A FIRST SEMI-QUANTITATIVE STUDY OF THE EMISSION OF VOLATILE ORGANIC COMPOUNDS AFTER THE APPLICATION OF ORGANIC AMENDMENTS IN THE FIELD

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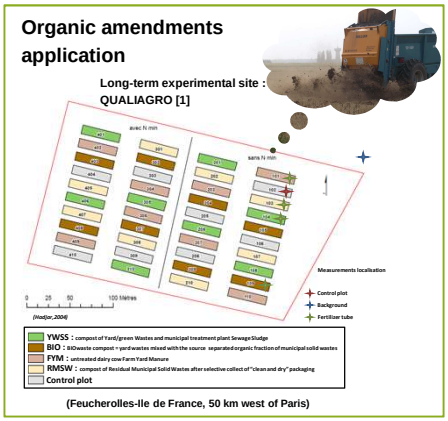
Context

The volatile organic compounds (VOC) have sanitary and environmental impacts. Whereas some sources like forests are largely studied, there are few data on their emissions by agricultural sources and especially after organic waste products application on cultivated fields. This poster presents first results of VOC concentrations measured after the application of urban composts and farm yard manure in the field and subsequent emission/deposition fluxes.

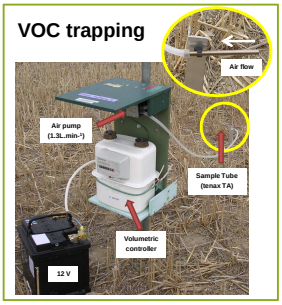
Materials and methods

Organic amendments application

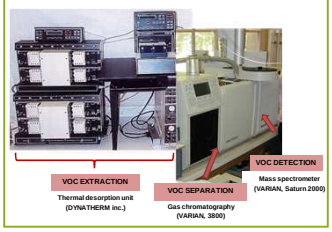


(Feucherolles-Ile de France, 50 km west of Paris)

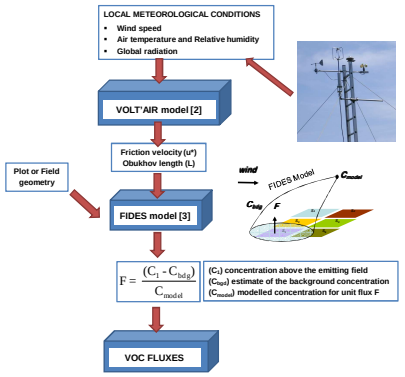
VOC trapping



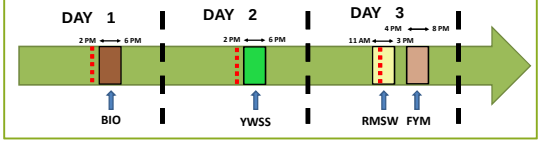
VOC analyzes



VOC fluxes calculation

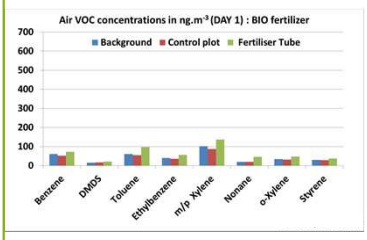


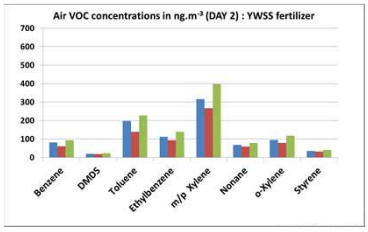
Sampling period

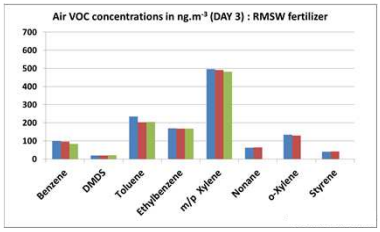


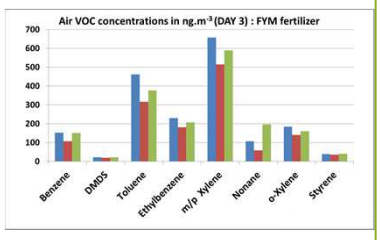
Results

VOC CONCENTRATIONS measured



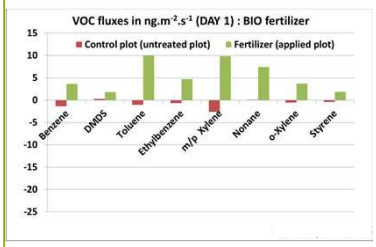


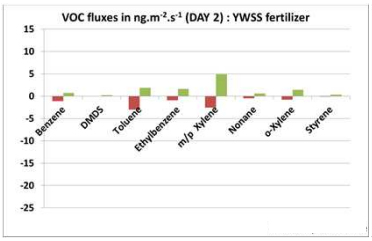


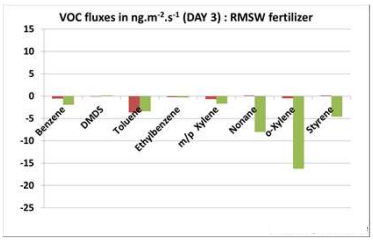


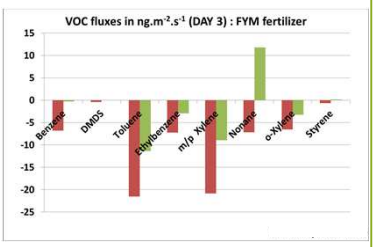
- VOC concentrations varied from 70 to 600 ng.m^{-3}
- High concentrations measured for Background and Control plot : Background > Control plot
- For BIO and YWSS fertilizers : Fertilizer plot > Background and Control plot → probable emissions
- Significant VOC concentrations increase in time : multiplied by a factor 4 for Toluene between the first and the third day following application except for DMDS and Styrene (constant concentration in time) → various behavior depending on VOC

VOC FLUXES calculated









- VOC emission and deposition fluxes are both observed
- VOC deposition systematically measured on Control plot (untreated plot) except for DMDS and one run for Styrene
- Comparison inter-amendments, contrasted results : emissions fluxes for BIO and YWSS especially large for Benzene, Toluene, Ethylbenzene, Xylene (BTX) ; deposition fluxes for RMSW and FYM fertilizer
- Significant higher VOC deposition after FYM application for BTX linked with larger background concentrations which could be explained by a high automobile traffic at this sampling period
- Clear Nonane emission flux following FYM application

Conclusions

- The study provides one of the first attempts to characterize VOC emissions after field application of organic amendments.
- It will help completing the environmental assessment of this practice.
- Air VOC concentrations increase following application of organic products.
- Accuracy of VOC concentration was good enough to highlight differences between the 4 organic products applied.
- Results need to be confirmed by further measurements :
  - better characterize the air VOC background concentration to identify automobile traffic influence
  - repeating this study over larger field to avoid cross contamination from one plot to the next
- It should be extended to other volatile organic compounds using a screening method and to other organic products recycled in agriculture in particular husbandry manure that produce nitrogenous VOC.

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References

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[2] Garcia, L., Bedos, C., Génermont, S., Braud, I., and Cellier, P. (2011). Assessing the ability of mechanistic volatilization models to simulate soil surface conditions: a study with the Volt'Air model. Science of the Total Environment 409, 3980-3992.
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