SEASONAL VARIATIONS OF VOCS EMISSIONS, SECONDARY AEROSOL AND OZONE FORMATION IN SUGARCANE FIELDS

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Abstact

Air pollution in Thailand, especially from volatile organic compounds (VOCs), significantly affects air quality. This study examines seasonal variations in VOC emissions, secondary aerosol formation, and ozone production in sugarcane fields in Nong Bua Lamphu Province using the TDU-GC-MS technique. Samples collected in 2023 across summer, rainy, and winter seasons showed that Alkanes made up 41%, Alkenes 34%, Aromatics 12%, Haloalkanes 5%, and OVOCs 8%. Phenol had the highest OFP and SOAP values in summer, while Isoprene and Phenol dominated in the rainy and winter seasons, respectively. Seasonal variations are linked to plant responses to heat and sunlight, influenced by temperature and humidity. The study offers a foundation for future air pollution research.

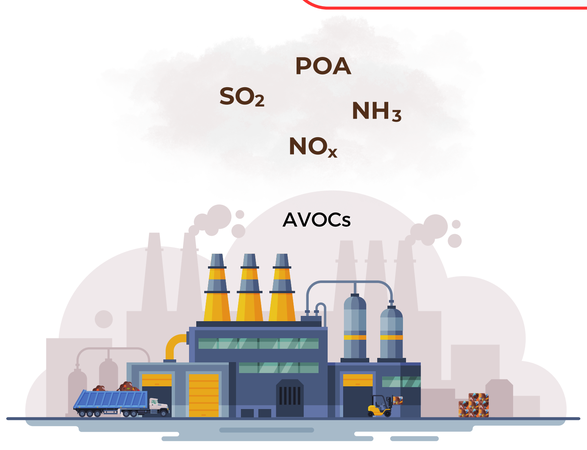
Objective

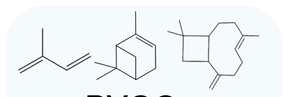
The study aims to investigate seasonal variations in VOC emissions, secondary aerosol formation, and ozone production in sugarcane fields in Nong Bua Lamphu Province using TDU-GC-MS. It also analyzes the chemical composition and concentration of VOCs to support efforts in addressing PM pollution.

Introduction

Anthropogenic-Biogenic interaction

$$VOCs + NOx \xrightarrow{light} PM + O_3$$





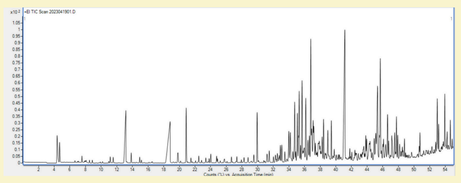
Methods

Preparing the tube and pump

Air sampling

Arrange the tubes inside tray

Run the ISTD using TDU-GC-MS



The results were obtained as a chromatogram

- Clean sorbent tubes
- Identification
- Calculation

Acknowledgment

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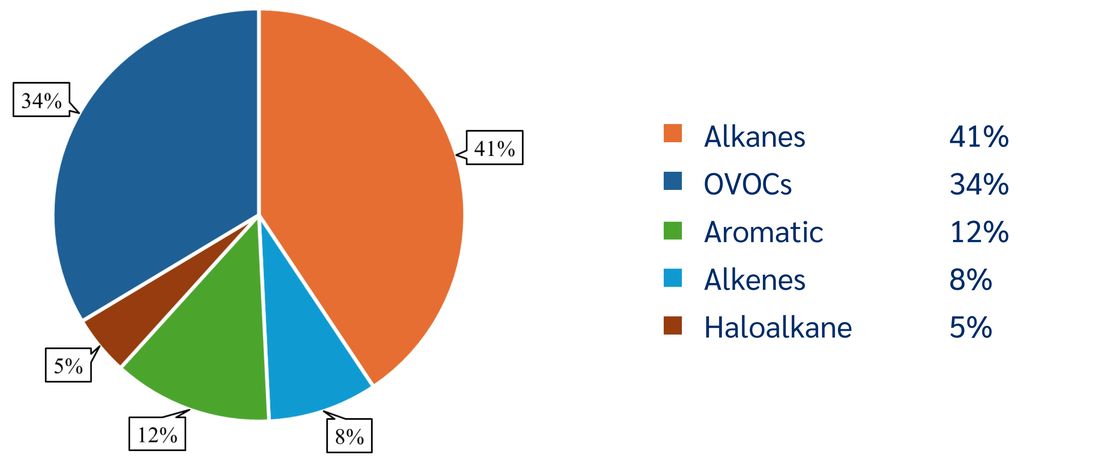
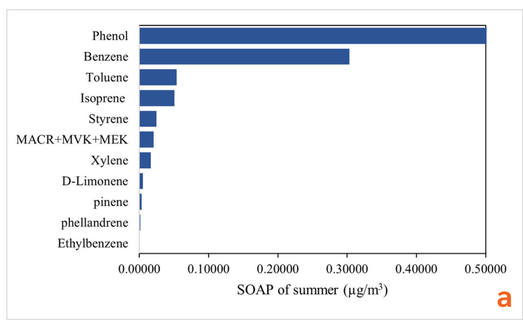
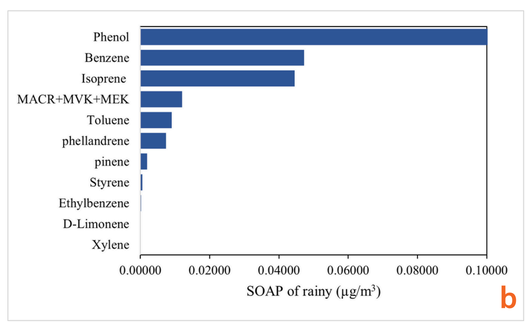
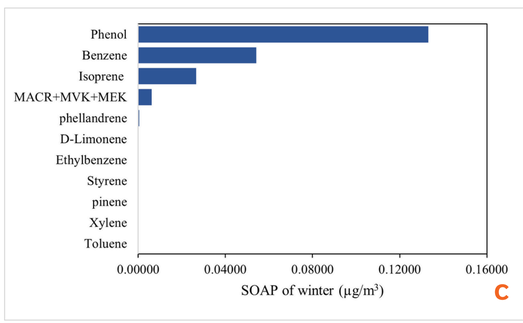
Results&Discussion

Fig.1 Determination of the chemical composition and amount of volatile organic compounds in the atmosphere at the sampling sites







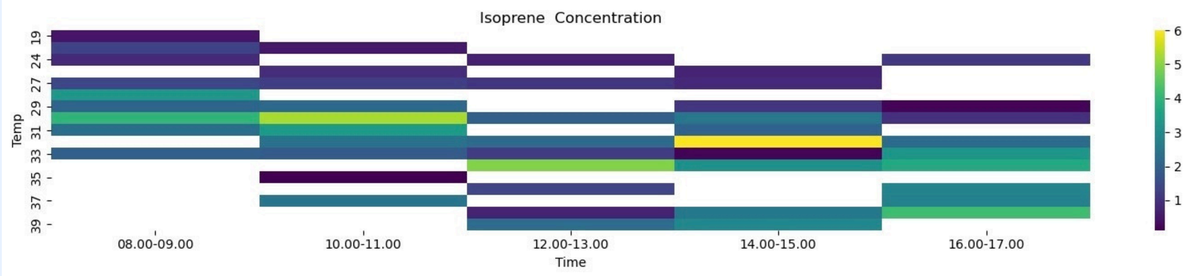


a. representation of the potential for secondary aerosol formation in the summer seasons.

b. representation of the potential for secondary aerosol formation in the rainy seasons.

c. representation of the potential for secondary aerosol formation in the winter seasons.

Fig.2 Heatmap analysis of the relationship between temperature and volatile concentrations at different time intervals.



Conclusion

The study found that seasonal temperature variations influenced the amount of VOC emissions from sugarcane fields. The analysis suggests that temperature plays a significant role in the formation and increase of volatile organic compounds (VOCs). Based on the SOAP calculations, compounds such as phenol, benzene, toluene, isoprene, and MACR+MVK+MEK showed high values, indicating their potential contribution to PM pollution issues.s to support efforts in addressing PM pollution.

Reference

Gu, S., Guenther, A., & Faiola, C. (2021). Effects of Anthropogenic and Biogenic Volatile Organic Compounds on Los Angeles Air Quality. Environmental Science and Technology, 55(18), 12191–12201.https://doi.org/10.1021/acs.est.1c01481