

Air monitoring of pesticide residues in Provence-Alpes-Côte d'Azur and Corsica

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Context

Air PACA and Qualitair Corse, the French Certified Air-Quality Monitoring Agencies (AASQA) of Provence-Alpes-Côte d'Azur (PACA) and Corsica, in partnership with the Laboratoire de Chimie de l'Environnement (Aix-Marseille University-CNRS), have set up a Regional Pesticide Observatory (ORP).

The objectives of this regional observatory are:

- 1/ to establish a diagnostic of pesticides concentrations in the air of PACA and Corsica in different contexts of sources,
- 2/ to assess the population exposure to pesticides in the atmosphere.

List of pesticides

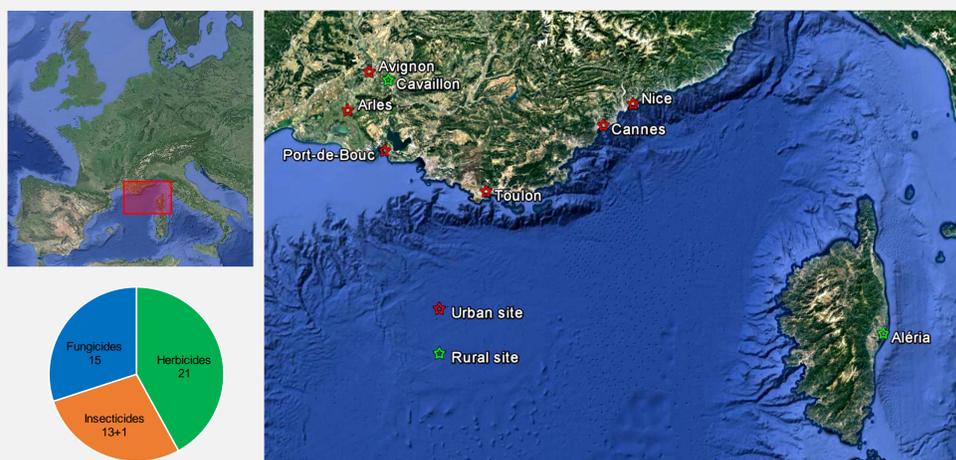
Herbicides (21): 2,4D, 2,4MCPA, Aclonifen, Amitrole, Chlorpropham, Diclofop-methyl, Diflufenican, Flazasulfuron, Flumioxazin, Flurochloridone, Fluroxypyr, Isoproturon, Linuron, Metazachlor, S-Metolachlor, Oxadiazon, Pendimethalin, Propyzamide, Prosulfocarb, Sulcotrione, Terbutylazine

Insecticides (13+1): Chlorpyrifos, Cypermethrin, Deltamethrin, Diflubenzuron, Esbiothrin, Fenoxycarb, Fipronil, Imidacloprid, Lambda-cyhalothrin, Lindane, Permethrin, Pirimicarb, Thiamethoxam + Piperonyl butoxide (PBO, synergist)

Fungicides (15): Boscalid, Cymoxanil, Cyprodinil, Difenconazole, Dimethomorph, Fenhexamid, Fenpropimorph, Flusilazole, Folpet, Iprodione, Kresoxim-methyl, Pyrimethanil, Spiroxamine, Tebuconazole, Tetraconazole

Pesticide monitoring

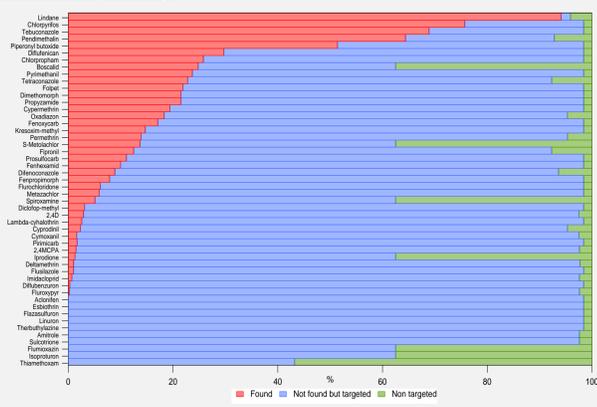
Since 2012, 50 pesticides were monitored in 6 urban sites (Arles, Avignon, Cannes, Port-de-Bouc, Nice, and Toulon) and 2 rural sites (Aléria and Cavaillon).



Sampling: 613 samples collected (~120 samples per year)
high-volume sampler (10 m³ h⁻¹ for 48 h)
→ gas-phase (polyurethane foams - PUF)
→ particle-phase (Total Suspended Particulate ; quartz fibre filter)

Some results

Detection frequency

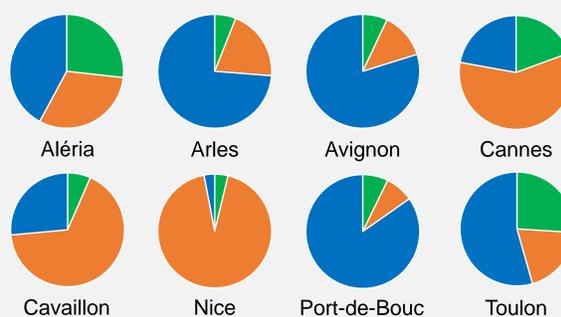


20% → never detected
10% → above 50% of detection
Lindane (94.1%) → prohibited in France

Average concentration of samples with detection (2012-2016)

71.9% → below 0.1 ng m⁻³
22.7% → between 0.1 and 1 ng m⁻³
14 pesticides exceeded an air concentration above 1 ng m⁻³ for at least 1 sample
→ **Folpet (122)**, **Chlorpyrifos (50)**, **Pendimethalin (26)**...

Pesticide distribution



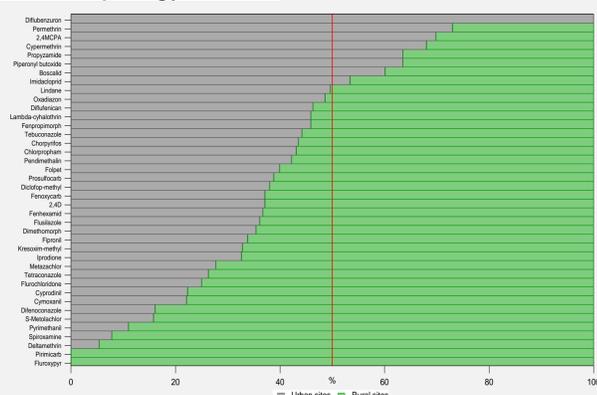
Permethrin + Lindane + PBO
→ Cannes – Nice

Chlorpyrifos
→ Cavaillon

S-Metolachlor + Chlorpyrifos + Dimethomorph
→ Aléria

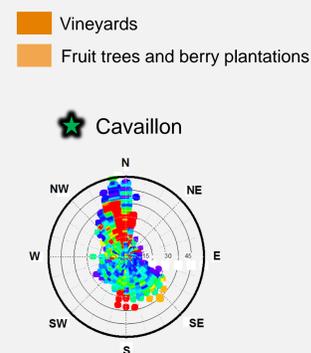
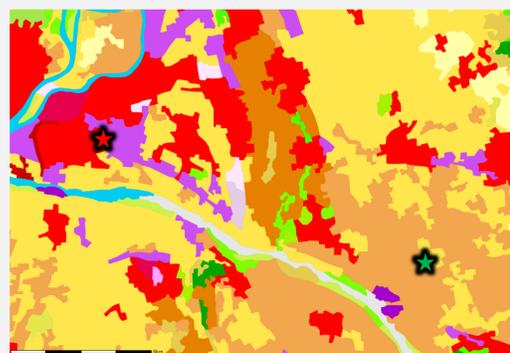
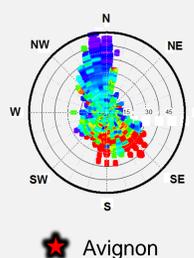
Folpet (not detected in 2016)
→ Avignon – Arles – Port-de-Bouc – Toulon

Influence of topology of sites



Detection of pesticides in rural aeras is higher than in urban aeras

Source analysis: focus on chlorpyrifos



Important aeras of vineyards and fruit trees between Avignon and Cavaillon
Chlorpyrifos is a broad spectrum insecticide for use in a wide range of arable and fruit crops.

Conclusions and outlook

Presence of pesticides in atmosphere of rural and urban aeras
Many years after its ban, **Lindane** is still the most detected (94.1%) in atmosphere
Implementation of a national monitoring in France

Reference: Petit JE, Favez O, Albinet A, Canonaco F. A user-friendly tool for comprehensive evaluation of the geographical origins of atmospheric pollution: Wind and trajectory analyses. Environ Model Softw, 88, 183-187, 2017.

Fundings: Regional Health Agencies (ARS PACA – ARS Corse – DREAL PACA) – PACA Region – Air PACA – Qualitair Corse