

SOURCES AND DISPERSION OF BTX EMISSIONS IN A PORT AREA IN GREECE



K.M. Fameli, V.D. Assimakopoulos, Th. Giannaros and V. Kotroni



Institute for Environmental Research and Sustainable Development, National Observatory of Athens, Athens, 152 36 Greece

Keywords: NMVOCs, BTX emissions, air quality modelling, port, Greece.

Presenting author email: kmfameli@noa.gr

Introduction

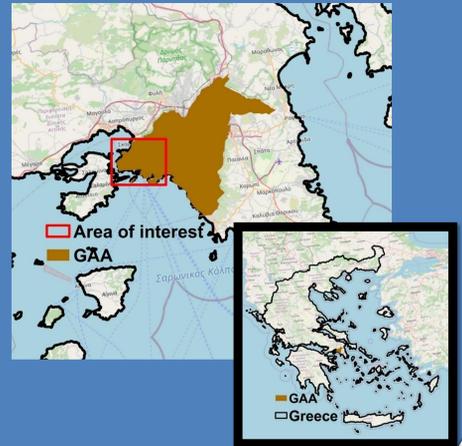
NMVOCs are emitted into the atmosphere from many sources (combustion activities, solvent use and power generation processes). A group of aromatic compounds known as **BTX (Benzene, Toluene, and Xylene)** are included in NMVOCs.

In Athens, the daily profile of aromatic VOCs, according to measurements conducted by Kaltsonoudis et al. (2016), is highly related with vehicles traffic especially in summer (~0.22 ppb) while in winter, the biomass burning increases benzene levels in the atmosphere significantly (from 1.00 ppb to 3.18 ppb).

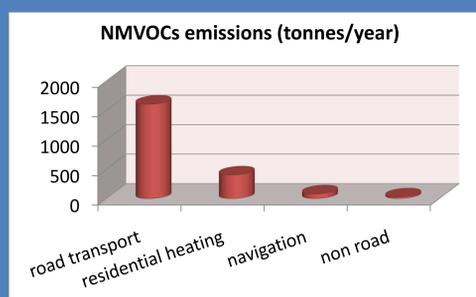
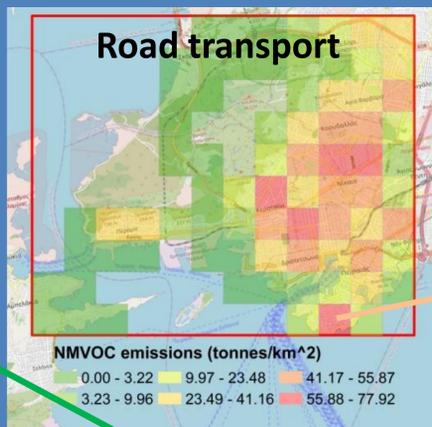
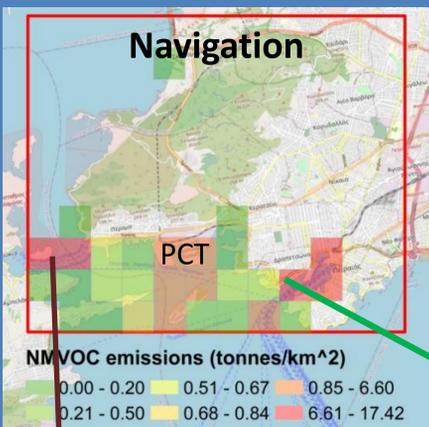
The role of the anthropogenic NMVOCs to the local air quality has been limited examined

The port of Piraeus

- Located at the SW suburbs of the Greater Athens Area (GAA)
- The busiest commercial and passenger port in Greece
- Highly populated
- Industrial facilities
- Densely road network (traffic congestions due to the movement from/to the port and the local market)



Sources of NMVOCs emissions



9.5% of NMVOCs emissions from road transport correspond to BTX species (2.0% accounts to Benzene, 4.4% to Toluene and 3.1% to m/p – Xylene)

Max value (77.92 tonnes/km²): located at the centre of Piraeus where the majority of vehicles commute
A great part of NMVOCs are emitted at the surrounding area of the port due to traffic problems

FEI-GREGAA emission inventory 1x1 km²
(Fameli & Assimakopoulos 2016)

Remarkable values at the ferry line Perama - Salamis Island (13.41 tonnes/km²) as well as at the Piraeus Container Terminal Single Member S.A. (PCT; 5.3 tonnes/km²).

Max value from navigation: 17.42 tonnes/km²
(almost 4.4 times lower compared to road emissions)
It appears at the the passenger port of Piraeus

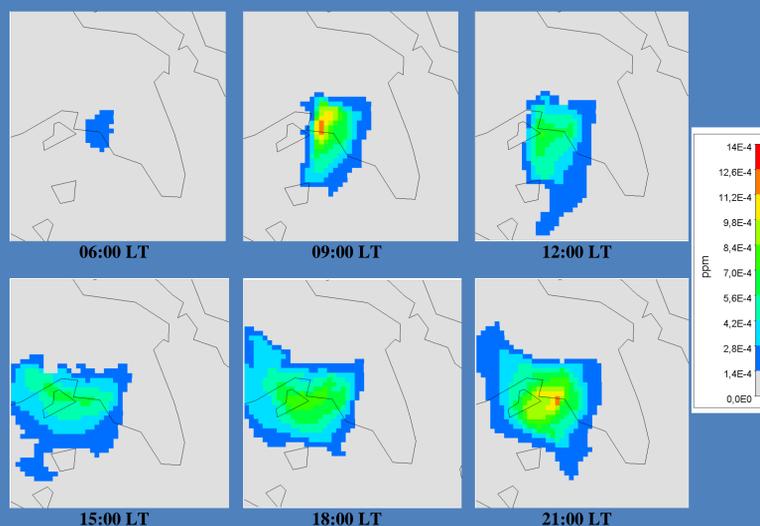
Air Quality Modelling

Modelling system: WRF/CAMx
Emissions: FEI – GREGAA

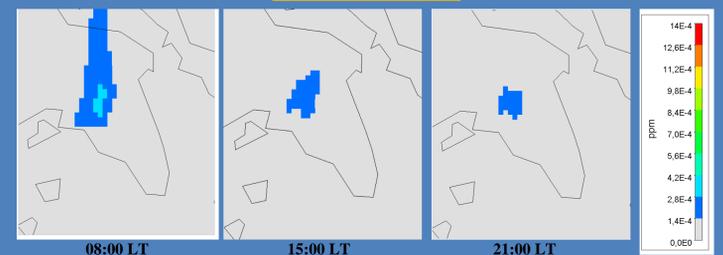
Cold period

Warm period

- ✓ A plume of high BTX was developed at the surrounding area of the port of Piraeus in the morning and remained there till late in the evening
- ✓ Concentrations ranged from 0.12 ppb to 1.4 ppb
- ✓ First peak at 09:00 LT (1.4 ppb)
- ✓ A nighttime high value slightly east to the morning one.
- ✓ Diurnal variation consistent with the anthropogenic activities.



Dispersion of BTX model concentrations on 16th September 2021



Dispersion of BTX model concentrations on 1st February 2022.

- ✓ Pollutants emitted at the urban area remained within the urban center.
- ✓ The scheduled vessels routes are limited in winter since the tourist season has ended and they cover mainly local needs.
- ✓ Max value in the morning (0.33 ppb) at the urban center and for the rest of the day values remained rather low (below 0.27 ppb)