

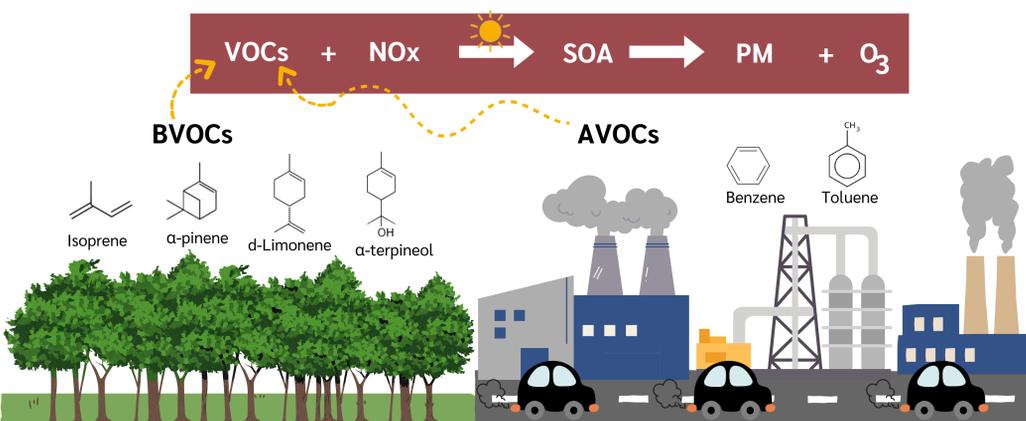
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ABSTRACT

Air pollution, including haze and fine particulate matter (PM), remains a serious issue today. This study aims to investigate the release of biogenic volatile organic compounds (BVOCs) into the atmosphere from the forest area of Huai Hong Khrai, Doi Saket District, Chiang Mai, over a continuous 24-hour period for 6 days. The analysis was conducted using thermal desorption unit-gas chromatography-mass spectrometry (TDU-GC-MS) to assess the formation of secondary organic aerosols (SOA) through chemical reactions between BVOCs and atmospheric oxidants. Air samples were collected during both daytime and nighttime periods. The results showed significant fluctuations in the concentrations of α -pinene, phenol and d-Limonene during the daytime, while their concentrations tended to decrease after 6-7 PM during the nighttime. Factors influencing these fluctuations were not limited to temperature and humidity but also included the secondary metabolism processes of plants. Furthermore, the study found that α -pinene had the highest ozone formation potential (OFP) and secondary organic aerosol potential (SOAP), followed by d-Limonene and phenol. This research provides a foundation for further studies on air pollution and its environmental impacts in the future.

INTRODUCTION



- VOCs = Volatile Organic Compounds
- BVOCs = Biogenic Volatile Organic Compounds
- SOA = Secondary Organic Aerosols
- AVOCs = Anthropogenic Volatile Organic Compounds
- NOx = Nitrogen Oxides
- PM = Particulate Matter

METHODOLOGY

Air sample collection

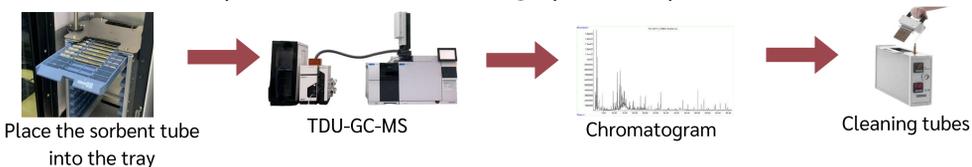
forests area of the Huay Hong Khrai Royal Development Study Center, located in Pa Miang Subdistricts, Doi Saket District, Chiang Mai Province.

4-9 March 2024



Instrument for analysis

- Thermal Desorption Unit Gas Chromatograph Mass Spectrometry (TDU-GC-MS)



Calculation of Secondary Organic Aerosol Potential (SOAP)

$$SOAP_{ij} = E_{ij} \times Y_{SOA_j}$$

$SOAP_{ij}$ = SOA formation potential from VOCs source i.
 E_{ij} = VOC emissions from the same source.
 Y_{SOA_j} = SOA yield from Gu et al. (2021).

Calculation of Ozone Formation Potential (OFP)

$$OFP_j = E_{ij} \times MIR_j$$

OFP_{ij} = Ozone formation potential from VOCs source i.
 E_{ij} = VOC emissions from source i.
 MIR = Maximum Incremental Reactivity (Gu et al., 2021).

ACKNOWLEDGMENTS

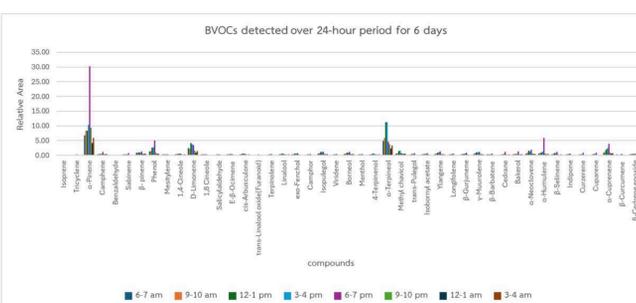
We would like to thank the Department of Chemistry, Faculty of Science, Chiang Mai University. Special thanks to Assoc. Prof. Dr. Sugunya Mahatheeranont, my advisor, and the atmospheric research team at the National Astronomical Research Institute of Thailand (Public Organization) for their invaluable guidance and research support.

References

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- (2.) 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.
- (3.) Adams, R. P. (2012). Identification of essential oil components by gas chromatography/mass spectrometry. *Allured Business Media*.

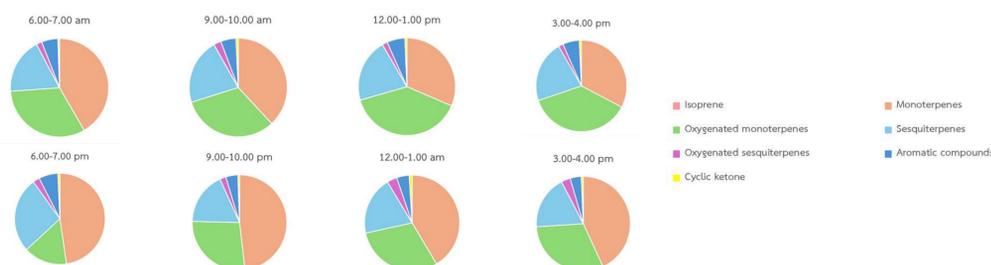
RESULTS

Total BVOCs detected in forests area

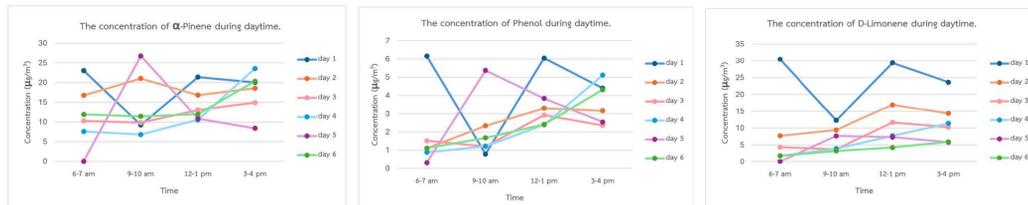


3 major compounds is α -pinene, phenol and d-Limonene.

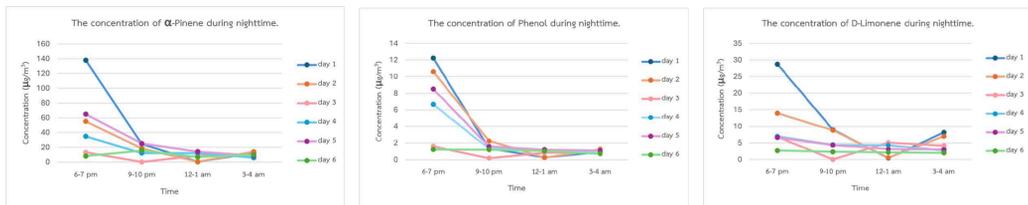
BVOCs proportion found in forests area



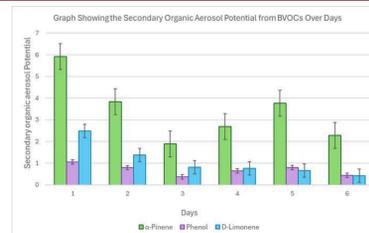
The concentration of 3 major compounds during the daytime over 6 days



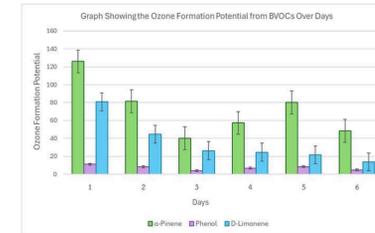
The concentration of 3 major compounds during the nighttime over 6 days



Evaluation of the Secondary Organic Aerosol Potential for 3 major compounds over 6 days.



Evaluation of the Ozone Formation Potential for 3 major compounds over 6 days.



CONCLUSION

BVOCs from forests in Huai Hong Khrai area were studied over six days, identifying 45 compounds. Monoterpenes dominated both day and night, while isoprene remained low due to high volatility. α -pinene, phenol, and d-limonene fluctuated during the day and decreased after 6.00–7.00 pm, influenced by sunlight and humidity. α -pinene had the highest ozone formation potential (OFP) and secondary organic aerosol potential (SOAP), impacting air quality and aerosol formation.