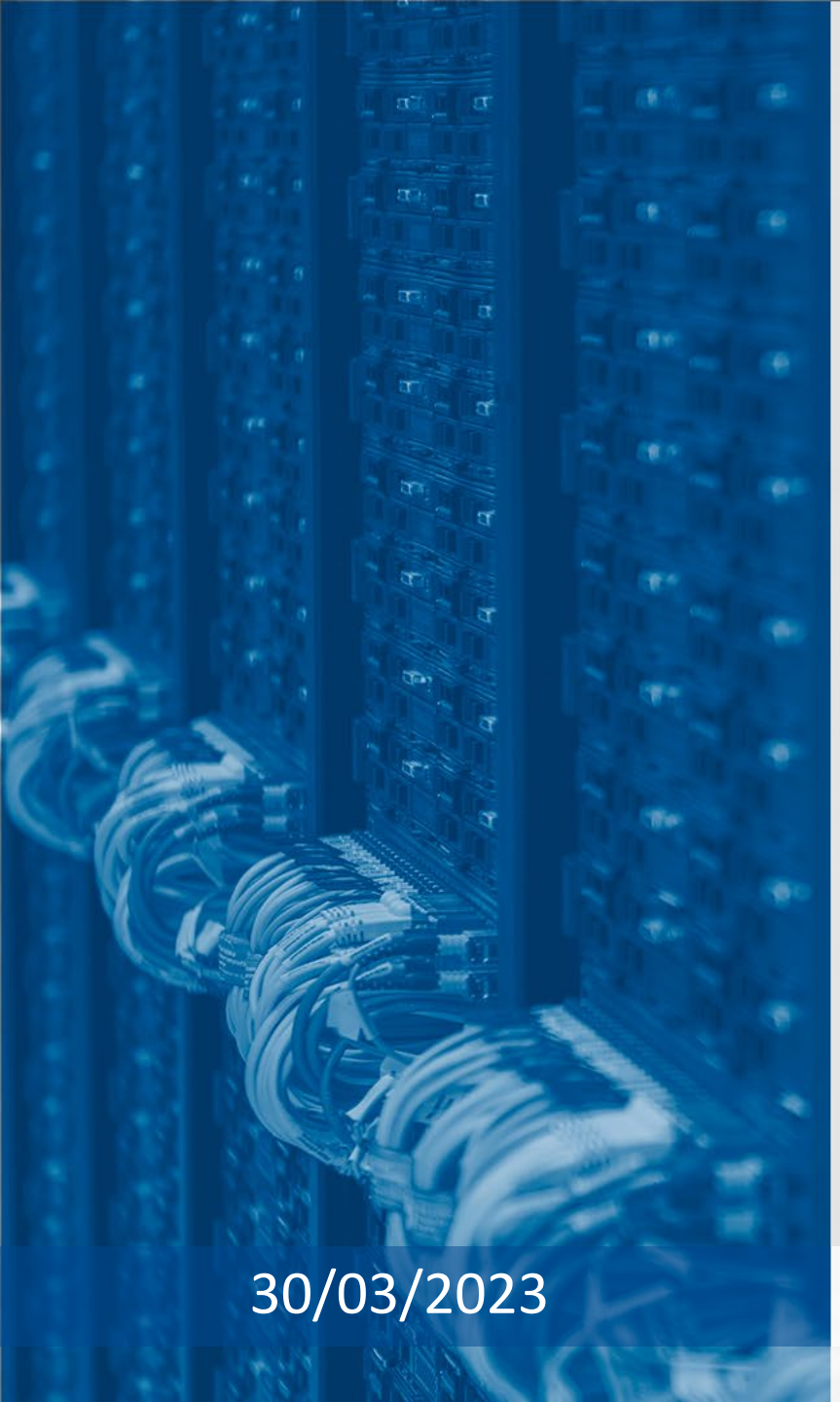

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Lessons learnt from Catalonian emissions in cooperation with SEEDS

Marc Guevara

with contributions from B. Mijling, R. van der A and J. Ding from KNMI

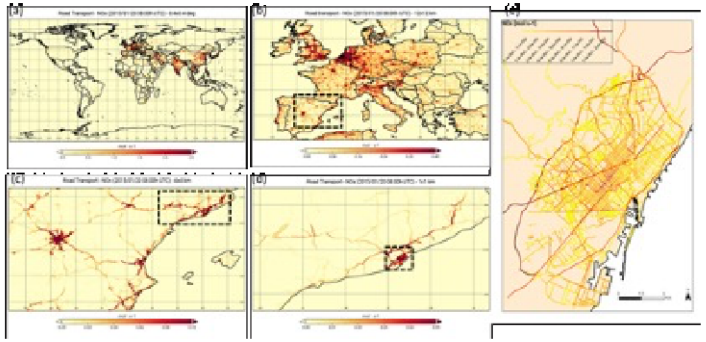
30/03/2023

SEEDS General Assembly and Stakeholder Engagement meeting

Air quality @BSC: Model and tool developments

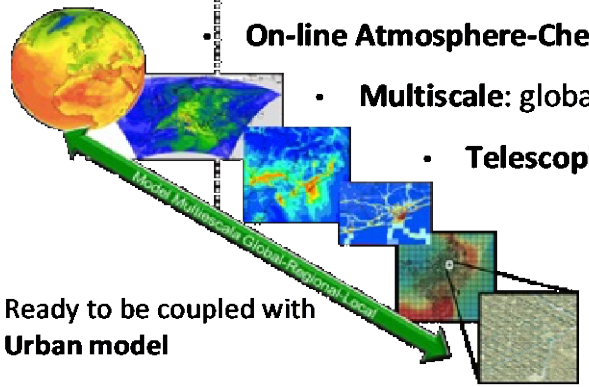
HERMESv3

A **python-based, open source, parallel and multiscale** emission model



MONARCH

- **On-line Atmosphere-Chemistry coupling**
- **Multiscale**: global to local (1km)
- **Telescoping nesting**

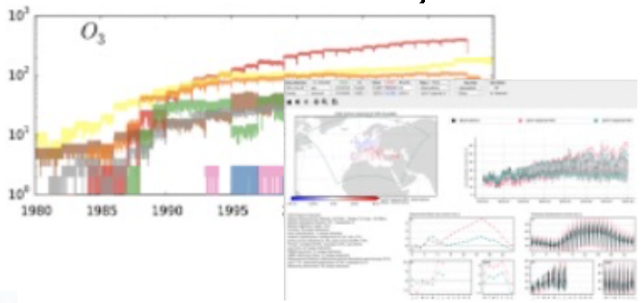


Ready to be coupled with **Urban model**

*Contributes to the **Copernicus CAMS regional production chain***

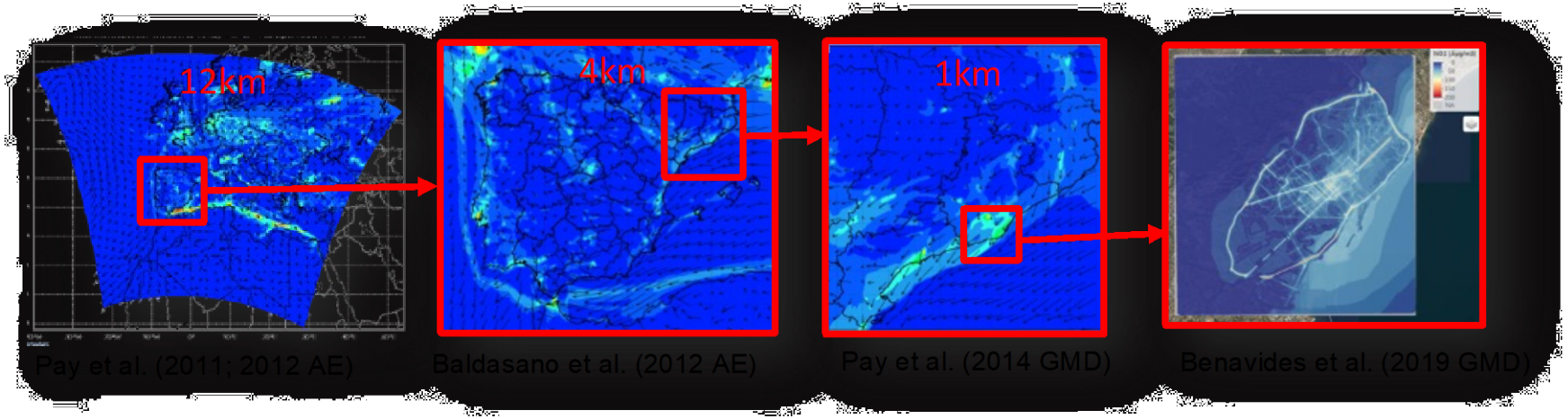
GHOST/Providentia

Harmonised treatment of observations and **dynamic/flexible evaluation** system



CALIOPE air quality forecasting system

Provides air quality forecast for Spain, hot spot areas at 1km and urban areas with CALIOPE urban model (*www.bsc.es/caliope*)



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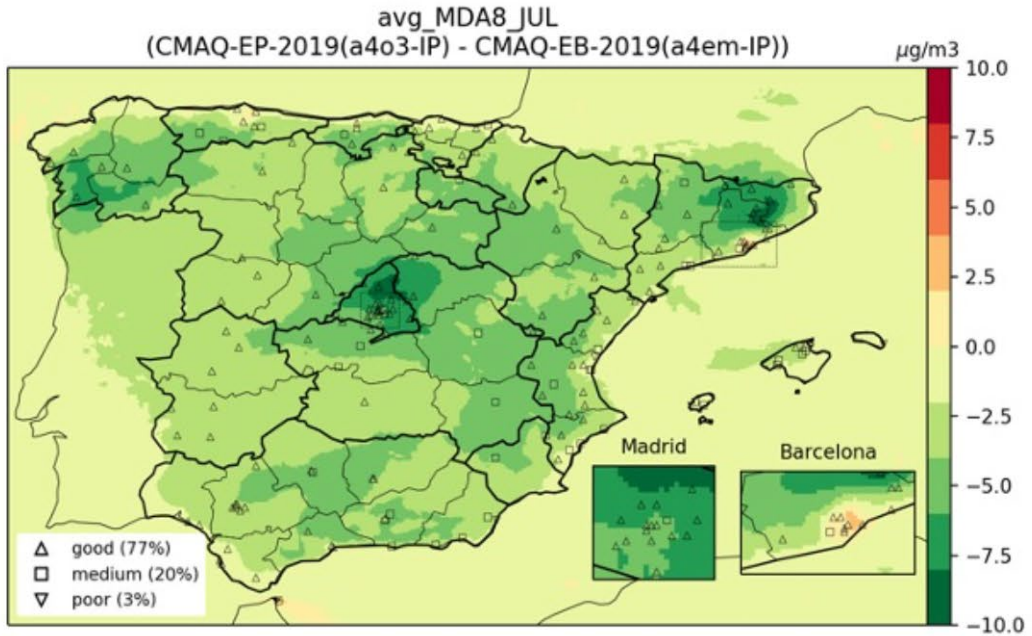
Impact assessment

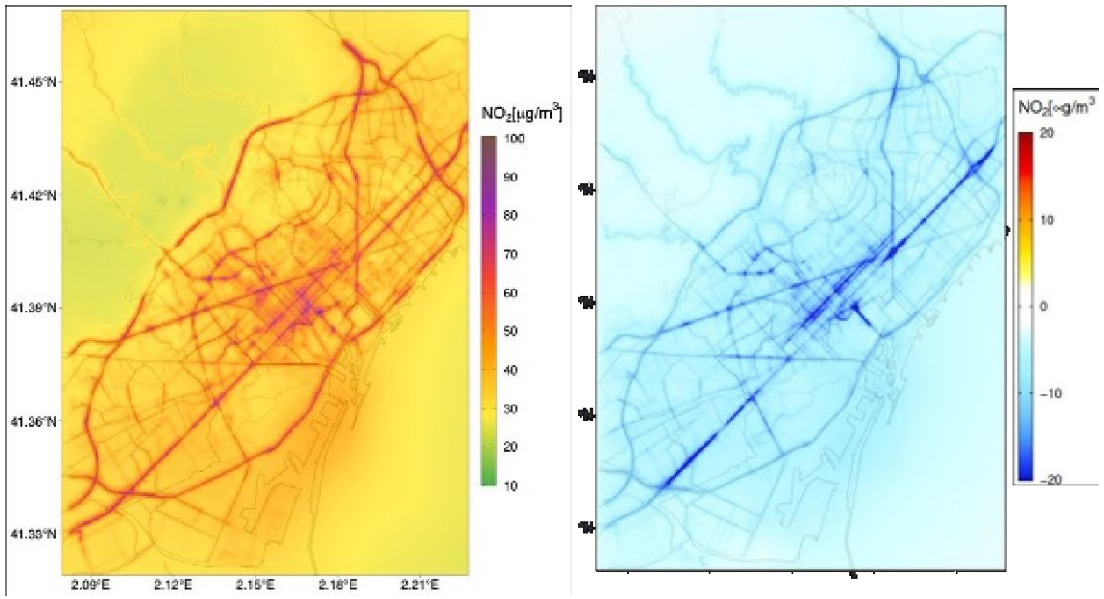
National O3 plan

Establishing the scientific basis for the development of a national plan to tackle the O3 problem in Spain



VITALISE

Assess the impact of traffic management strategies on urban air quality and public health in Barcelona



in collaboration with ISGlobal Instituto de Salud Global Barcelona

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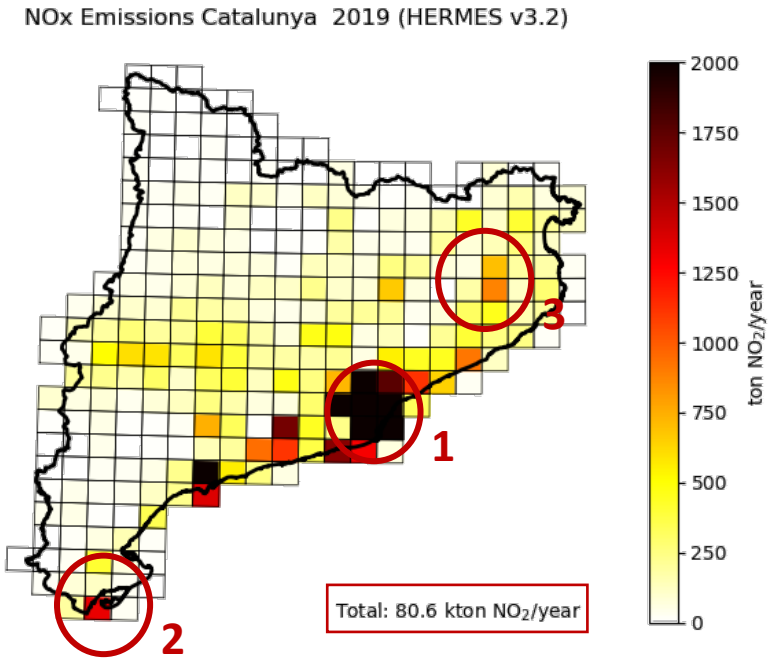
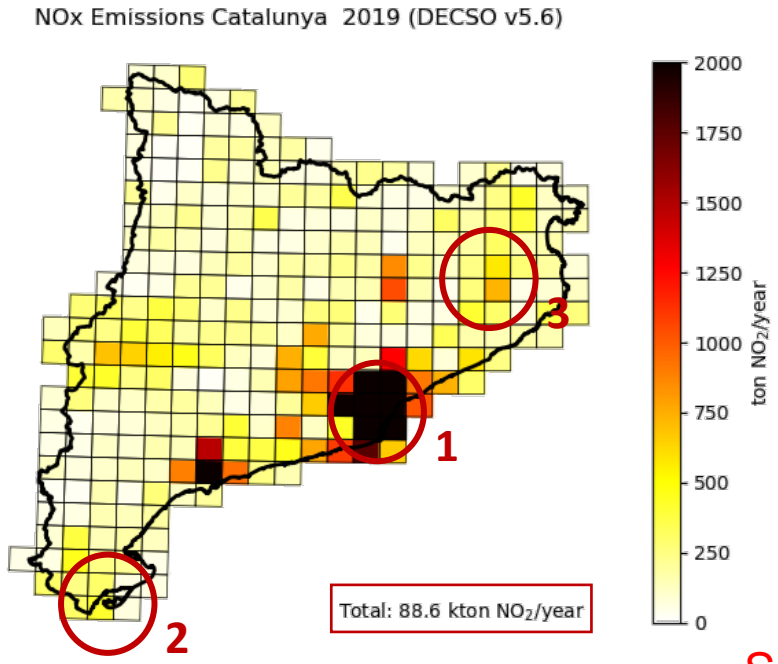
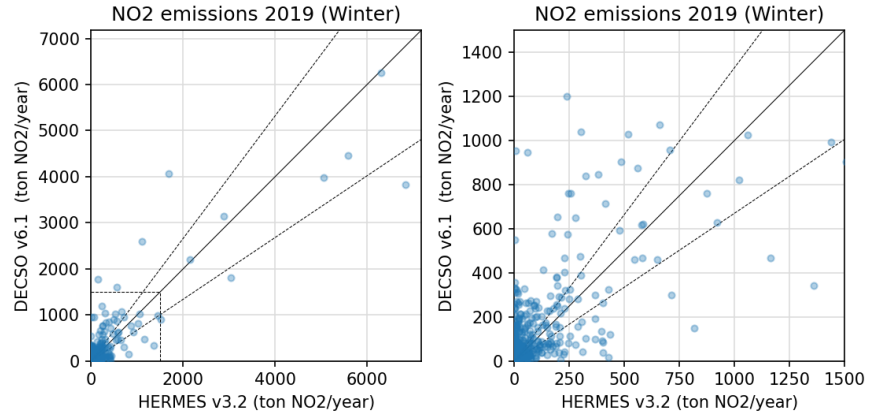
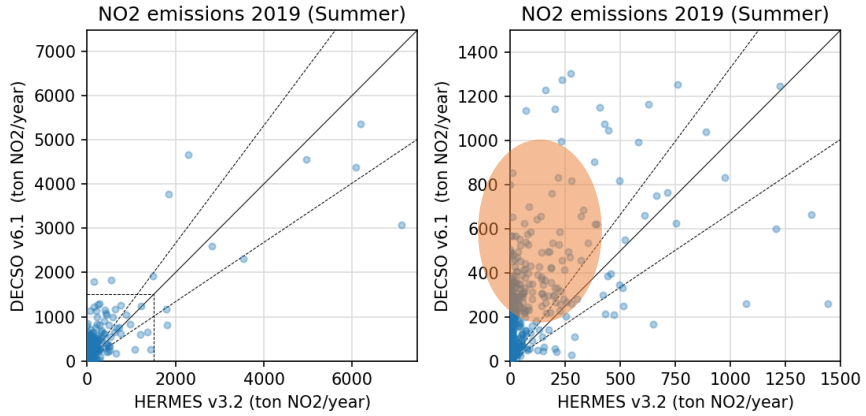
HERMESv3 versus DECSO





Soil NOx emissions





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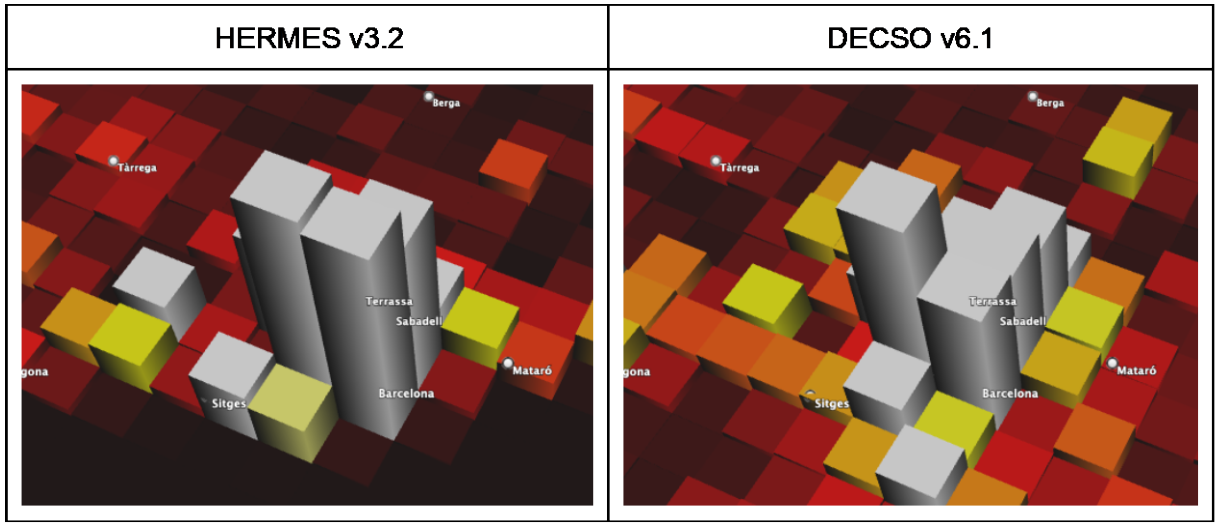
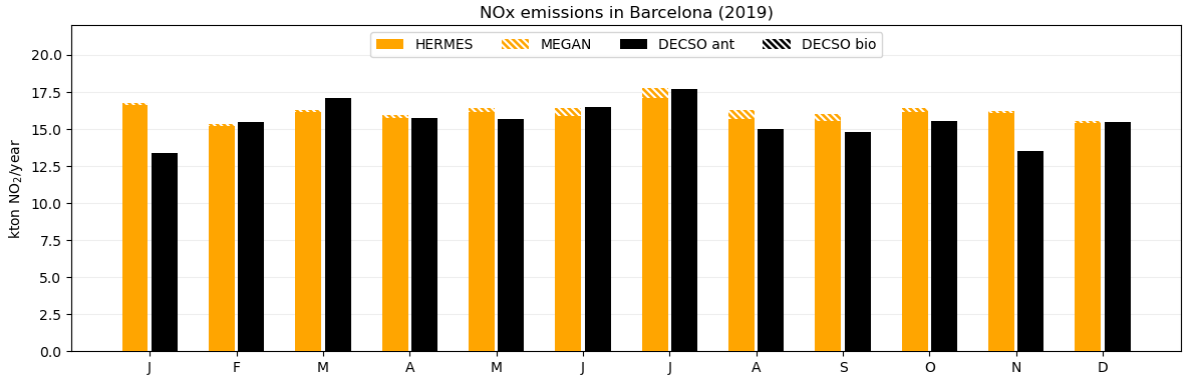
Barcelona area

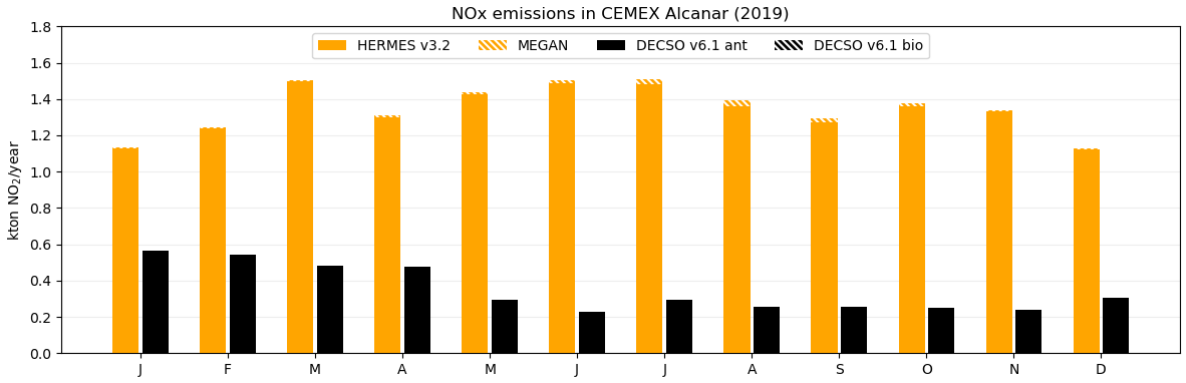




- 27.3 kton NO2/year according to HERMES, which is about 34% of the total emissions found in Catalunya.
- DECSO estimates slightly less NOx emissions for this area: 26.1 kton NO2/year.
- Although differently distributed over the grid cells, the aggregated emissions are well in line.
- No strong seasonalities identified neither in HERMES nor DECSO

Industrial hotspot in Alcanar

HERMES v3.2	DECSO v6.1
	



- A strong registered point source in HERMES (**1.33 kton NO2/year**) → emissions derived from the Large Point Source Database provided by the Spanish Ministry of Environment
- The DECSO estimation, however, is 74% lower: **0.35 kton NO2/year**
- Results from the Continuos Emission Monitoring System provided by the Government of Catalonia indicate emissions of **1.1kton NO2/year**
- The large disagreement is not well understood, and subject of further investigation (factory hotspot hardly visible in the level-2 TROPOMI satellite product, errors in the assumed surface albedoe?)

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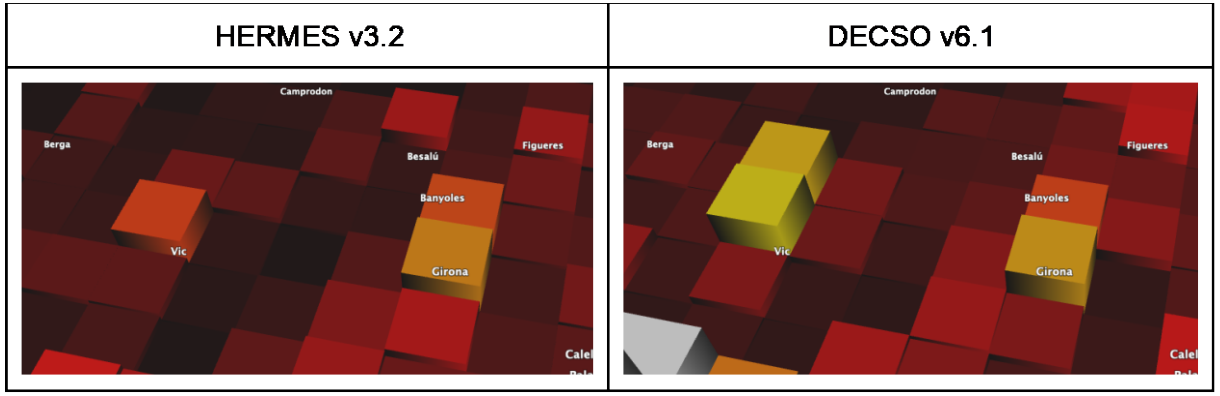
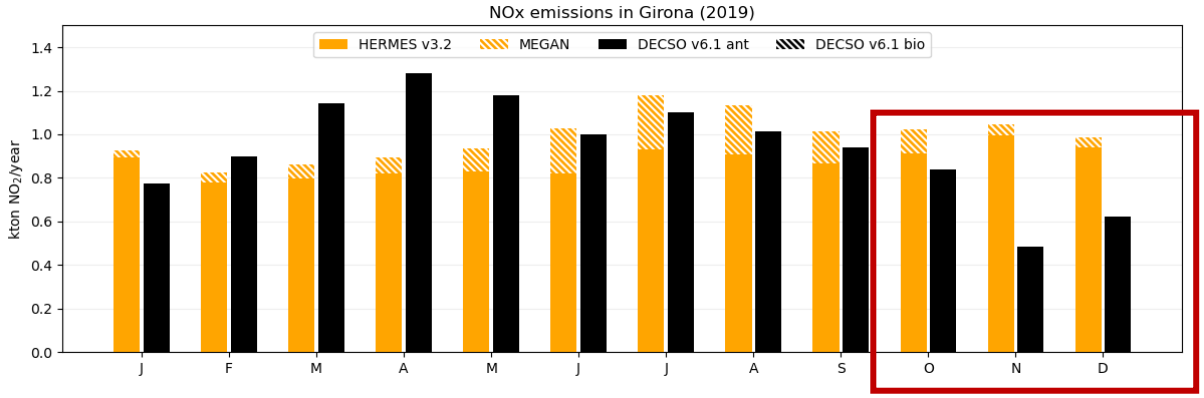
Girona area





- Results in total annual emissions agree very well, with HERMES having slightly stronger emissions.
- Important differences in the seasonal cycle: DECSO shows a continuous decrease during OND, while HERMES mantains almost constant emissions
- Influence of emissions from agricultural machinery and associated crop calendar considered in HERMES

Crop type	Soil cultivation	
	Start_date	End_date
Wheat	1st November	31st December
Rye	1st September	31st October
Barley	1st November	31st December
Oat	1st October	31st November

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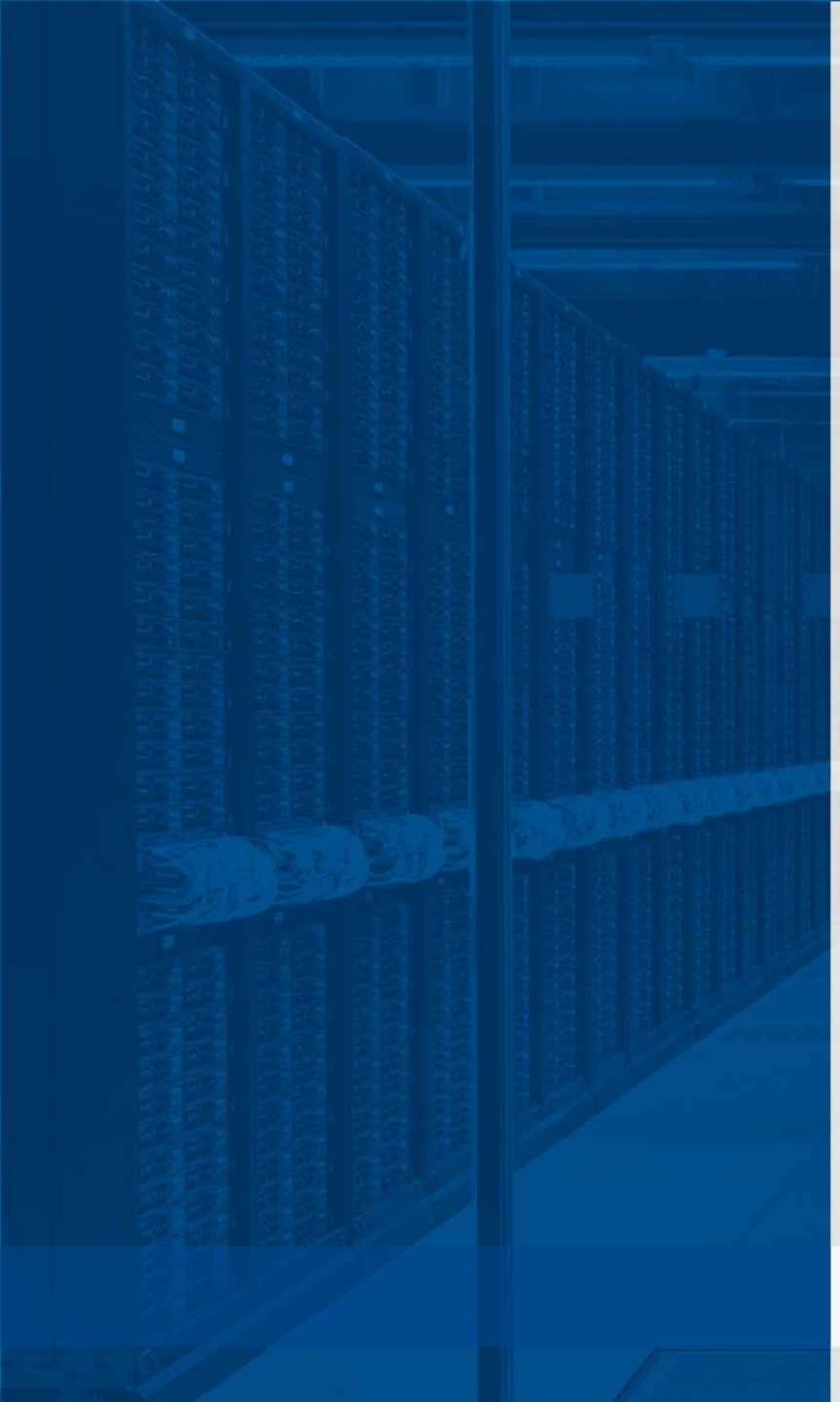
Take home messages

- Both the “bottom-up community” can learn from the top-down results, and the “top-down community” can learn from the bottom-up results
- HERMES and DECSO compare reasonably well, especially looking at yearly totals and main urban hotspot (Barcelona urban area)
- DECSO highlights important role of biogenic NOx emission (specially in summer)
- The industrial facility in Alcanar, which appears a strong hotspot in HERMES, is largely unnoticed by DECSO (need further investigation)
- Comparison of seasonalities highlights the need to review assumptions for seasonal distribution of agricultural machinery emissions in HERMESv3



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Thank you!

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