Supplement of

Using wavelet transform to analyse on-road mobile measurements of air pollutants: a case study to evaluate vehicle emission control policies during the 2014 APEC summit

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Figure S1. The commonly used mother wavelet functions and the "dbN" family wavelet functions used in this study.
Figure S2. The original decomposition results of the WTM using db6 and eight decomposition levels for 6 November 2014. NO is the on-road mobile measurement concentration, aNO is the decomposed signal representing the trend in the background, and $d = (d_1 + d_2 + ... + d_8)$ is the decomposed signal representing trends in vehicle emissions. $d_1$–$d_8$ are the decomposed signals representing variations at different frequencies.
Figure S3. Moving the decomposed result of the WTM by taking REF_line as the reference line (example data from 8 November 2014). The black line represents the original measured on-road NO concentrations, the red line represents original high-frequency concentrations decomposed by the WTM, and the blue line represents original low-frequency concentrations decomposed by the WTM. The purple dotted line represents a moving reference line, which is a 5 min moving minimum of line “d”. The orange line represents C_{bg} and was obtained by adding “aNO” to “REF_line”, and the cyan line represents C_{veh} and was obtained by subtracting “REF_line” from “d”. The principle of the selection of the REF_line is to keep the original shape of “aNO” and “d” but avoid negative values as much as possible.

Figure S4. Correlations between the on-road emission concentrations (i.e. C_{veh}) obtained by the wavelet transform method (WTM) and the moving low percentile method (MLPM) in each day for NO, NO_{x}, BC, CO, SO_{2}, and O_{3}. The blue line shows the linear fit curve and the gray area is the 95% confidence interval.
Figure S5. Correlations between the on-road background concentrations (i.e. $C_{bg}$) obtained by the wavelet transform method (WTM) and observations at the PKU site in each day for NO, NO$_x$, BC, CO, SO$_2$, and O$_3$. The blue line shows the linear fit curve and the gray area is the 95% confidence interval.
| Date (MM/DD_Night, Day) | Start time<sup>a</sup> (hh:mm) | End time<sup>b</sup> (hh:mm) | Driving duration<sup>c</sup> (h) |
|------------------------|-------------------------------|-------------------------------|-----------------------------|
| 10/28_Day              | 10:17                         | 11:55                         | 1.63                        |
| 10/29_Day              | 09:52                         | 11:20                         | 1.47                        |
| 10/30_Day              | 20:06                         | 21:13                         | 1.12                        |
| 10/31_Day              | 10:09                         | 11:28                         | 1.32                        |
| 11/01_Day              | 09:53                         | 11:18                         | 1.42                        |
| 11/02_Day              | 09:56                         | 11:24                         | 1.46                        |
| 11/03_Day              | 10:05                         | 11:17                         | 1.20                        |
| 11/04_Night            | 00:58                         | 02:06                         | 1.13                        |
| 11/04_Day              | 09:56                         | 11:29                         | 1.55                        |
| 11/05_Night            | 00:58                         | 02:12                         | 1.23                        |
| 11/05_Day              | 09:56                         | 11:10                         | 1.23                        |
| 11/06_Night            | 01:10                         | 02:22                         | 1.20                        |
| 11/06_Day              | 09:58                         | 11:10                         | 1.20                        |
| 11/07_Night            | 01:04                         | 02:05                         | 1.02                        |
| 11/07_Day              | 09:58                         | 11:08                         | 1.17                        |
| 11/08_Night            | 00:56                         | 02:05                         | 1.15                        |
| 11/08_Day              | 09:58                         | 11:12                         | 1.23                        |
| 11/09_Night            | 00:58                         | 02:07                         | 1.15                        |
| 11/09_Day              | 09:58                         | 11:07                         | 1.15                        |
| 11/10_Night            | 00:59                         | 02:07                         | 1.13                        |
| 11/10_Day              | 09:59                         | 11:08                         | 1.15                        |
| 11/11_Night            | 00:59                         | 2:09                          | 1.17                        |
| 11/11_Day              | 10:01                         | 11:12                         | 1.18                        |
| 11/12_Night            | 00:59                         | 02:11                         | 1.20                        |
| 11/12_Day              | 09:58                         | 11:06                         | 1.13                        |
| 11/13_Night            | 00:58                         | 02:08                         | 1.17                        |
| 11/13_Day              | 09:57                         | 11:18                         | 1.35                        |
| 11/14_Night            | 00:58                         | 02:08                         | 1.17                        |
| 11/14_Day              | 09:57                         | 11:45                         | 1.80                        |
| 11/15_Night            | 00:58                         | 02:08                         | 1.17                        |
| 11/15_Day              | 10:00                         | 11:28                         | 1.47                        |
| 11/16_Night            | 00:58                         | 02:10                         | 1.20                        |
| 11/16_Day              | 10:02                         | 11:19                         | 1.28                        |
| 11/17_Night            | 00:58                         | 02:08                         | 1.17                        |
| 11/17_Day              | 09:57                         | 11:29                         | 1.53                        |
| 11/18_Night            | 00:59                         | 02:08                         | 1.15                        |
| 11/18_Day              | 10:03                         | 12:03                         | 2.00                        |
| Date     | Start Time | End Time | Duration |
|----------|------------|----------|----------|
| 11/19_Night | 00:58      | 02:06    | 1.13     |
| 11/19_Day  | 09:57      | 11:16    | 1.32     |
| 11/20_Night| 00:59      | 02:09    | 1.17     |
| 11/20_Day  | 09:57      | 11:38    | 1.68     |
| 11/21_Night| 00:58      | 02:10    | 1.2      |
| 11/21_Day  | 10:02      | 11:59    | 1.95     |
| 11/22_Night| 00:58      | 02:06    | 1.13     |

*Start-time is when the monitoring vehicle entered the 4th Ring Road.

*Start-time is when the monitoring vehicle left the 4th Ring Road.

*Driving duration is the length of time when the monitoring vehicle driving along the 4th Ring Road.*