

# Ambient Nano-Aerosol in East Asian Cities based on East-Asia Nanoparticle Monitoring Network (EA-Nanonet)

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## INTRODUCTION

- Ambient nano-aerosol has been getting an increasing attention from their health risk point of view.
- Not enough information on the status and characteristics of ambient nano-aerosol and their emission sources yet.
- Status and characteristics of ambient nano-aerosol have not been compared between different locations in different countries.
- East Asia Nano-particle monitoring Network (EA-Nanonet) was established for the monitoring of ambient nano-aerosol.
- Campaigns were conducted in Oct.-Nov. 2015 and Mar.-Apr. 2016 and a part of summarized results is reported in the present conference.

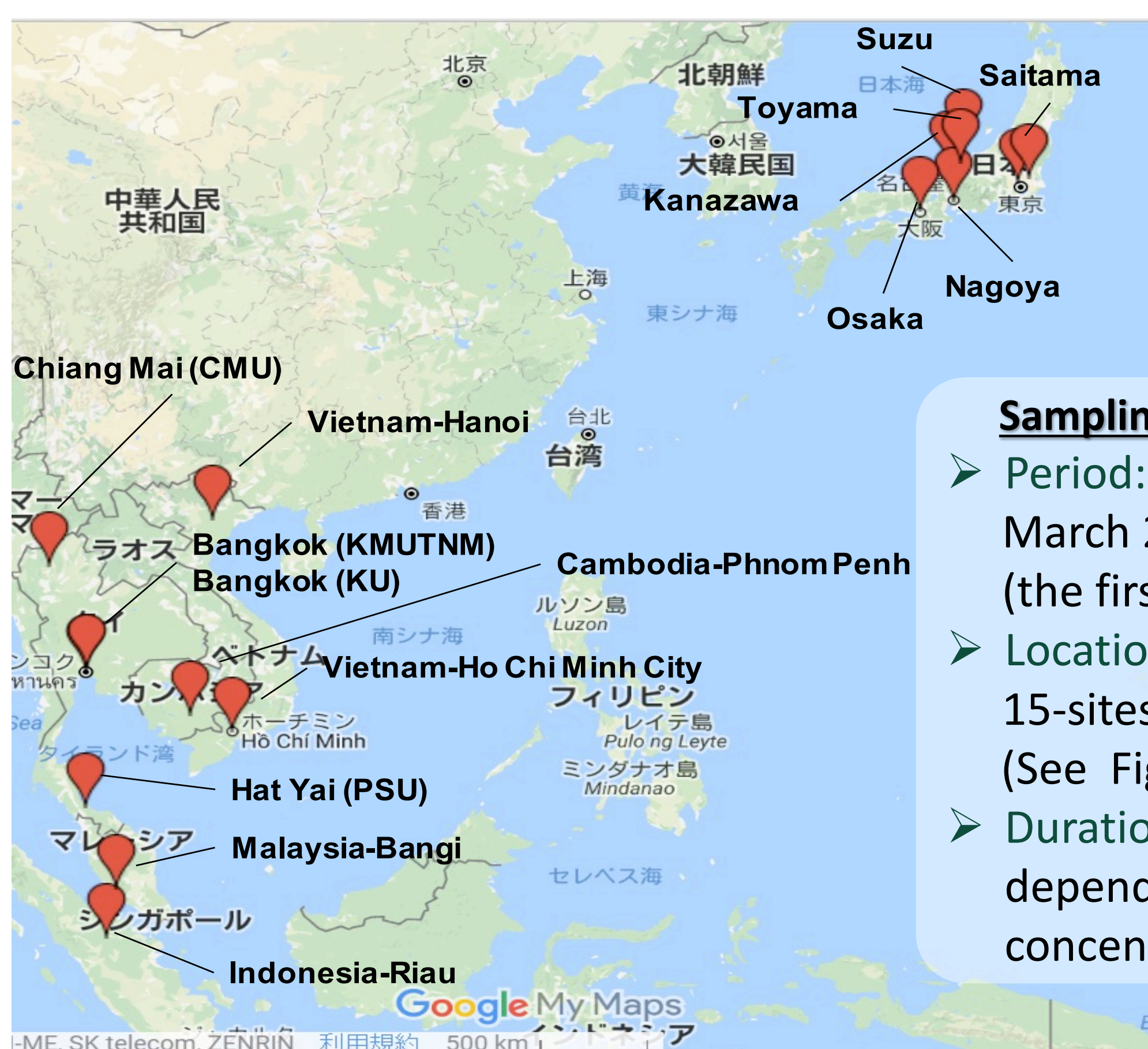
## METHODOLOGY

### Air Sampler as a common tool for the Campaign

- Sampler: The sampler consists of four impactors stages (> 10, 2.5 - 10, 1 - 2.5, 0.5 - 1  $\mu\text{m}$ ) and an inertial filter stage (0.1 - 0.5  $\mu\text{m}$ ) as well as a backup filter (< 0.1  $\mu\text{m}$ ) (See Fig 1.).
- Filter: A quartz fibrous filters 55 mm (Pallflex 2500QAT-UP)
- Flow rate: 40L/min.



Fig 1. PM<sub>0.1</sub> sampler



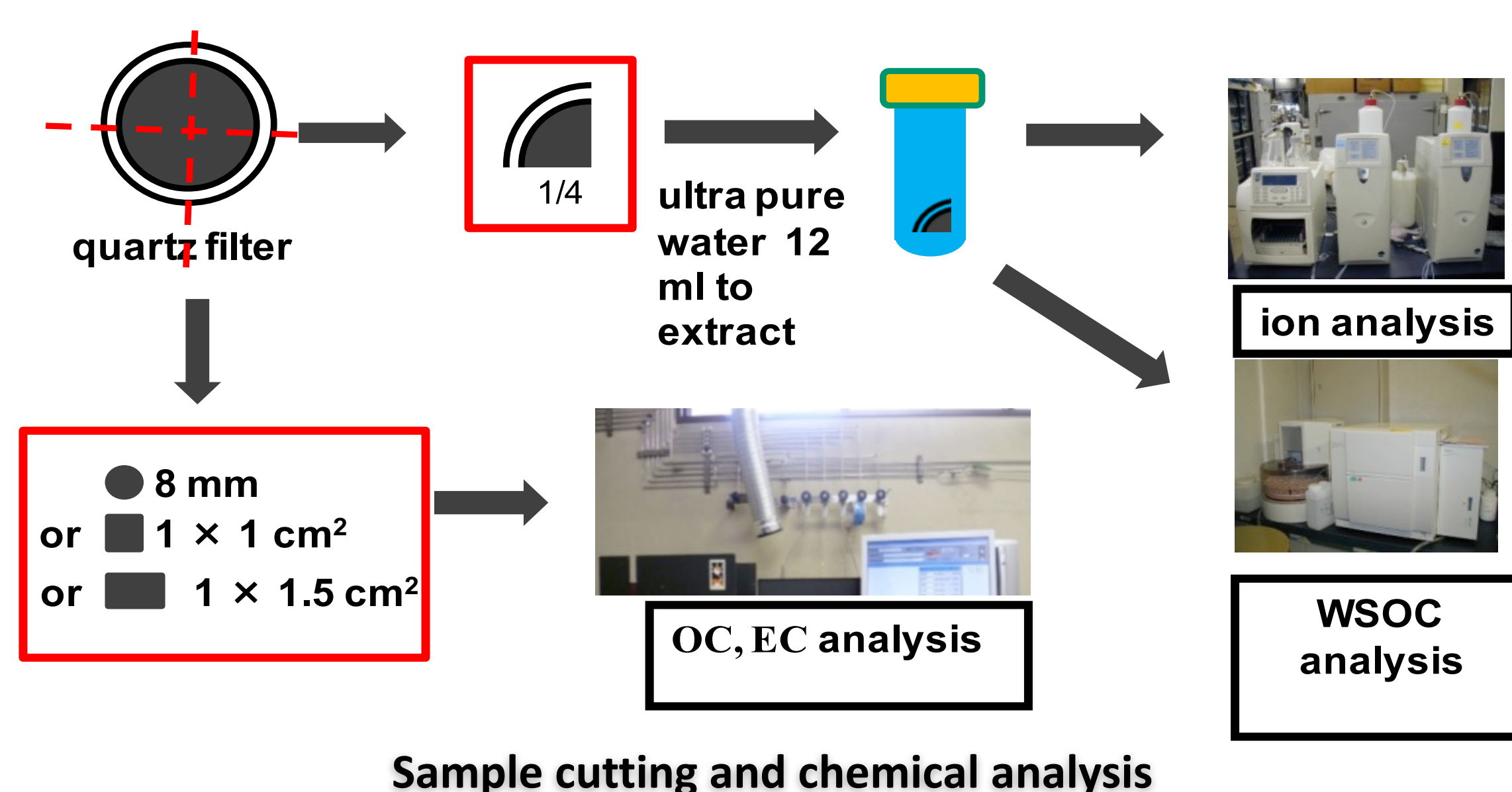
### Sampling period and locations

- Period: March 28-April 3, 2016 (the first major campaign)
- Location: 15-sites in 6-different countries (See Fig.2)
- Duration: 1 - 7 days depending on the PM concentration at each site.

Fig 2. Locations of monitoring sites for the campaign in March-April 2016

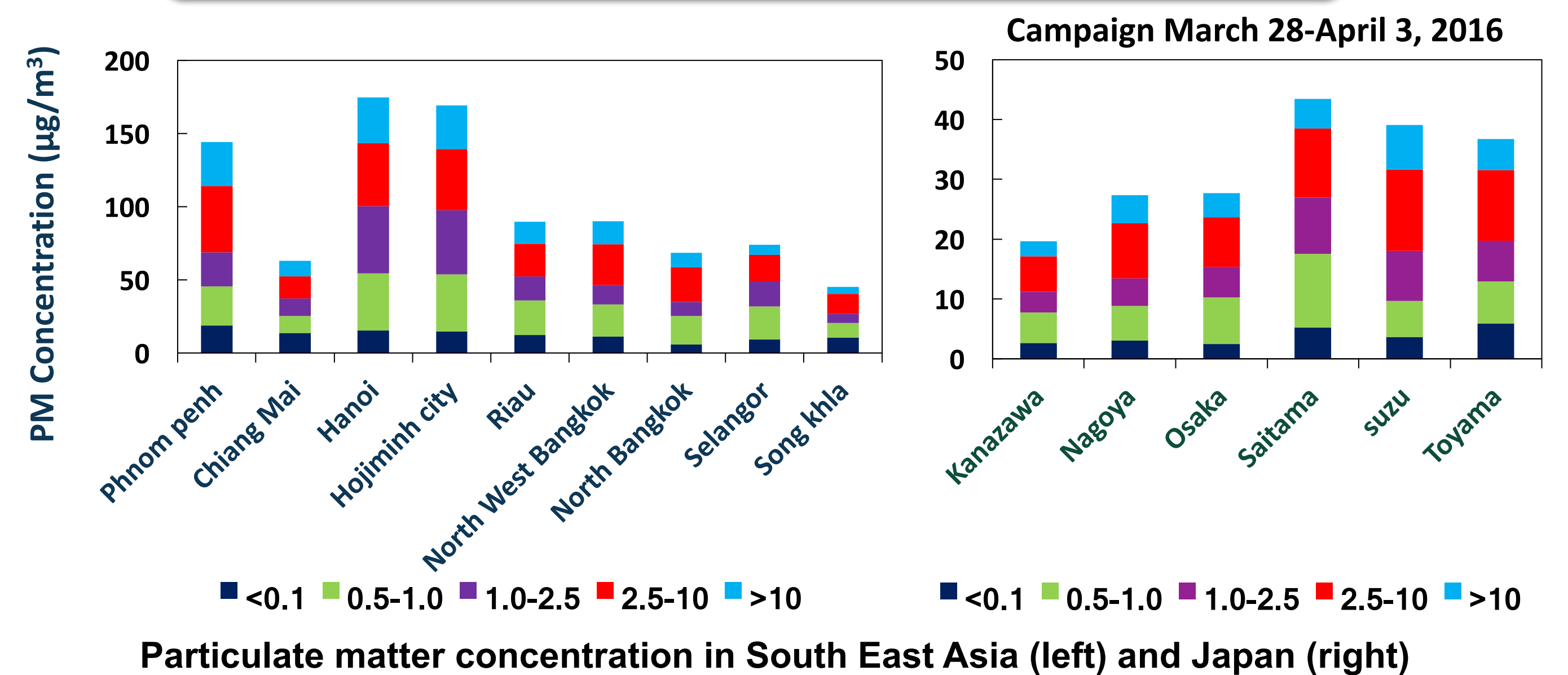
### Analyzed chemicals

- Carbon: elemental carbon (EC, char-EC, soot-EC), organic carbon (OC) using a thermal-optical carbon analyzer (Sunset carbon analyzer) following the IMPROVE-TOR protocol.
- Ions: Cl<sup>-</sup>, NO<sub>3</sub><sup>-</sup>, SO<sub>4</sub><sup>2-</sup>, Na<sup>+</sup>, NH<sub>4</sub><sup>+</sup>, K<sup>+</sup>, Mg<sup>2+</sup>, Ca<sup>2+</sup> using LC
- WSOC: water soluble organic carbon using TOC analyzer
- Organic acids: malonic acid, malic acid, succinic acid and oxalic acid using GC-MS



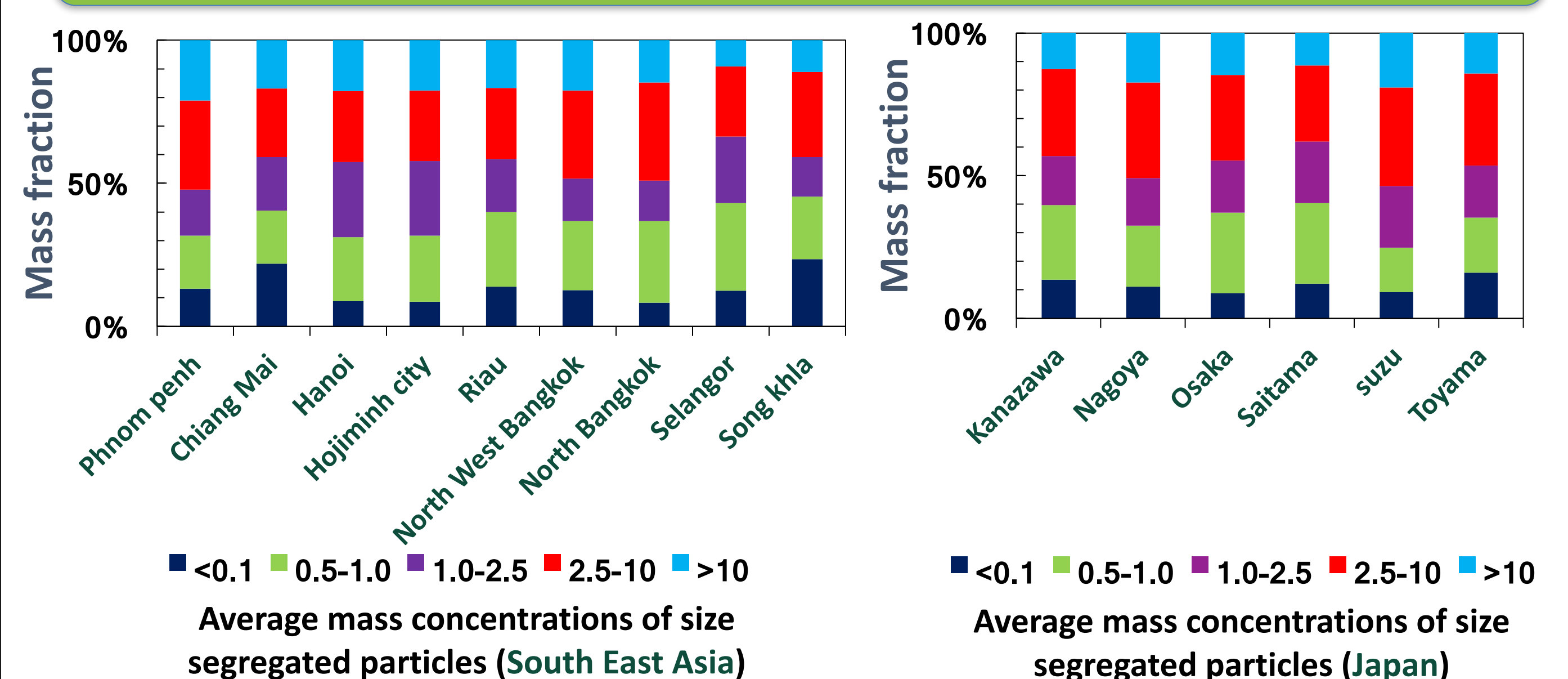
Sample cutting and chemical analysis

## RESULTS AND DISCUSSION

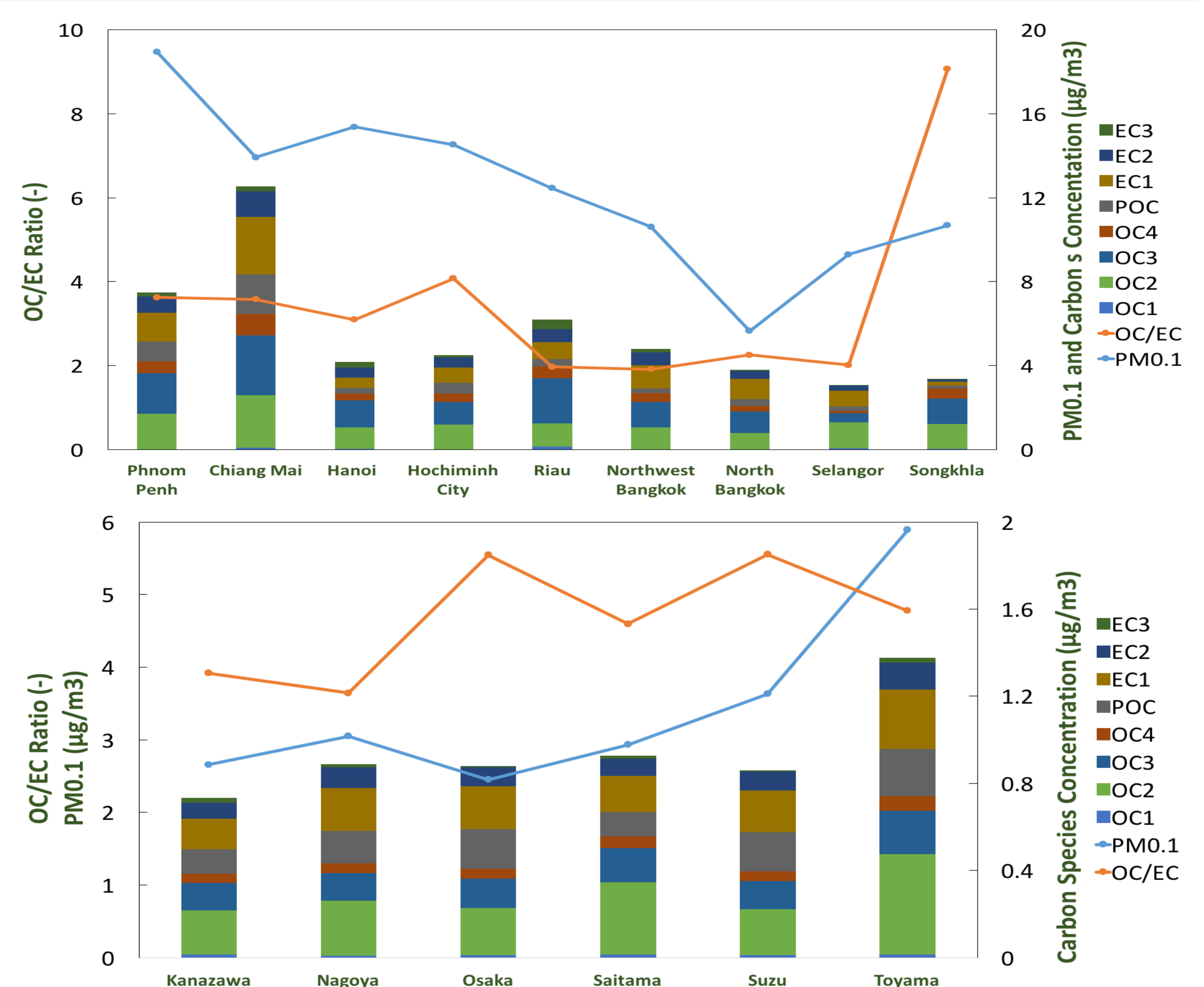


Particulate matter concentration in South East Asia (left) and Japan (right)

- Japan, TSP concentrations in this campaign range from 21.79 – 42.81  $\mu\text{g}/\text{m}^3$ . The highest concentration shown in Saitama. The lowest was Kanazawa.
- SEA found TSP concentrations range from 47.54 – 183.91  $\mu\text{g}/\text{m}^3$ . Vietnam was the highest concentration and the lowest was observed in Songkhla, Thailand.



- PM<sub>0.1</sub> mass concentration ranged 2.7 - 5.9  $\mu\text{g}/\text{m}^3$  in Japan while 5.7 - 18.9  $\mu\text{g}/\text{m}^3$  in Southeast Asian (SEA) countries, or, 2 - 3 times larger in Southeast Asia.
- 2.5 - 10  $\mu\text{m}$  was dominate in Japan and Southeast Asia.



Carbon Species Concentration and OC/EC ratio (South East Asia) and (Japan)

- The concentrations of OC were higher than EC in every site.
- The OC/EC ratios in nano-aerosol at the sampling sites ranged from 1.91 to 9.06. The highest of OC/EC ratio was observed at Songkhla, Thailand (9.06) and the lowest OC fraction was North Bangkok, Thailand (1.91).
- This indicates that sources are soot emissions of domestic fires, industrial and coal power plant emissions, in addition to aged traffic emissions transported
- Characteristics of PM<sub>0.1</sub> will be discussed in detail based also on other chemicals.

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