Yale 耶鲁大学-南京信息工程大学大气环境中心

Yale-NUIST Center on Atmospheric Environment

Atmospheric Chemistry and Physics

A discussion on the paper "Primary and secondary organic carbon downwind of Mexico City".

IF:5.053

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Outline

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1 Background

- The proportion of carbon aerosols in aerosol is high, they have an important impact on the global climate change, radiation, visibility, environmental quality and human health.

- Carbon components in the aerosols are mainly organic carbon (OC) and elemental carbon (EC), and the total carbon (TC) can be considered as the sum of OC and EC.

- OC is mainly derived from organic compounds and photochemical reactions, EC is mainly produced by combustion.

2 Introduction

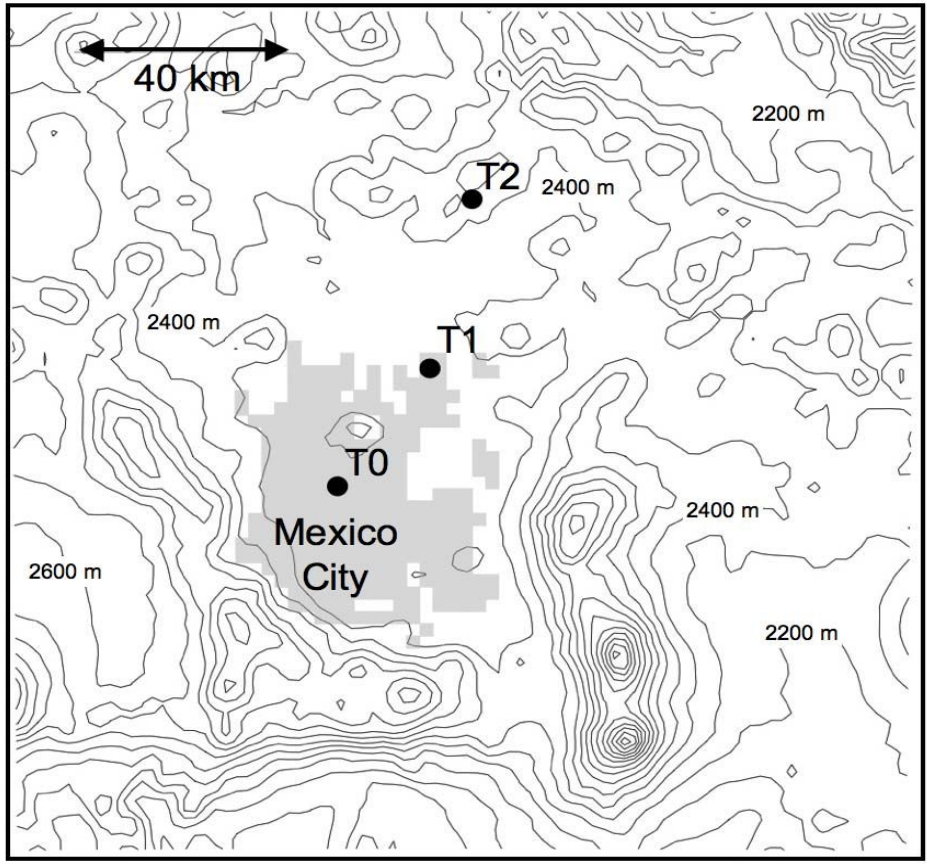
- The Megacity Initiative: Local and Global Research Observations (MILAGRO) project took place in the Mexico City area in March 2006.

- The experiment in this paper is a little part of the MILAGRO and its focus is on the chemical characteristics of carbon species at suburban T1 and rural T2.

- The potential emission sources of OC, EC, primary organic carbon (POC), and secondary organic carbon (SOC) at T1 and T2 are also be investigated.

3 Experimental and Measurements

Field site



In order to study particulate matter transport and transformation in the Megacity environment, fine particulate carbon was measured simultaneously at two supersites, suburban T1 and rural T2, downwind of Mexico City during the MILAGRO field campaign in March 2006.

Fig. 1. Site map showing T0, T1, and T2 in relation to Mexico City.

3 Experimental and Measurements

Instrumentation and Measurement

1. Aerosol sampling stacks and inlets were used to collect particles smaller than 2.5 μm.

2. Two semi-continuous Sunset OCEC analyzers (Model 3F,Sunset Laboratory Inc., Portland, OR) were used to measure OC and EC mass loadings at the T1 and T2 sites.

3. The boundary layer height was determined by the 915MHz radar wind profiler (RWP) operated by the Argonne National Laboratory.

4. Trace gases measurements including carbon monoxide (CO), ozone (O_3), sulfur dioxide (SO_2), and nitrogen oxides including nitric oxide (NO), nitrogen dioxide (NO_2), and NO_x (NO_x=NO+NO_2) were provided by the University of California, Berkeley.

4 Results and discussion

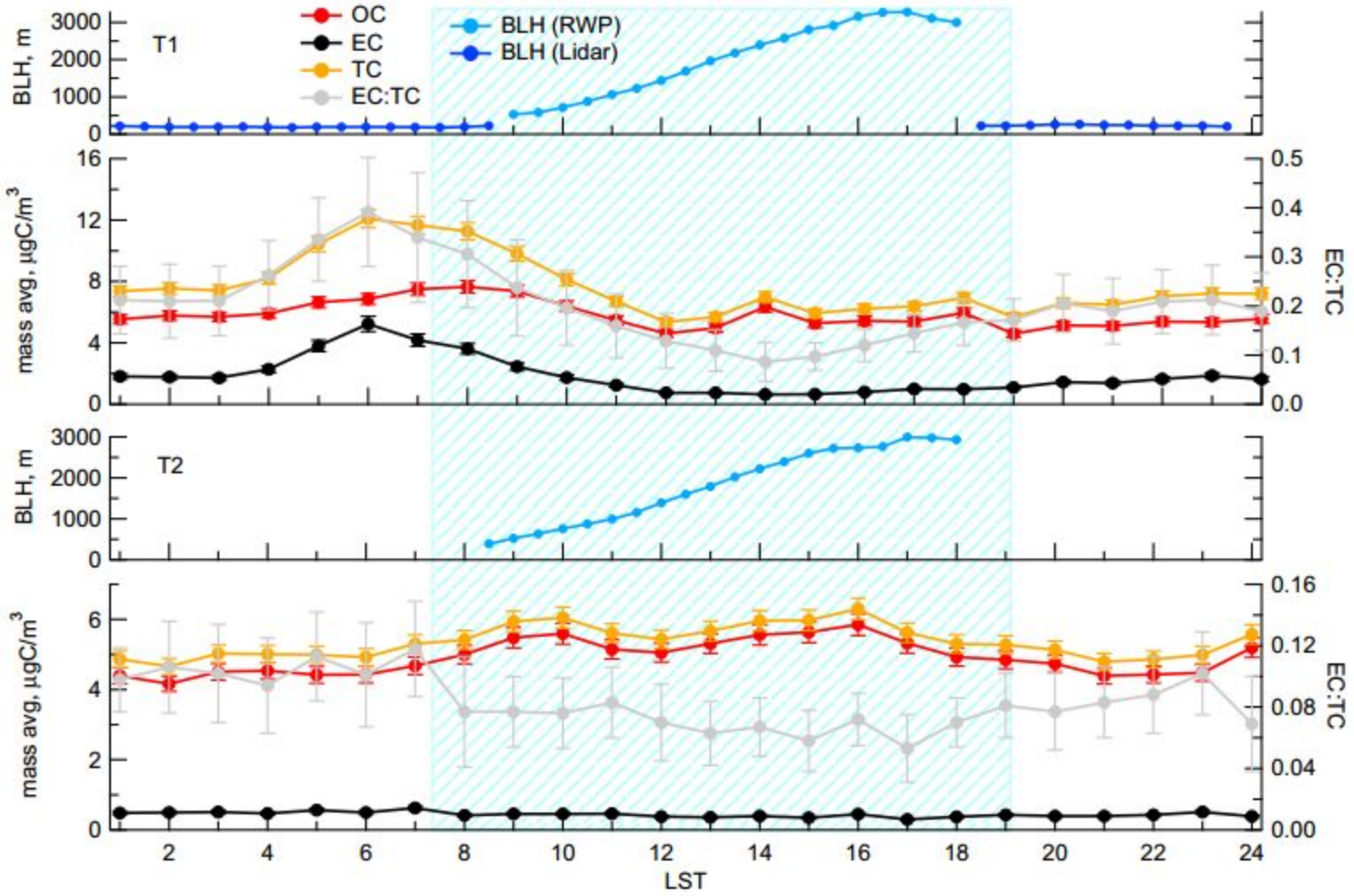


Fig. 2. Hourly-averaged Thermal OC, Thermal EC, TC, Thermal EC:TC ratio, and boundary layer height at T1 and T2 during the entire campaign.

4 Results and discussion

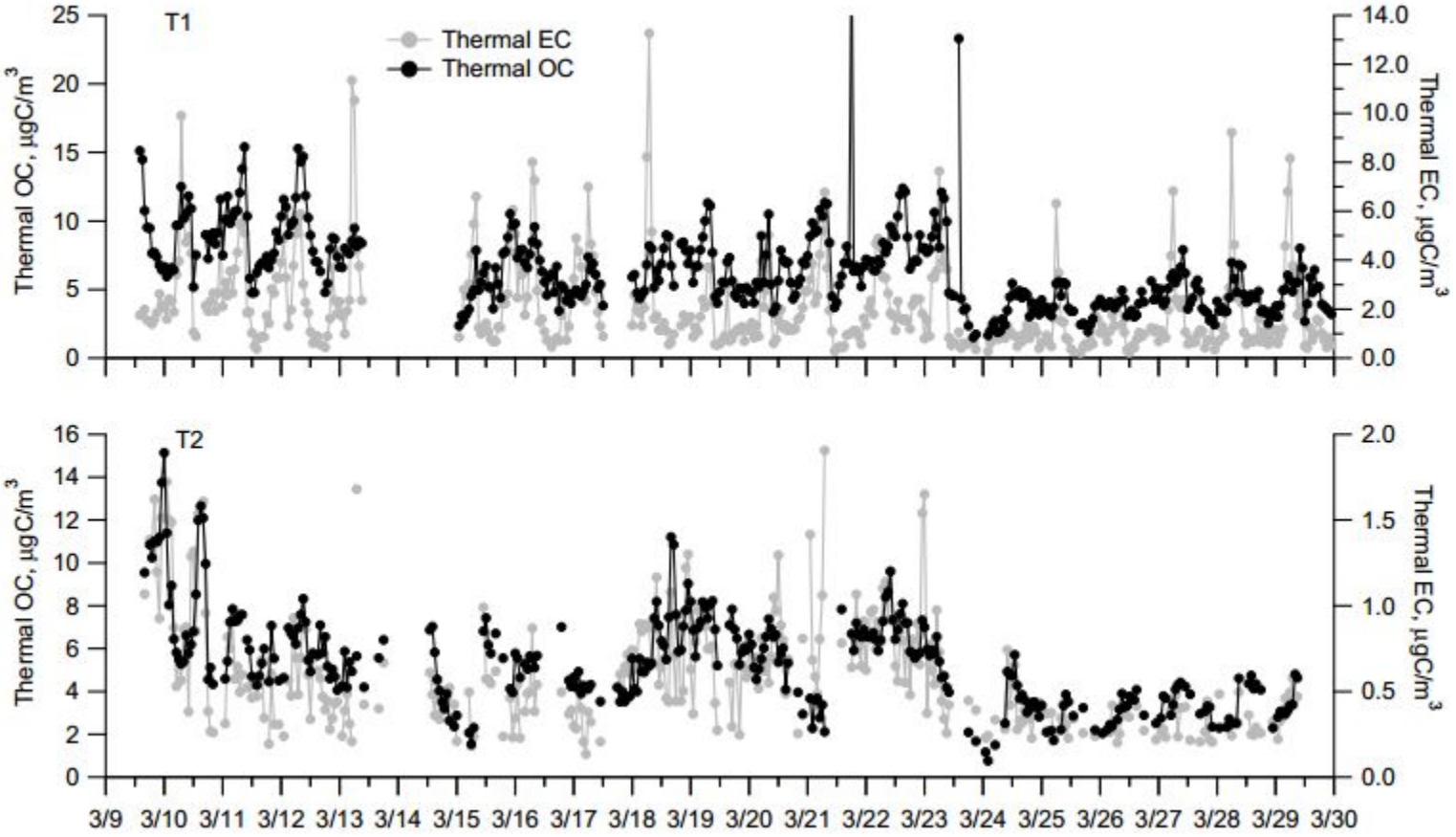


Fig. 3. Time series of Thermal OC (black dots) and Thermal EC (light grey dots) at T1 and T2 sites.

4 Results and discussion

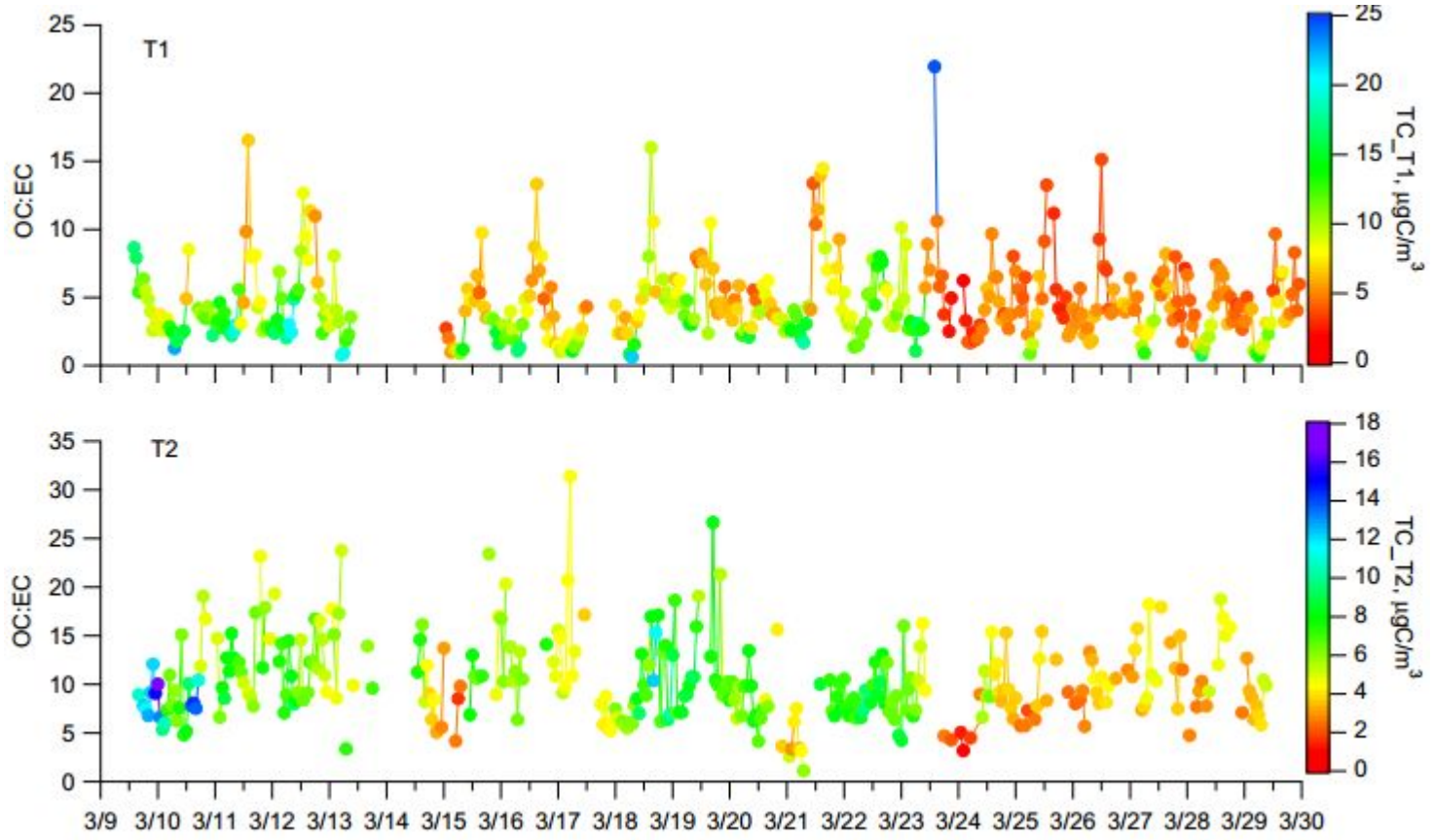


Fig. 4. Time series of the ratios of Thermal OC to Thermal EC at T1 and T2. The data are shaded as a function of TC mass loading at each site.

4 Results and discussion

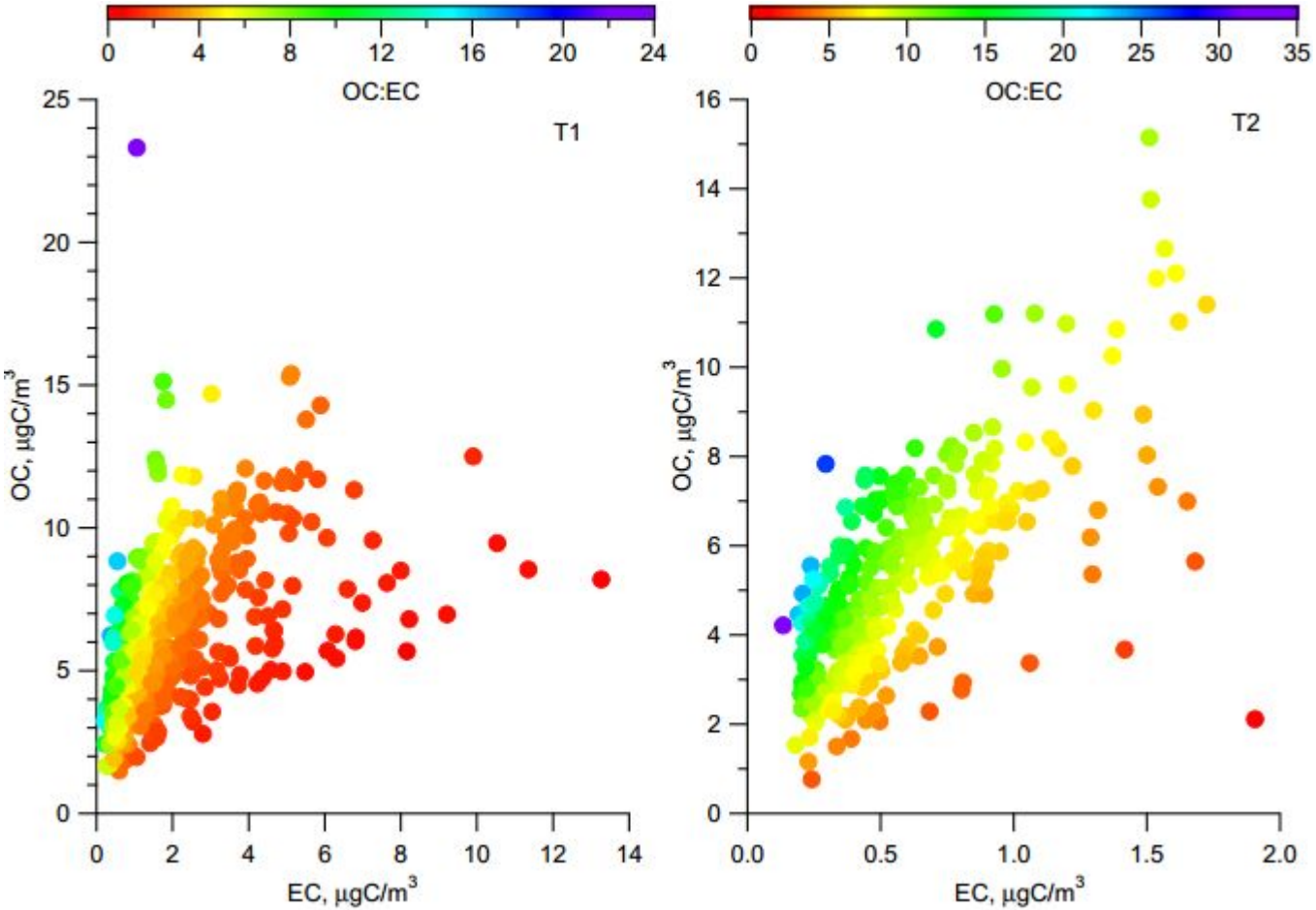


Fig. 5. Scatter plots of OC vs. EC at T1 (left panel) and T2 (right panel), respectively. The data points are color coded as a function of the OC to EC ratio.

4 Results and discussion

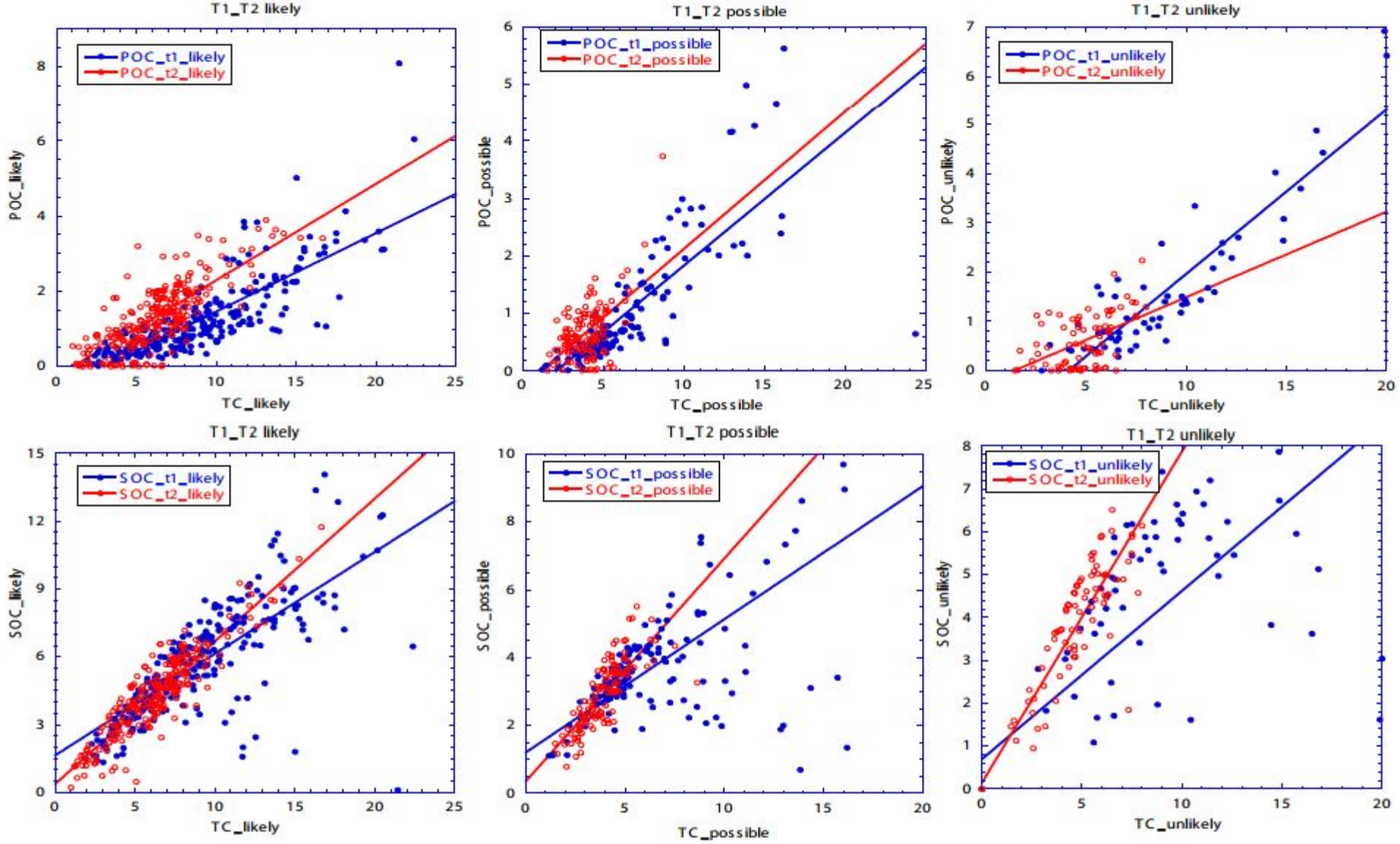


Fig. 6. Scatter plots of SOC vs. TC and POC vs. TC during the three transport scenarios between T1 to T2, transport likely, possible, and unlikely dates.

4 Results and discussion

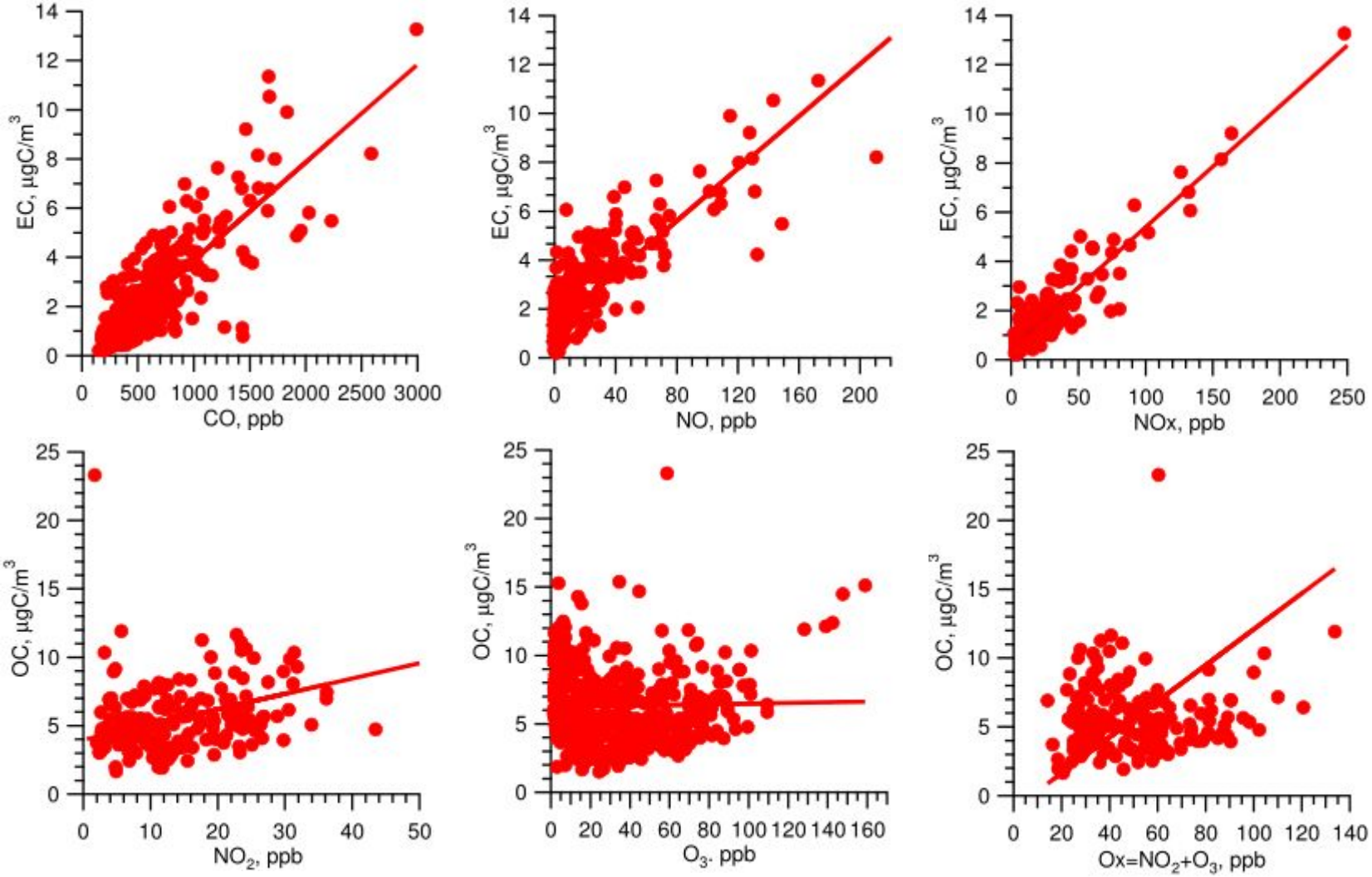


Fig. 7. Scatter plots of EC vs. CO, EC vs. NO, EC vs. NO_x (NO_x=NO+NO_2) and OC vs. NO_2, OC vs. O_3, and OC vs. O_x (O_x=NO_2+O_3) at T1.

4 Results and discussion

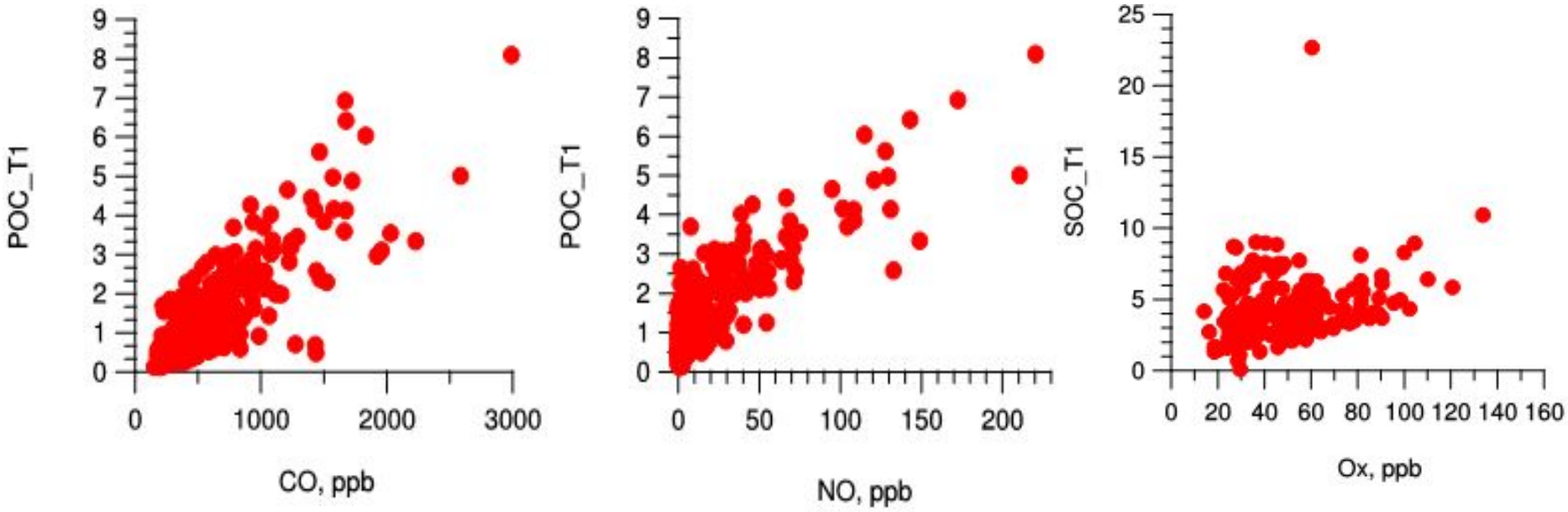


Fig. 8. Scatter plots of POC vs. CO, POC vs. NO, SOC vs. O_x respectively at T1.

5 Conclusions

- High OCEC mass loadings were observed in the downwind of Mexico City. Higher OC and EC were observed at T1 than at T2. The emissions at T1 was possibly from the nearby highways and local traffic.

- Higher proportion of secondary aerosols were inferred at T1 than at T2 according to the OC to EC ratios.

- Strong similarities of SOC and POC between T1 and T2 under transport favorable conditions indicate that particle transport occurred.

- Strong correlations of EC and POC vs. CO, NO respectively were observed, indicating the local traffic is a main emissions. Correlations were also seen between OC and SOC vs. the sum of O_3 and NO_2 , confirming the secondary nature of OC observed at T1 and the realiability of the EC-tracer method.

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Thank you for your attention!