



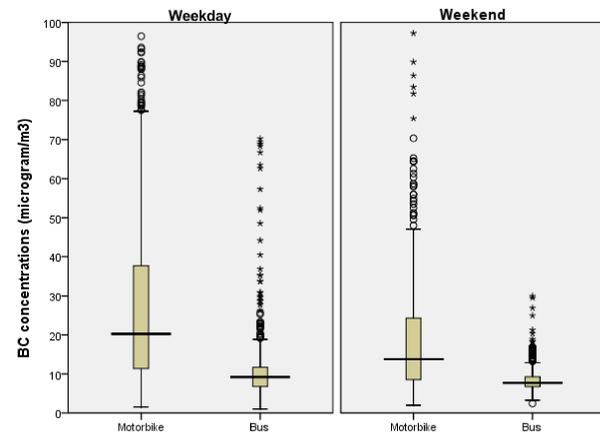
# A PILOT STUDIES ON BLACK CARBON CONCENTRATIONS IN VARIOUS TRANSPORT MODES IN HANOI, VIETNAM

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## 1 INTRODUCTION

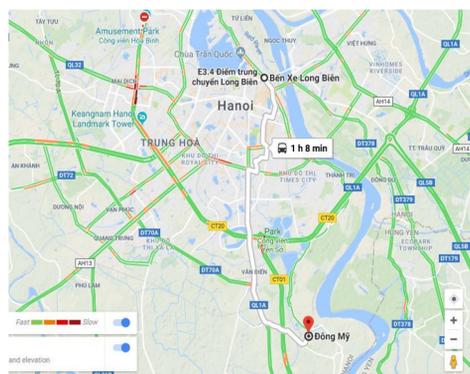
- Black Carbon (BC) strongly impact not only on human health but also global warming.
- BC is mainly emitted from vehicle emissions in large cities.
- In Hanoi, due to rapid urbanization process, the number of vehicles is increasing rapidly and vehicle emission becomes the major cause of air quality degradation.
- However, there is no studies have been conducted to understand the levels of BC in transport environments in Vietnam.
- Therefore, the study aims to determine levels of BC concentrations in several common transportation mode in Hanoi.

### BC Concentrations: Weekday vs. Weekend



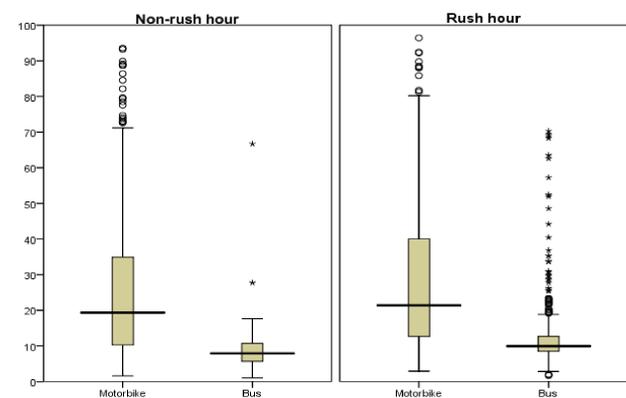
## 2 METHODS

- Intrumentation: Two microAeth® model AE51 monitors (AethLabs San Francisco, USA) measure continuously and simultaneously.
- Survey route: from the central of Hanoi (Long Bien bus station) to suburban (Dong My commune), about 18 kilometers.
- Survey transportation mode: Public buses and motorbikes
- Survey time: Weedays and Weekend, Rush hours and Non-rush hours.



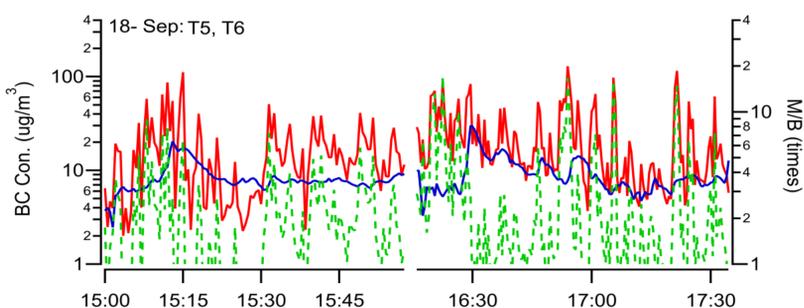
Monitoring site

### BC Concentrations: Rush vs. Non-rush Hours

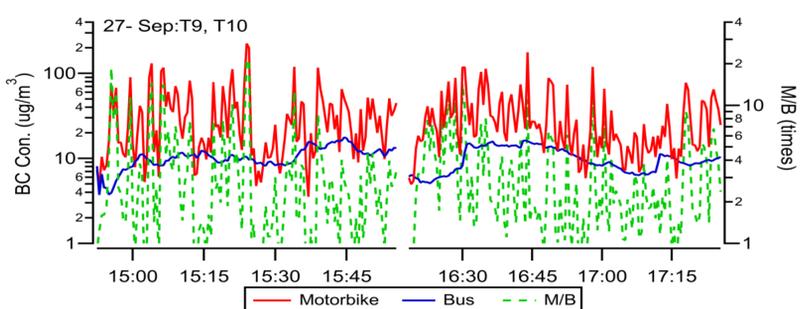


## 3 RESULTS AND DISCUSSION

### BC Concentrations: Motorbikes vs. Buses



Sunday



Thursday

## 4 CONCLUSIONS

- This is the first study in Vietnam that measured the concentrations of BC in various transport modes.
- The mean BC concentrations on motorbikes ( $29.3 \mu\text{g}/\text{m}^3$ ) were significantly higher than those inside buses ( $10.1 \mu\text{g}/\text{m}^3$ ), and ratios of them is 3.6 times.
- The mean of BC concentrations inside buses in Hanoi were similar to those in China, but significantly higher than those in developed countries, such as United States, Australia.

## 5 REFERENCES

- Cai, Jing, et al. (2014) "Validation of microAeth® as a black carbon monitor for fixed-site measurement and optimization for personal exposure characterization". Aerosol and air quality research 14(1):1.
- Li, Bo, et al. (2015) "Personal exposure to black carbon during commuting in peak and off-peak hours in Shanghai". Science of the Total Environment 524:237-245.
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