Workshop on Aerosol Impact in the Environment: from Air Pollution to Climate Change

Seasonal and diurnal variations of carbonaceous aerosols in Bangkok

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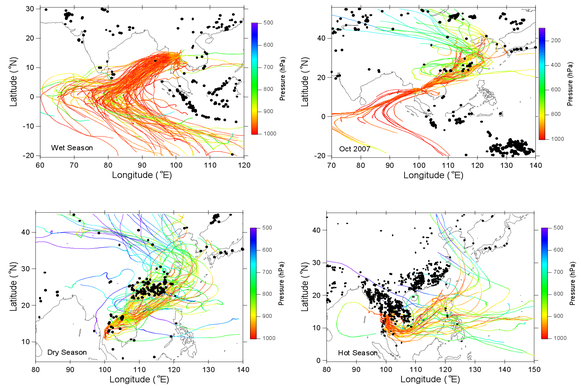
I. Introduction:

Concentrations of BC and OC aerosols were measured in Bangkok during April 2007-March 2008. Emission from automobile vehicles was a major anthropogenic source of aerosols throughout the year, while biomass burning contributed significantly during the hot season. The observation site was influenced by the flow of cleaner oceanic air due to the prevailing southwest monsoon during the wet season. On the other hand, the northeast flow transported from the continental polluted air mainly from China passing through SEA continent territory during the dry season.

II. Measurement Site , Emissions Sources and General circulation

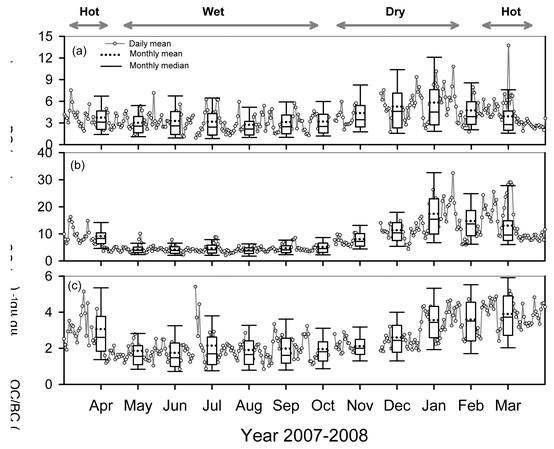


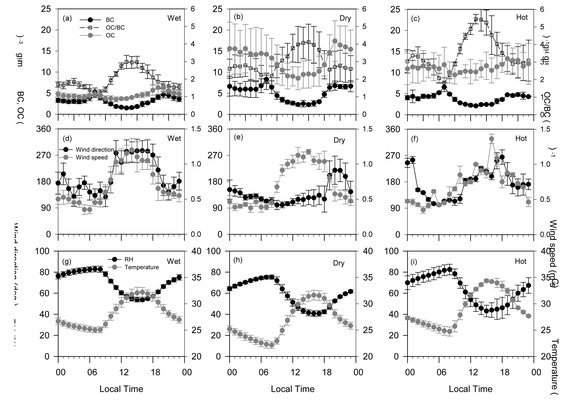
Bangkok, the capital city of Thailand, is situated in the central part of Thailand, in the Chao Phraya River Basin of immediate proximity to the Gulf of Thailand. Economically, Bangkok is one of the most important cities in Southeast Asia (SEA). The Bangkok Metropolitan Region (BMR) covers an area of 7,761.5 km^2 and had a registered population of 11,971,000 as of January 2008. The city often faces serious traffic congestion due to both public and private vehicles there are estimated to be more than 5.4 million vehicles running on the roads of Bangkok city [*DLT*, 2008]. New vehicles registrations in the city have increased by 39% compared to that in the year 2002 (details given at http://www.dlt.go.th/statistics_web/statistics.html).

The measurement site on the campus of the Asian Institute of Technology (AIT, 14.08N, 100.62E), which is in the Pathumthani and is located ~40 km north from the Bangkok city center along the west side of the Phaholyothin road (see Figure 2). This road is important for the northeastern sector connected to Bangkok city. The traffic consists of both gasoline- and diesel- fuelled vehicles.

There are three main seasons, namely wet (May-October), dry (November-February), and hot (March-April), in Thailand [*Pochanart et al*., 2003]. The wet season prevails due to southwesterly (SW) wind flow, and the dry season is due to northeasterly (NE) wind flow. The SW wind flow is associated with the northward movement of the inter-tropical convergence zone (ITCZ) across Thailand which brings cleaner marine air from the southern Indian Ocean. During the dry season, the long-range transport of continental air from different regions of East Asia takes place due to the southward movement of the ITCZ. The observation site is influenced by mixed air masses (marine and continental) during the hot season.

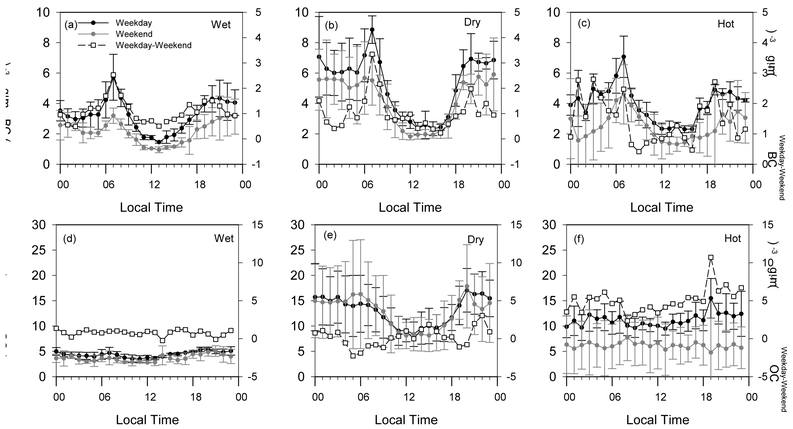
III. Temporal variations of BC and OC aerosols

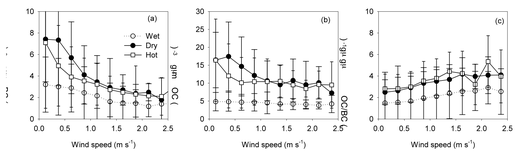




The annual trends of both BC and OC aerosols show clear seasonality, with the lowest concentrations in the wet season and highest in the dry season. The average concentrations of BC were 3.0±1.2 μg m^{-3} and 4.3 ± 1.3 μg m^{-3} in the wet and dry seasons, respectively. The concentrations of OC were 5.3±2.0 μg m^{-3} and 13.1 ± 5.8 μg m^{-3} in the wet and dry seasons, respectively. In the wet season, the concentrations of aerosols emitted from local sources were diluted due to the flow of cleaner air from the Indian Ocean and wet removal. In the dry season, the long-range transport of pollutants mainly from China added to the local emissions, resulting in the highest concentrations of BC and OC aerosols. In spite of the highest activities of biomass burning in the hot season, moderate levels of BC of 3.8 μg m^{-3} and OC of 11 μg m^{-3} were due to the mixing with cleaner Pacific air masses. However, the highest average ratio of OC/BC of 3.8 μg μg^{-1} observed in the hot season confirms the predominant contributions from biomass burning sources.

IV. Relationship between aerosols and local meteorology and Weekend Effects





Acknowledgments

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