# Evolution of ambient air concentrations of 46 pesticides in Wallonia, Belgium in summer 2015

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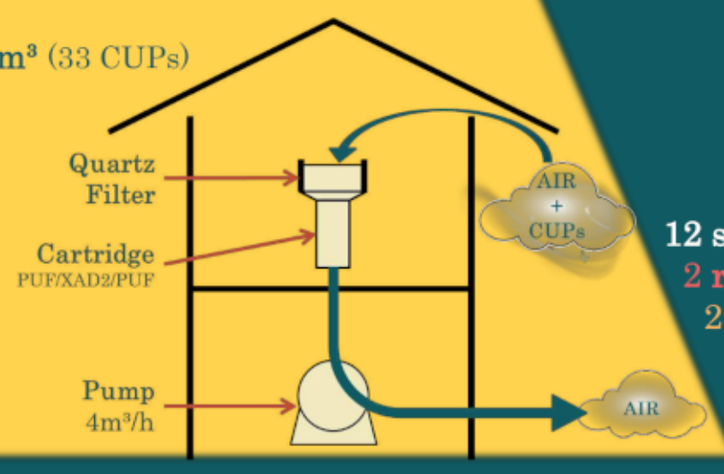
## Introduction & objectives

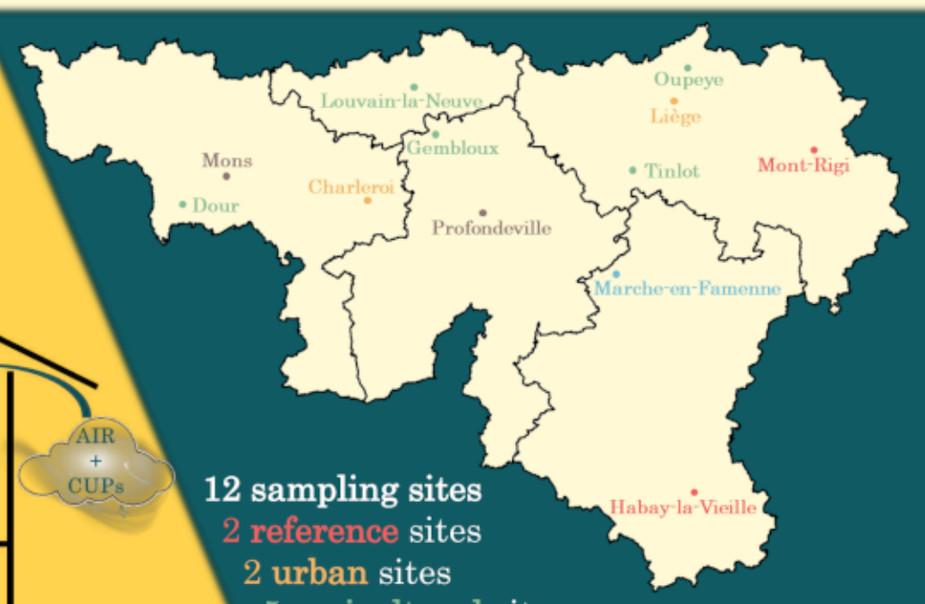
- Human can be exposed to pesticides through 3 main pathways: dermal exposure, ingestion and inhalation
- It is now suggested that inhalation exposure might be important in rural but also in urban locations
- Studies in North America and Europe have reported pesticides air concentrations in rural and urban locations as high as several hundreds of nanograms per cubic meters (ng/m³)
- Assessment of currently-used pesticides (CUPs) concentrations in ambient air is important for better understanding human exposure and potential health effects
- In this study, ambient air concentrations of 46 CUPs were assessed in Wallonia, Belgium between 25th June and 20th August 2015.
- To provide a better insight of the population exposure in Wallonia samples were taken from 12 sampling sites with different typologies

## Material & Methods

- CUPs associated to particulate matter retained on Quartz filter
- Gas phase CUPs retained on PUF/XAD-2/PUF cartridge
- Sampling for 14 days ; 4 campaigns from 25th June to 20th August 2015
- Analysis of 46 CUPs using GC-MS/MS and HPLC-MS/MS
- Limit of quantification (LOQ): 0,1 ng/m³ (*13 CUPs) and 0,04 ng/m³ (33 CUPs)

| CUPs | Uses | CUPs | Uses | CUPs | Uses | CUPs | Uses |
|---|---|---|---|---|---|---|---|
| 2,4-D | herbicide | cyproconazole | fungicide | fenpropimorph | fungicide | propiconazole | fungicide |
| 2,4-DB* | herbicide | cyprodinil | fungicide | iprodione | fungicide | propyzamid* | herbicide |
| aclonifen* | herbicide | deltamethrin | insecticide | kresoxim-methyl | fungicide | prosulfocarb* | herbicide |
| benfluralin | herbicide | difenoconazole | fungicide | linuron | herbicide | pyrimethanil | fungicide |
| boscalid | fungicide | diflufenican* | herbicide | MCPA | herbicide | S-metolachlor | herbicide |
| captan | fungicide | dimethenamid-P | herbicide | metazachlor | herbicide | spiroxamine | fungicide |
| chlorothalonil* | fungicide | dimethoate | insecticide | metribuzin | herbicide | tebuconazole | fungicide |
| chlorpyrifos-ethyl | insecticide | epoxiconazole | fungicide | myclobutanil | fungicide | terbuthylazine | herbicide |
| clopyralid* | herbicide | ethofumesate* | herbicide | oxadiazon | herbicide | tetraconazole | fungicide |
| cyhalothrin | insecticide | ethoprop* | insecticide | penconazole | fungicide | triallate* | herbicide |
| cymoxanil | fungicide | fenoxycarb | insecticide | pendimethalin* | herbicide | | |
| cypermethrin | insecticide | fenpropidin* | fungicide | pirimicarb* | insecticide | | |



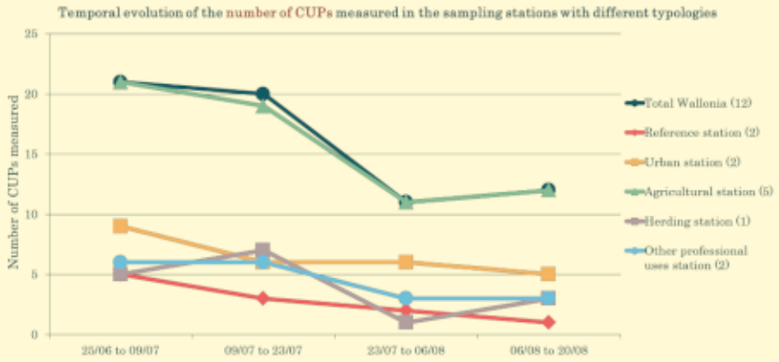

12 sampling sites
2 reference sites
2 urban sites
5 agricultural sites
1 cattle site
2 other professional uses sites

## Results

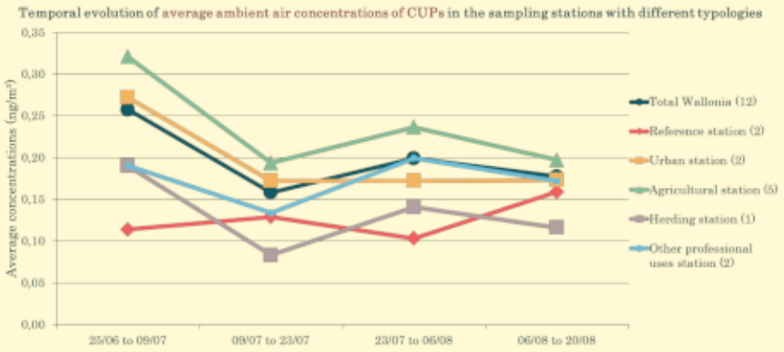
- Over 8 weeks of sampling (4 sampling campaigns) a total of 25 CUPs (12 fungicides, 10 herbicides and 3 insecticides) were detected in at least 1 sample
- 4 CUPs (2 fungicides and 2 herbicides) measured in >50% of samples even in remote reference site
- Number of CUPs measured in Wallonia was highest during the first campaign (21 CUPs between 25th June and 9th July) and lowest during the 3rd campaign (11 CUPs between 23rd July and 6th August)
- Highest number of CUPs measured at agricultural sites (max 21 ≠ CUPs) and lowest number of CUPs measured at reference sites (max 5 ≠ CUPs)
- Strong reduction of the number of CUPs measured in Wallonia after the 23rd July due to a strong reduction in agricultural sites and a less marked reduction in other sites

| CUPs | Frequency of quantification | Range (ng/m3) | Average ± S.D. (ng/m3) |
|---|---|---|---|
| chlorothalonil | 85,4% | 0,10 - 2,73 | 0,49 ± 0,54 |
| benfluralin | 68,8% | 0,04 - 1,91 | 0,28 ± 0,47 |
| cymoxanil | 62,5% | 0,04 - 0,97 | 0,27 ± 0,24 |
| S-metolachlor | 52,1% | 0,04 - 1,68 | 0,19 ± 0,33 |
| fenpropidin | 47,9% | 0,10 - 1,80 | 0,54 ± 0,36 |
| terbuthylazine | 37,5% | 0,04 - 0,20 | 0,09 ± 0,04 |
| captan | 35,4% | 0,06 - 2,03 | 0,39 ± 0,56 |
| pendimethalin | 31,3% | 0,10 - 0,59 | 0,21 ± 0,13 |
| triallate | 20,8% | 0,10 - 0,40 | 0,20 ± 0,11 |
| propiconazole | 16,7% | 0,04 - 0,12 | 0,05 ± 0,03 |
| spiroxamine | 14,6% | 0,04 - 0,12 | 0,07 ± 0,03 |
| chlorpyrifos-ethyl | 10,4% | 0,05 - 0,26 | 0,11 ± 0,09 |
| prosulfocarb | 8,3% | 0,11 - 0,13 | 0,12 ± 0,01 |
| fenpropimorph | 8,3% | 0,04 - 0,09 | 0,06 ± 0,02 |
| oxadiazon | 8,3% | 0,05 - 0,07 | 0,05 ± 0,01 |
| linuron | 6,3% | 0,08 - 0,32 | 0,19 ± 0,12 |
| dimethenamid-P | 6,3% | 0,04 - 0,09 | 0,06 ± 0,03 |
| boscalid | 6,3% | 0,04 - 0,06 | 0,04 ± 0,01 |
| tebuconazole | 6,3% | 0,04 - 0,05 | 0,04 ± 0,01 |
| ethofumesate | 6,3% | 0,03 - 0,09 | 0,05 ± 0,03 |
| cyprodinil | 4,2% | 0,04 - 0,08 | 0,06 ± 0,02 |
| difenoconazole | 4,2% | 0,05 - 0,07 | 0,06 ± 0,02 |
| kresoxim-methyl | 2,1% | 0,04 | - |
| cyhalothrin | 2,1% | 0,05 | - |
| cypermethrin | 2,1% | 0,08 | - |

Temporal evolution of the number of CUPs measured in the sampling stations with different typologies




Temporal evolution of average ambient air concentrations of CUPs in the sampling stations with different typologies




- Average [CUPs] were highest between 25th June and 9th July 2015 than during the 3 other sampling periods
- Highest average [CUPs] measured at agricultural sites (0,32 ± 0,52 ng/m³ between 25th June and 9th July) and lowest at reference sites (0,11 ± 0,07 ng/m³ between 25th June and 9th July)
- 3 fungicides (chlorothalonil, captan and fenpropidin) and 2 herbicides (benfluralin and S-metolachlor) were detected at concentrations >1 ng/m³ at agricultural sites
- 4 CUPs (chlorothalonil, cymoxanil, fenpropidin and terbuthylazine) detected at the reference site located > 10 km from any CUPs uses (Mont-Rigi) but at concentrations lower than in any other sites

## Conclusions

- CUPs are measured at higher concentrations and in higher number in Wallonia in early summer
- Herbicides and Fungicides detected are mainly used in pre-emergence (early summer) which is consistent with the evolution of their concentrations in ambient air samples in early summer
- CUPs are detected in higher number and at higher concentrations near their uses as highlighted in agricultural sites
- CUPs concentrations are almost as high in urban sites as agricultural sites
- Highly volatile CUPs can be detected far from their uses as highlighted in reference site