

INTERCOMPARISON OF THE TEMPORAL DISTRIBUTION AND SPECIATION OF OFFICIAL ANTHROPOGENIC EMISSIONS IN SPAIN

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INTRODUCTION

Temporally resolved and speciated atmospheric emission inventories are essential for air quality models to accurately simulate the chemical transformation of pollutants in the atmosphere. This study presents a detailed catalogue of temporal and speciation emission profiles developed for Spain, which is integrated into the High-Effective Resolution Modelling Emission System delta version (HERMES_Δ).

HERMES_Δ is a system that processes the official Spanish emission inventory for use in the national air quality modelling system maintained by the Spanish Meteorological Agency (AEMET). The collection of speciation profiles incorporates up-to-date European and national information, allowing the disaggregation of non-methane volatile organic compound (NMVOC) emissions into individual chemical species. The temporally resolved and speciated emissions were analyzed and compared with those reported by the Copernicus Atmosphere Monitoring Service European Regional inventory (CAMS-REG).

METHODOLOGY

Data were obtained for 10 emission sectors, covering 224 SNAP activities across 19 NUTS regions in Spain. This includes the development of 138 spatial proxies, 788 temporal profiles, and 157 speciation profiles.

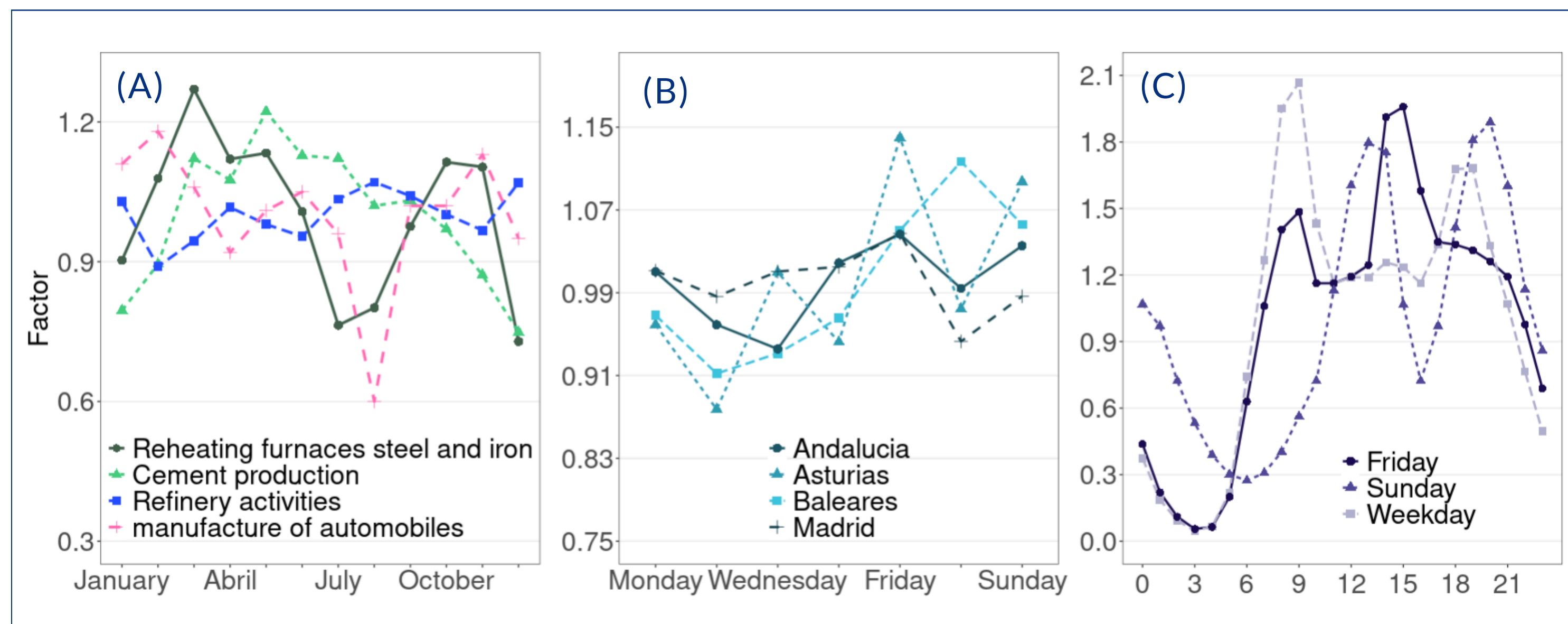


FIGURE 1. (A) MONTHLY PROFILES FOR SELECTED INDUSTRIAL ACTIVITIES, (B) WEEKLY PROFILES FOR THE AVIATION SECTOR PER SOME NUTS2 REGION, AND (C) HOURLY PROFILES FOR ROAD TRANSPORT URBAN DRIVING PATTERN FOR LIGHT-DUTY VEHICLES IN MADRID PER DAY OF THE WEEK

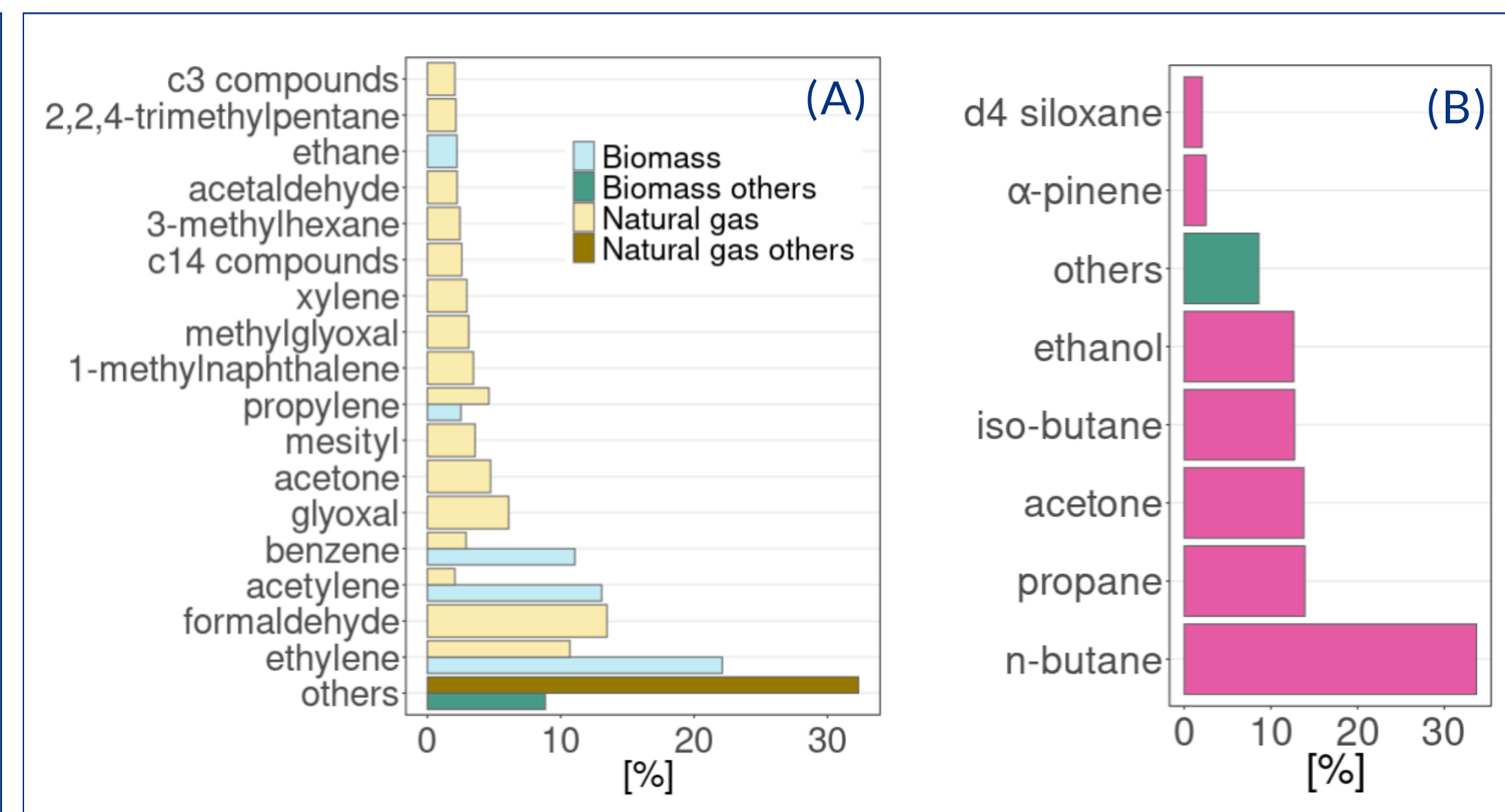


FIGURE 2. NMVOC SPECIATION (A). FUEL TYPE FOR RESIDENTIAL COMBUSTION PLANTS AND (B). DOMESTIC USE OF SOLVENTS

RESULTS AND DISCUSSION

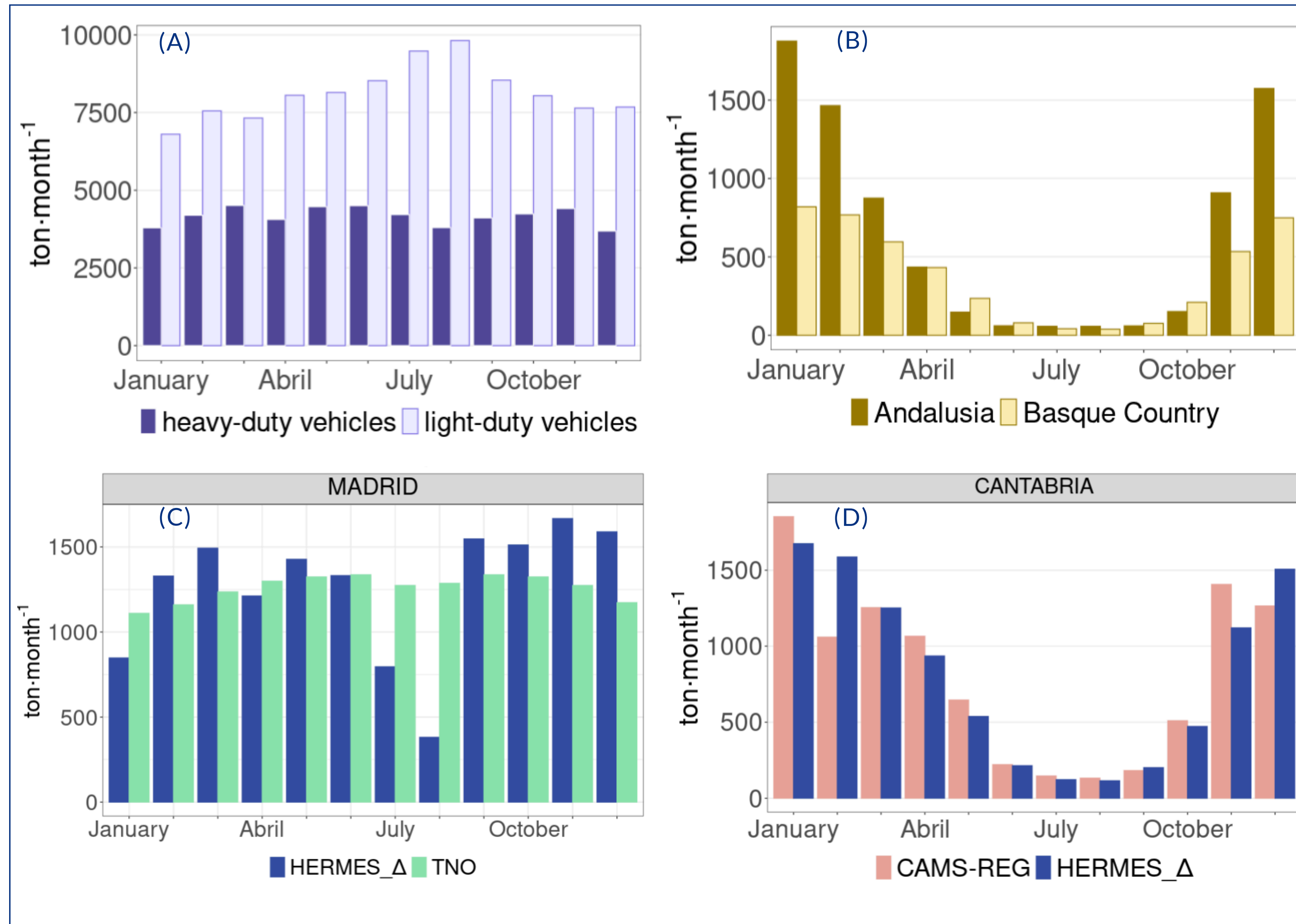


FIGURE 3. (A) MONTHLY NOX EMISSIONS FROM INTERURBAN+RURAL DRIVING PATTERNS BY TYPE OF VEHICLE IN SPAIN (B) MONTHLY PM2.5 EMISSIONS FROM RESIDENTIAL COMBUSTION OF BIOMASS FOR SELECTED NUTS2 REGIONS, (C) MONTHLY NOX ROAD TRANSPORT EMISSIONS REPORTED USING THE HERMES_Δ AND TNO TEMPORAL PROFILES AND (D) MONTHLY NOX EMISSIONS FROM RESIDENTIAL COMBUSTION USING THE HERMES_Δ AND CAMS-REG TEMPORAL PROFILES

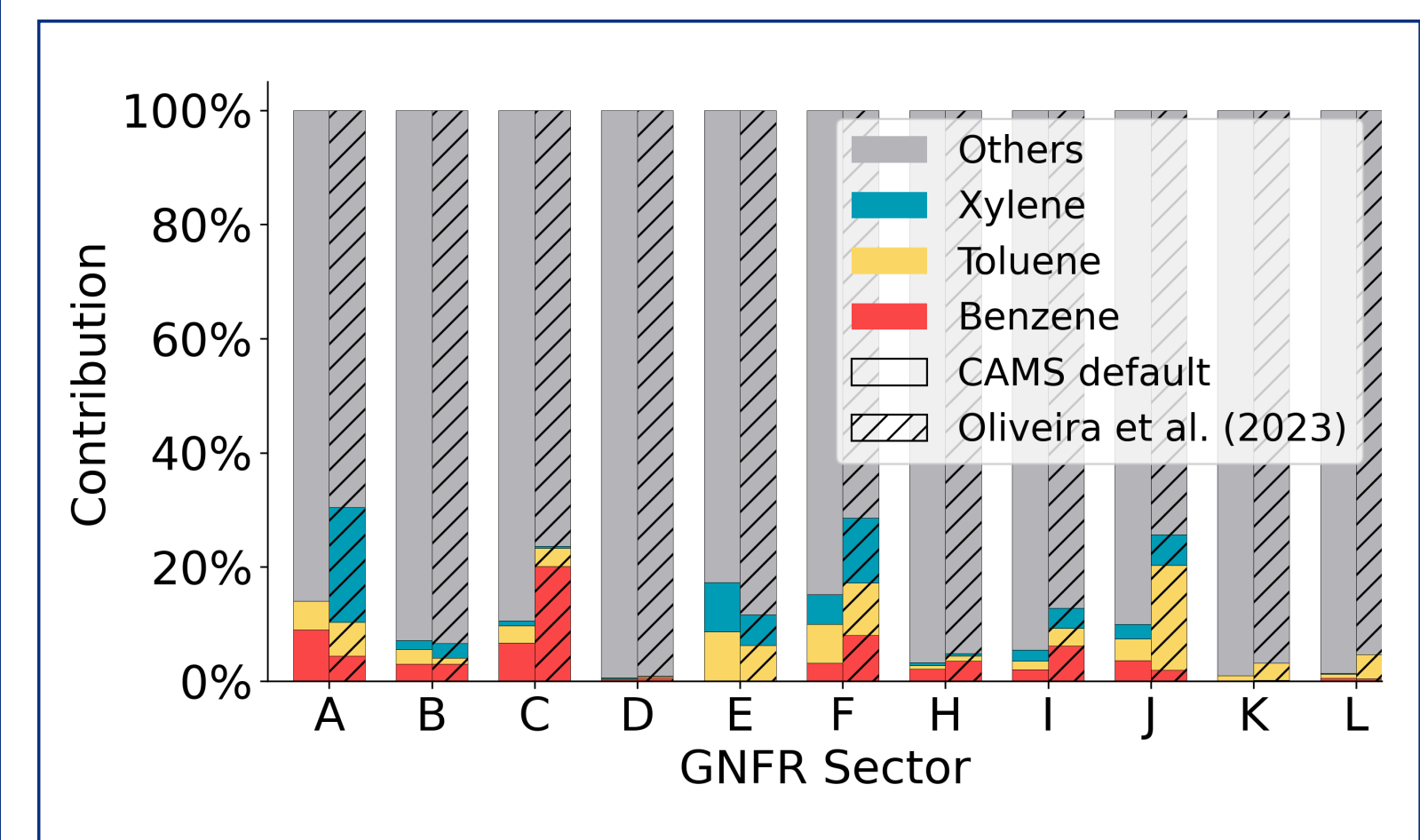


FIGURE 4. VOCs PERCENTAGE CONTRIBUTION PER GNFR SECTOR FOR CAMS AND OLIVEIRA ET AL. (2023) SPECIATION FOR SPAIN

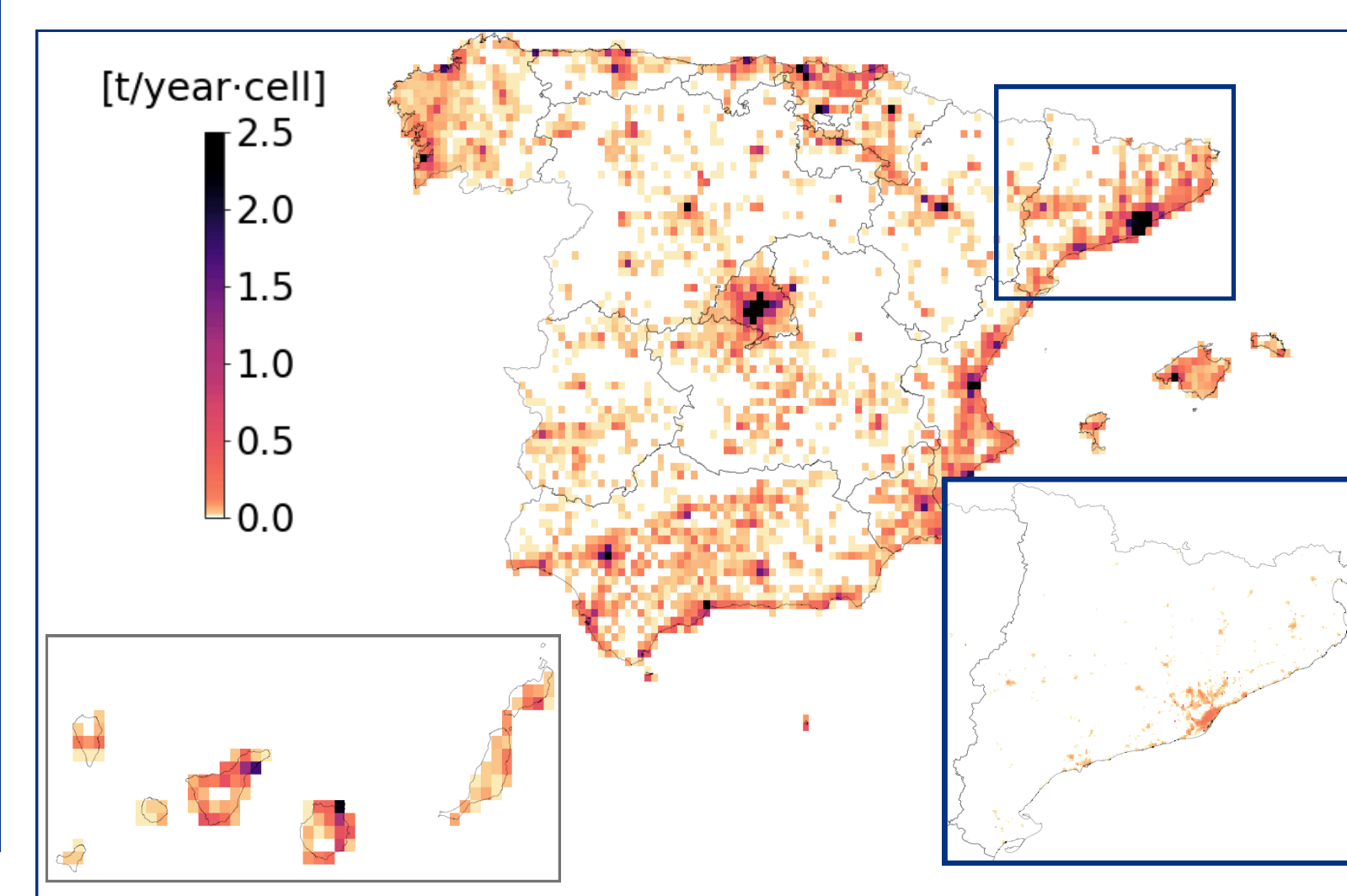


FIGURE 5. TOLUENE GRIDDED EMISSIONS FROM THE USE OF SOLVENTS IN SPAIN FOR TWO RESOLUTIONS IN SPAIN FOR 2021

CONCLUSION

- This study presents a catalogue of temporal and speciation profiles for processing anthropogenic emission inventories in Spain part of the HERMES_Δ system.
- The profiles consider climatological and socio-demographic factors affecting emissions.
- By providing detailed and accurate emission data, HERMES_Δ will enhance the ability to forecast air quality and offer valuable information for policymakers and the general public.
- Future work will assess the impact of these profiles on AEMET's air quality model performance.

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