



SEEDS
Sentinel EO-based Emission
and Deposition Service

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SEEDS soil NO_x emissions

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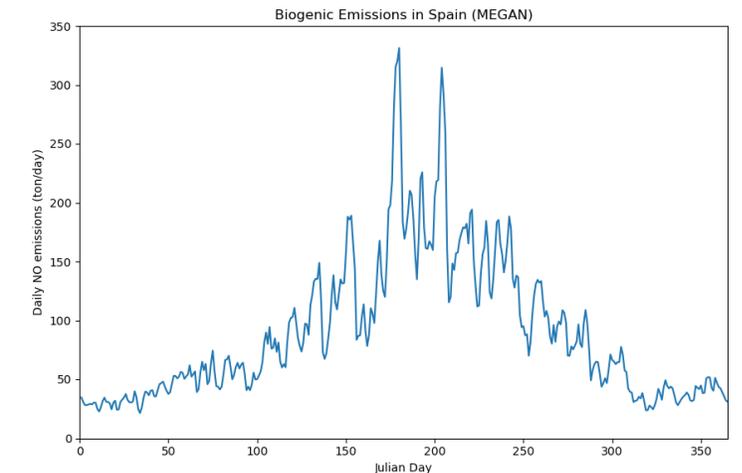
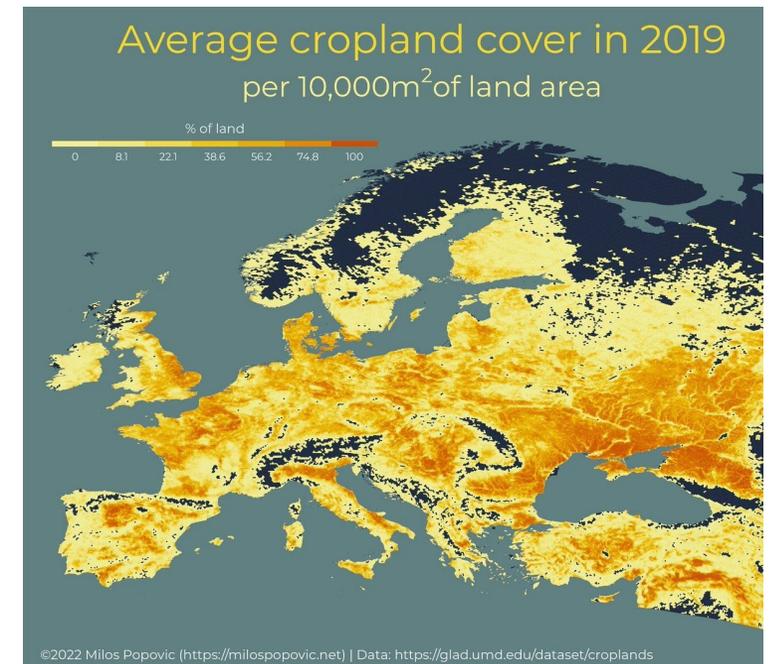


- Method for split-up of biogenic and anthropogenic emissions
- Results for Spain and Europe
- Validation
- Conclusions



Introduction – biogenic emissions

- Soil emissions come from bacterial activity in the soil.
- Emissions are from cropland, grassland, and forest, thus almost every grid cell contain biogenic emissions.
- Fertilizer use enhances the emissions.
- Emissions have a strong temperature (and rainfall) dependence, which show up in the seasonal cycle.
- Satellites see only total emissions, thus a post-processing is applied based on the seasonal cycle and land-use information



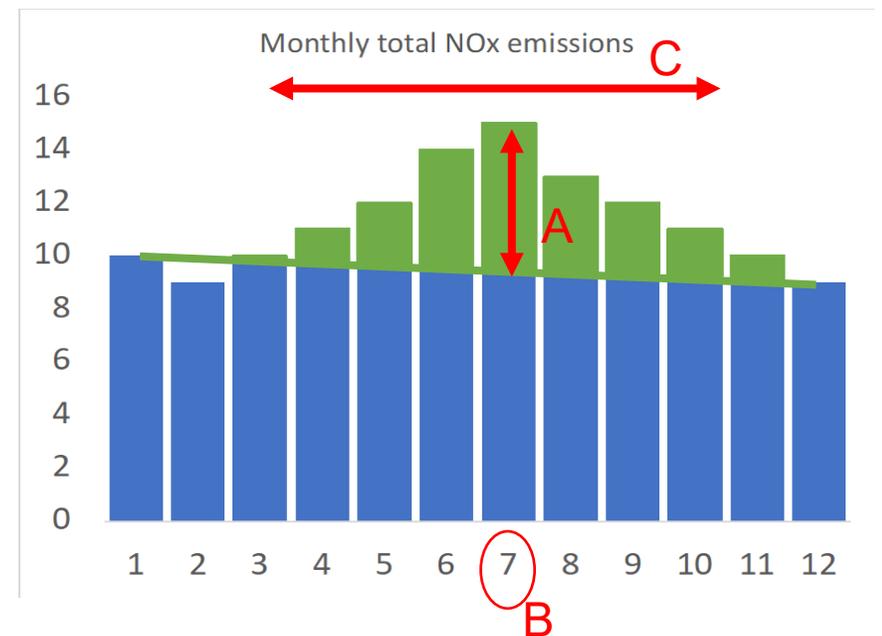
Method

Per region and land use type (crop, grass, shrub or forest):

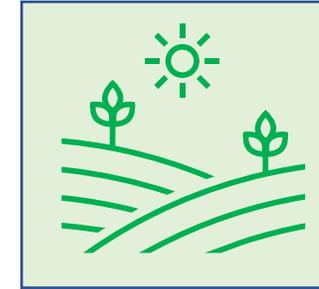
- Use land-use to select pixels without urban land and covered almost completely by e.g. cropland. Find parameters:
 - Determine the average B and C
 - Estimate a maximum A_{max} per land-type
- Per pixel fit A with boundary conditions:
 - Not above maximum A_{max} weighted with land-use
 - No monthly NOx can be higher than total NOx
- Land use type from Land Cover data from the Copernicus Global Land Service.

$$f(t) = A e^{\frac{-(t-B)^2}{2C^2}}$$

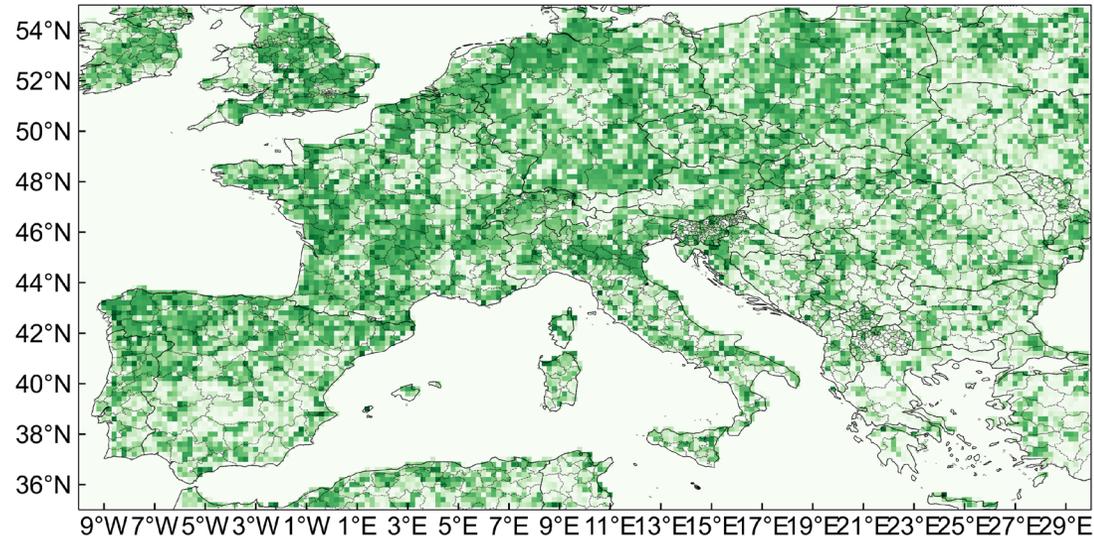
A, B, C?



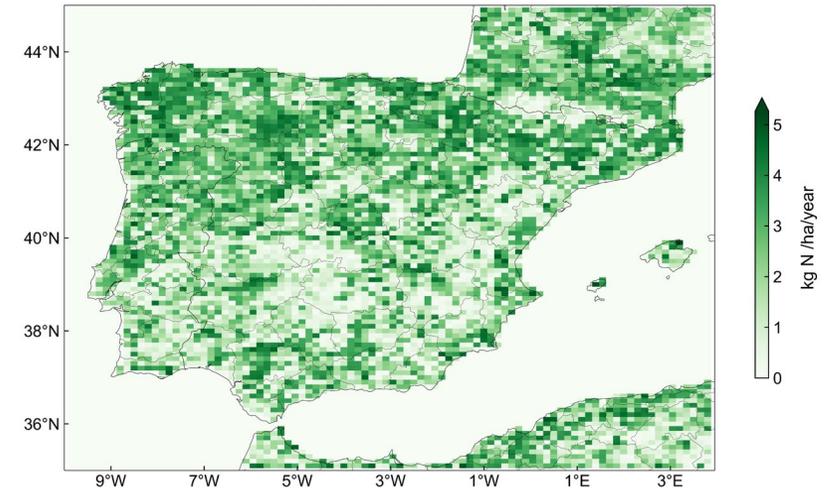
Results biogenic NOx



DECSO bio summer 2019

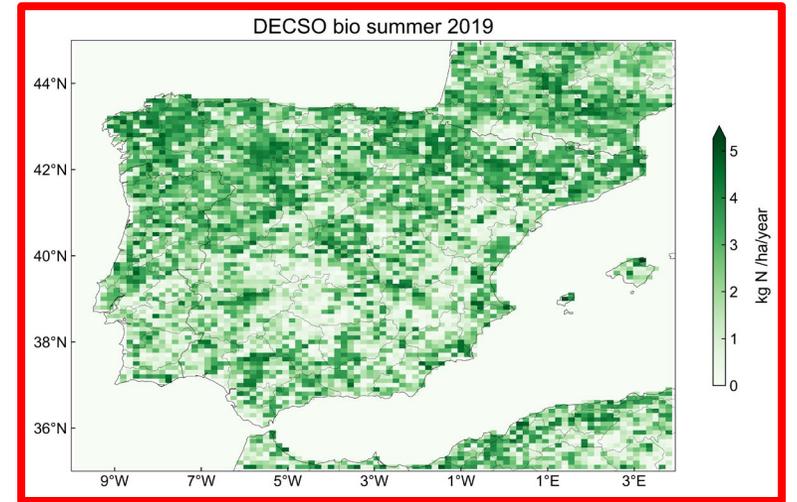
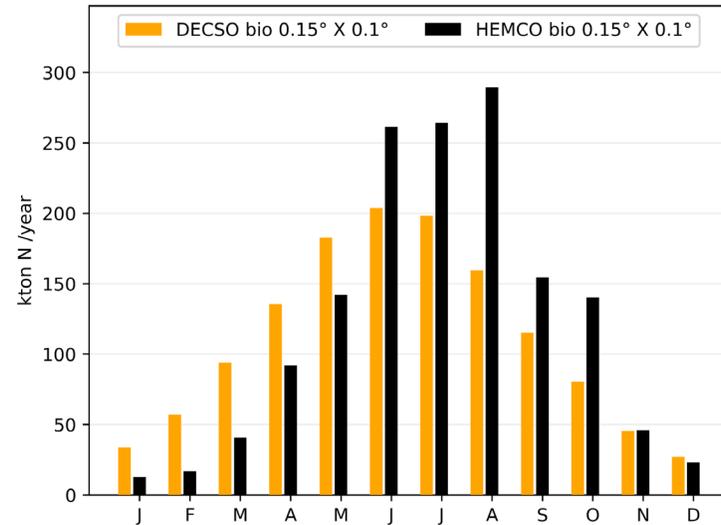
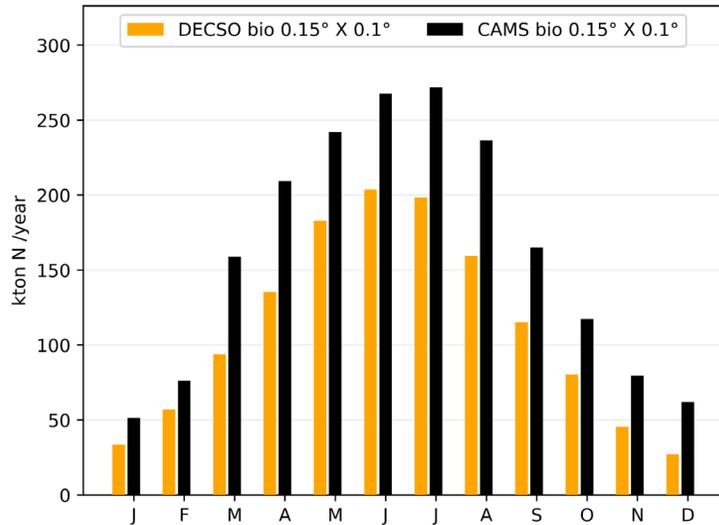


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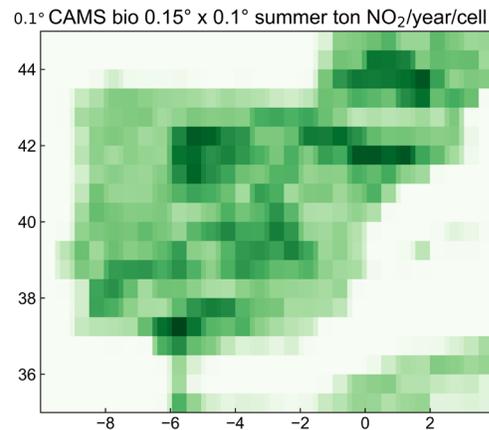


Comparison calculated soil emissions to other soil inventories

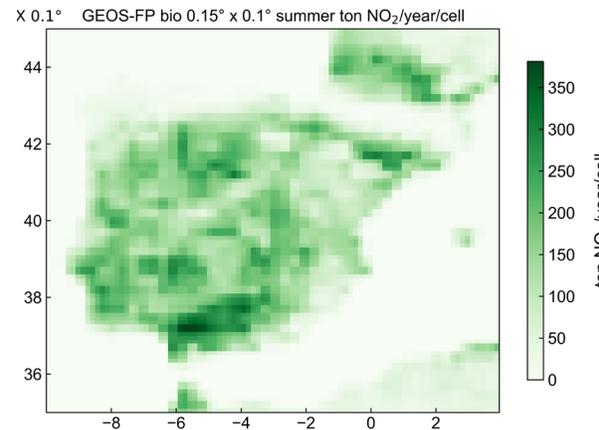
Calculated Bio (A: summer-winter, B: 4°X2° neighbor, C: CAMS)



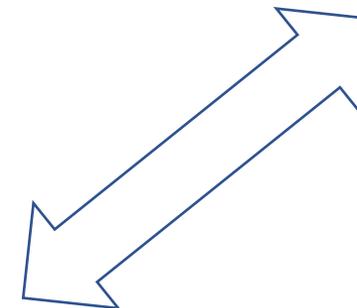
Spatial pattern of calculated soil emission



CAMS-GLOB-SOIL

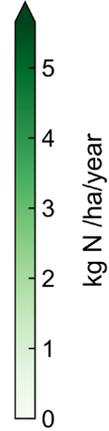
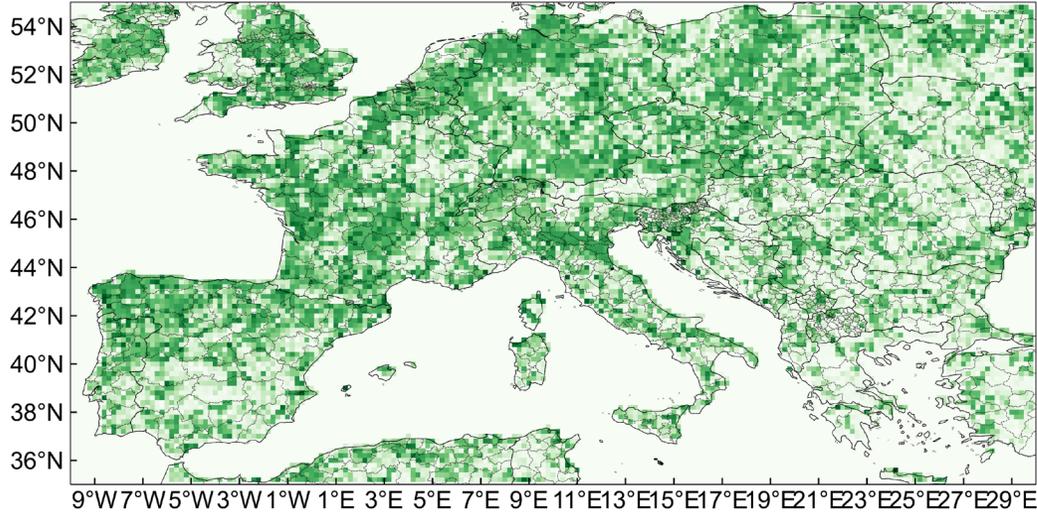


HEMCO

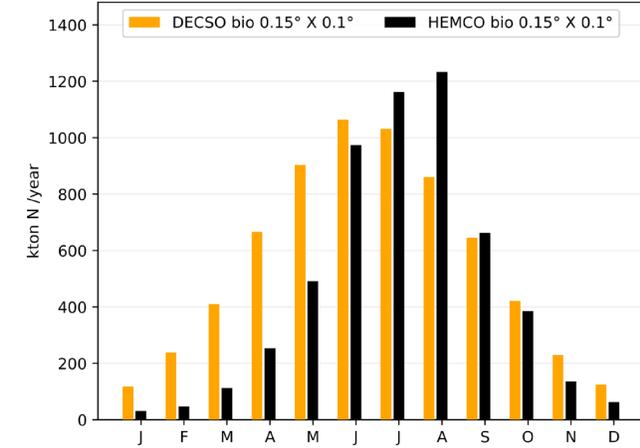
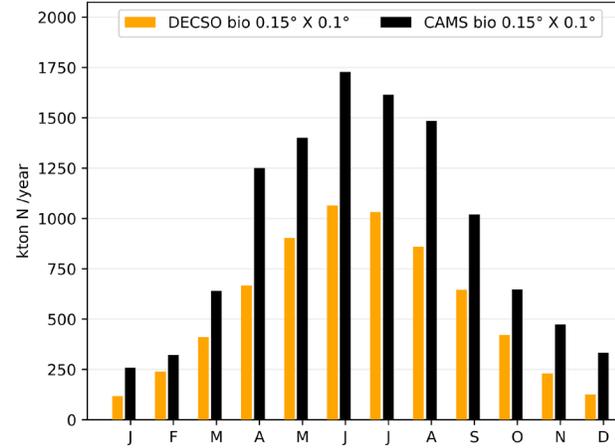


Results for Europe

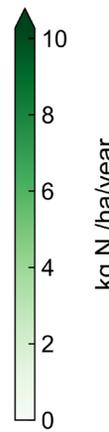
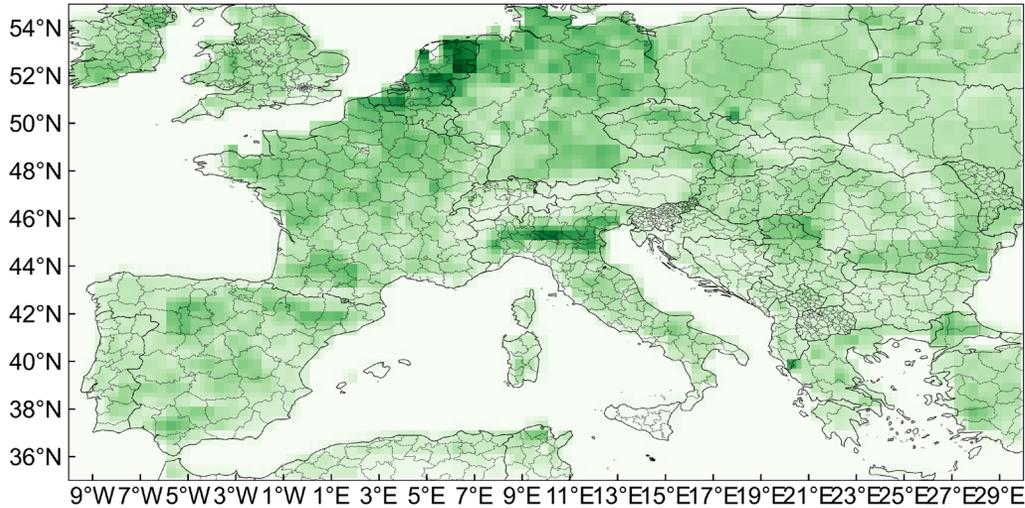
DECSO bio summer 2019



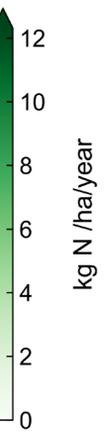
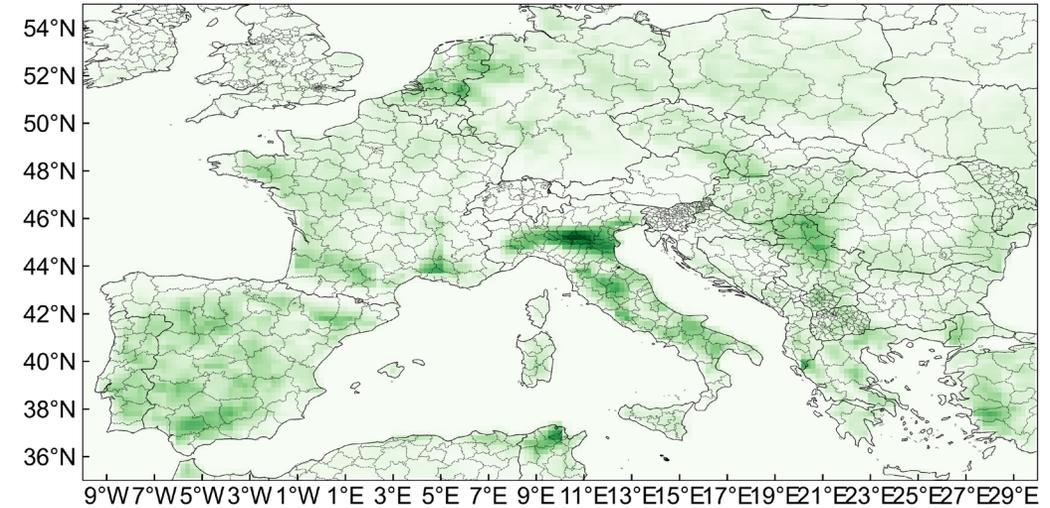
Calculated Bio (A: summer-winter, B: 4°X2° neighbor, C: CAMS)



CAMS bio summer 2019

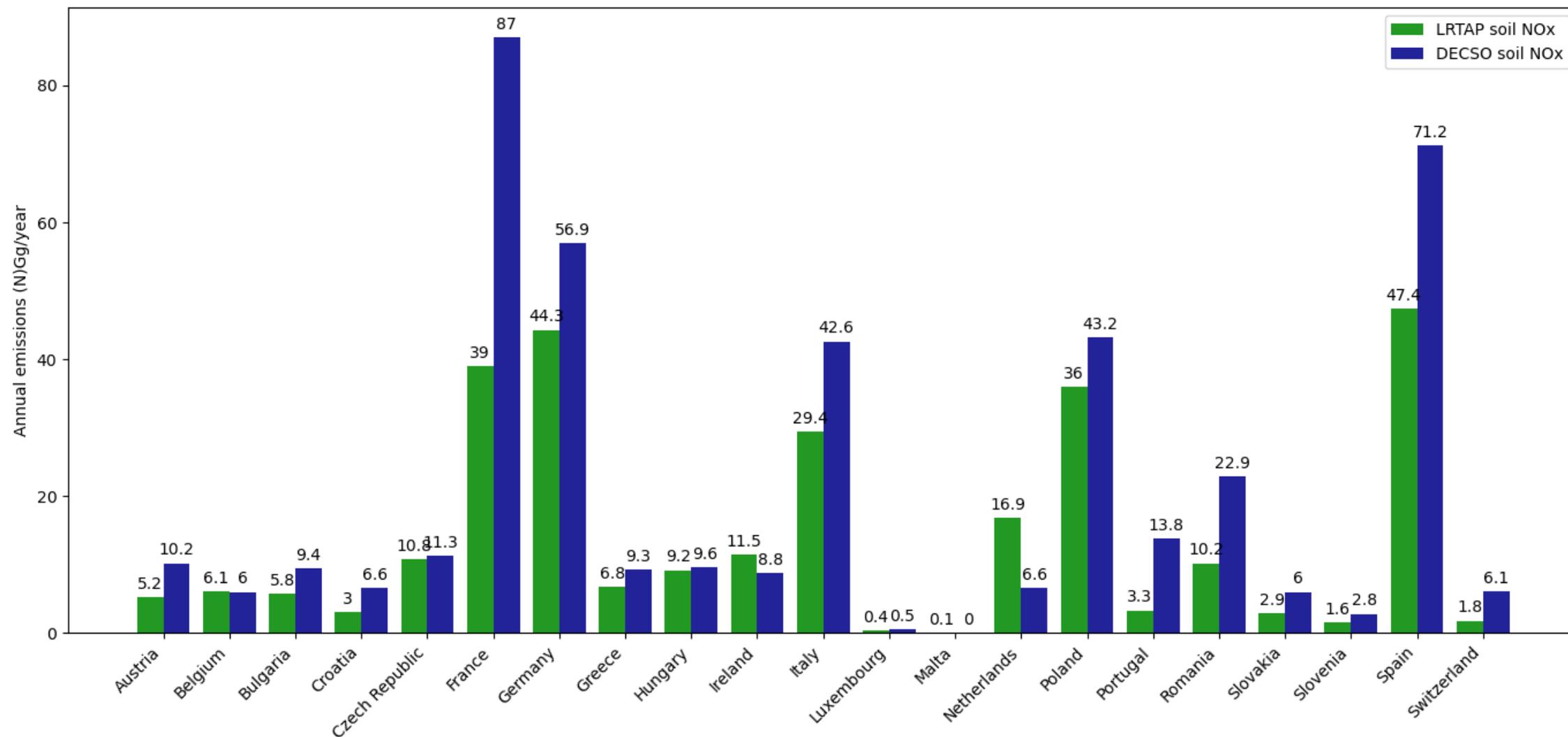


HEMCO bio summer 2017



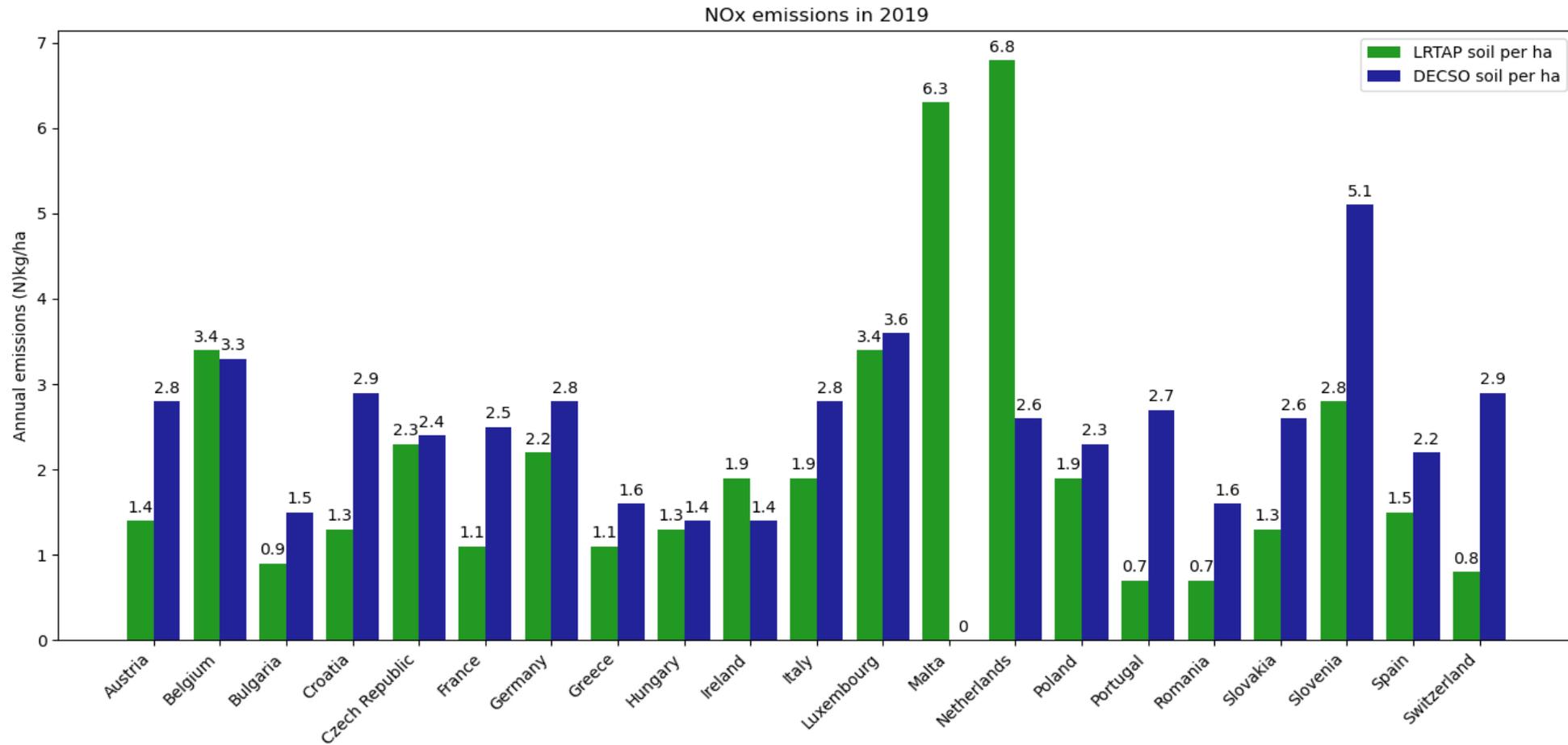


NOx emissions in 2019



LRTAP (National emissions reported to the convention on long-range transboundary air pollution) from EEA
Note: LRTAP does not include forest emissions.

Soil NOx per ha



Average soil NOx in Europe is 2.3 kg/ha/yr for DECSO

SEEDS Biogenic NO_x emissions

Summary

- Post-processing method presented to get biogenic emissions and improved anthropogenic emissions.
- Reasonable agreement with CAMS and HEMCO
- Total biogenic emissions match LRTAP for most countries
- Algorithm will be further improved in the last year of SEEDS