

Response to the Comments of the Reviewers

Evaluating Vehicle Emission Control Policies using on-Road Mobile Measurements and Continuous Wavelet Transform: a Case Study during the Asia-Pacific Economic Cooperation Forum, China 2014

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We thank the reviewers for their helpful comments. We have revised the manuscript according to their suggestions and respond to their concerns below.

Reviewer #3:

Major Comments:

1. The article title clearly reflects the authors' focus on evaluating the efficacy of vehicle emission controls by using the mobile measurement results. They reported the emission reductions of CO and NO_x (i.e., 28% and 16% for the APEC period compared with those before the event) in the abstract and conclusion sections. I doubt the accuracy of the results for several major technical issues. First, as the author noted in L358 to 361, a considerable fraction of direct emissions from on-road vehicles attribute to the accumulative concentrations (e.g., on-road background, which is derived by using the CWT method). Thus, the variations in instantaneous concentrations may not represent the variations in vehicle emissions. Second, this manuscript has not addressed the link between vehicle emissions and concentrations of air pollutants, which may be affected by a series of complex conditions (e.g., meteorological conditions, traffic conditions that impact the turbulence in micro environment). Even including the fraction of vehicle emissions owing to the on-road background concentration, I am afraid that the change of concentrations may be not strictly equal to the change of vehicle emissions. Third, the authors conducted the on-road sampling only on one road. Therefore, it is not sufficiently representative of all roads in the city of Beijing. For example, the local roads in the downtown area should be more influenced by the traffic variations of passenger vehicles, while the traffic corridors in the outskirts (e.g., high ways outside the 4th Ring Rd) would be relatively more associated with the traffic variations of diesel vehicle fleets. If without the results for other types of roads in Beijing, I suggest the authors restrict the within the scope of 4th Ring Rd and amend the current statements in abstract and conclusion sections.

Response to Reviewer comment No. 1: Agree. We also think of the reviewer's worry.

Our method cannot decompose the real vehicle emission from mobile measure signal as we noted. We just decomposed the “instantaneous concentration” part which should be have close link with the real vehicle emission. Strictly, the 4th Ring Road measure results cannot represent all roads in the city of Beijing.

2. Black carbon (BC) is one key pollutant that well reflects the emission contribution from diesel vehicles. I disagree with the authors on the traffic contribution to BC concentrations (e.g., L333 to 358). For example, previous studies have found higher BC levels in traffic environment than background. One source apportionment study using one site near 4 Ring Rd indicated that the traffic contribution of elementary carbon concentrations was higher than other sources like coal and biomass burning (ES&T, 2015, 49, 8408-8415). Instead, I do feel the coarse time resolution of BC measurement (1-min sampling) might be an important cause of the less significant pikes of BC than CO and NO_x. Therefore, I suggest the relevant statement be revised, and the limitation should be noted.

Response to Reviewer comment No. 2: First, we agree that traffic emission is a main contributor of on-road BC concentration. Besides, we found the on-road BC concentration increased 159% from November 8 relative to November 10 in night-time measure, and on-road CO and NO_x increased 52% and 6%, respectively. The quick increase of on-road BC should be contribute by unorganized coal burning in night-time. Also, time resolution is an important limitation of BC concentration analyze.

3. The authors present the meteorological data during three periods in the manuscript. However, this section may be not so close to the main objective of this study. I wonder whether the CWT method can derive instantaneous concentrations by eliminating or reducing the short-term effects from various metrological conditions. If so, the manuscript can be enhanced by providing more links between the meteorological data and the results derived by using the CWT method.

Response to Reviewer comment No. 3: CWT method can reducing effects from part of metrological conditions, like breeze, relative humid and temperature. But this method cannot eliminating all metrological conditions, like gale.

Special Comments:

1. L 21 to23: Why the authors consider vehicle emission controls implemented during the APEC summit week were the strictest ever in China, just because the implementation included regions outside Beijing? Using the odd-even policy as an example, the implementation period during the 2008 Olympic Games was throughout 24 hours; however, this restrictive policy was implemented from 3 am to 0 am during the 2014 APEC summit. (similar comments on L 148)

Response to Reviewer comment No. 1’: The vehicle emission controls basically similar with the 2008 Olympic Games, also the implemented time (Wang et al., 2009). Besides, surround cities (such as Tianjin, Shijiazhuang and Jinan) also implement vehicle emission control policy.