*Supplement of*

**Exploring the variations in ambient BTEX in urban Europe and its environmental implications**
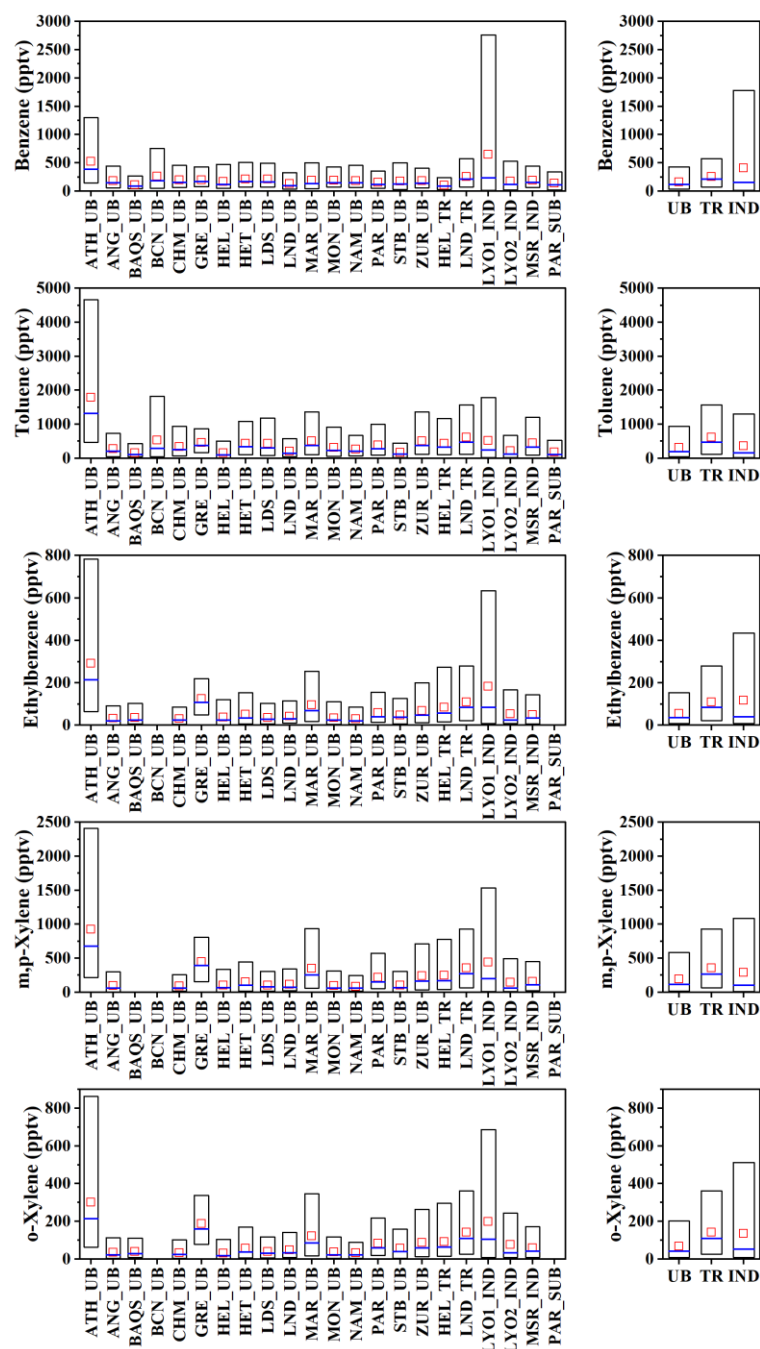
***Figure S1***. *Comparison of BTEX mixing ratios in ambient air between monitoring sites (left panel) and different types sites (UB, urban background; TR, traffic; IND, industry, right panel) during 2017-2022 (but HEL_UB only during February 2016 and ATH_UB only 2016-2017). The box represents the 5th–95th percentiles of ratios. The middle line and middle square represent the median and mean values of ratios, respectively. Blank means without available measurement data.*

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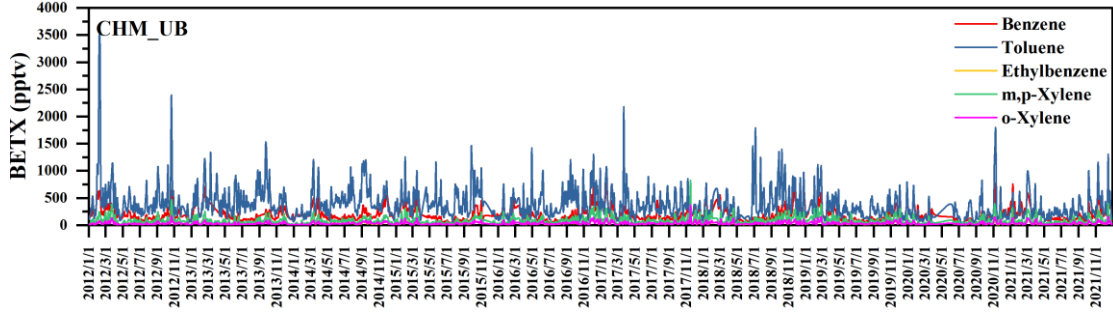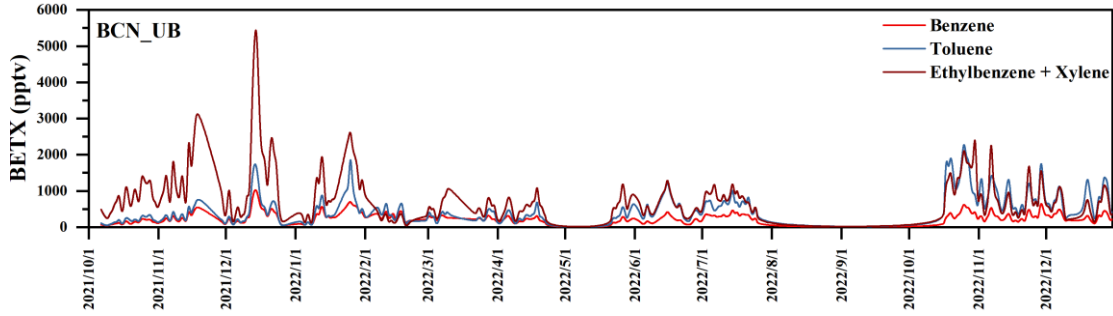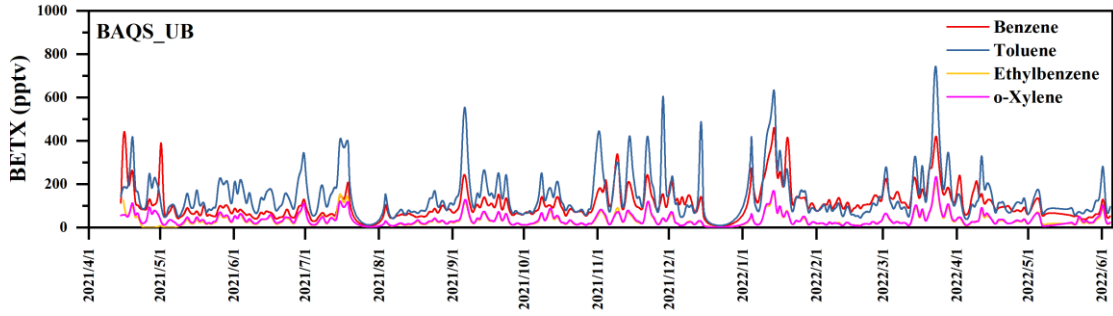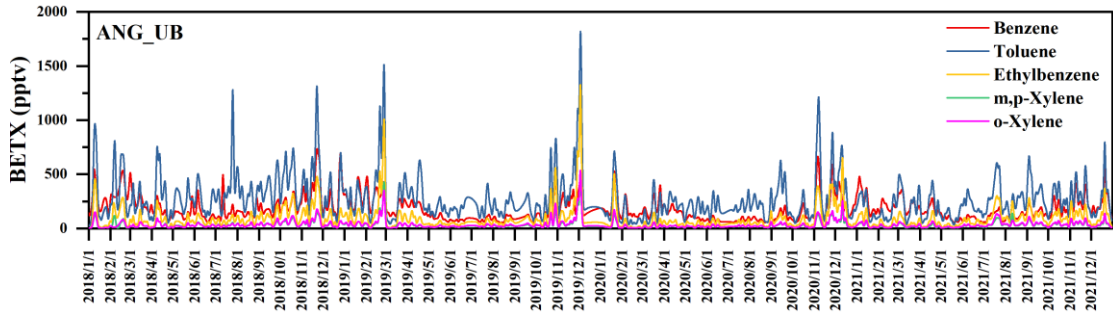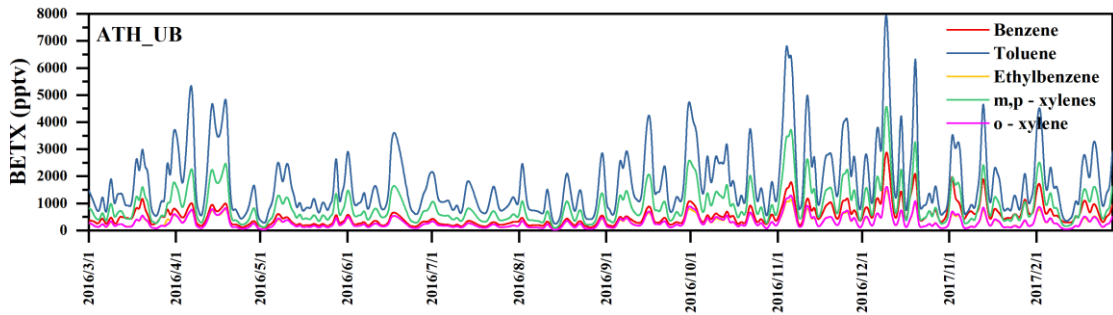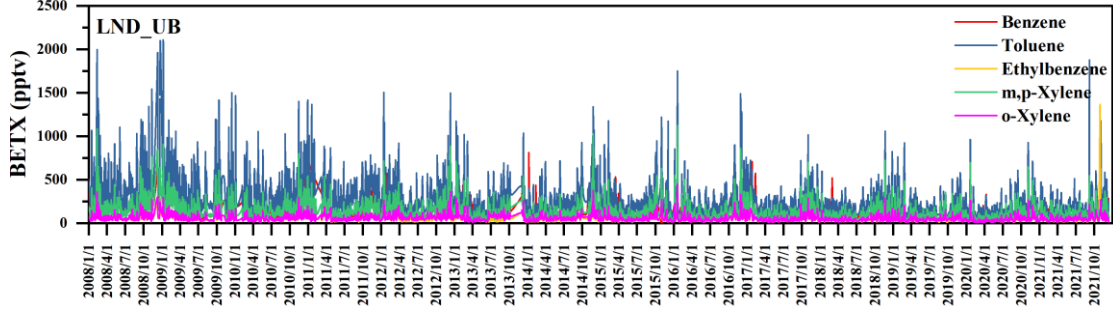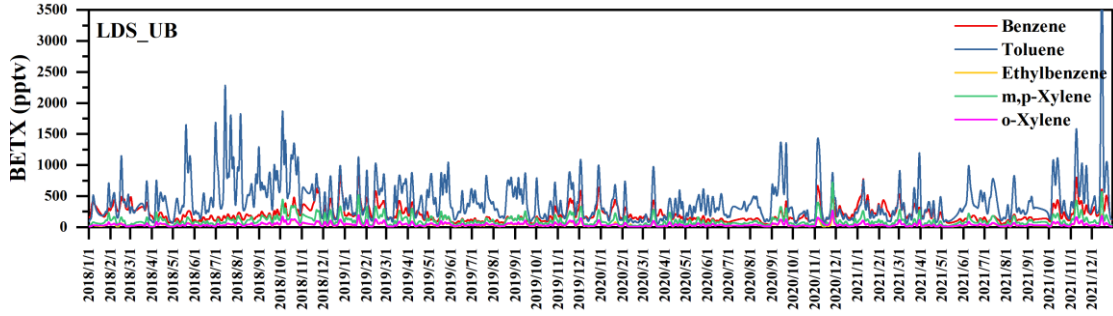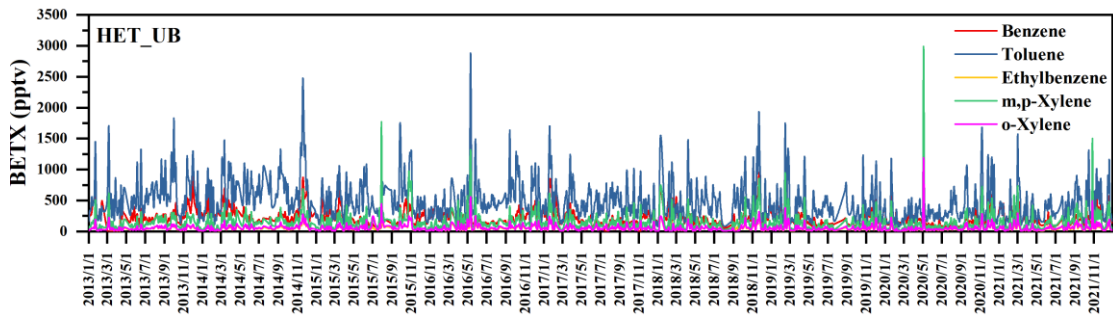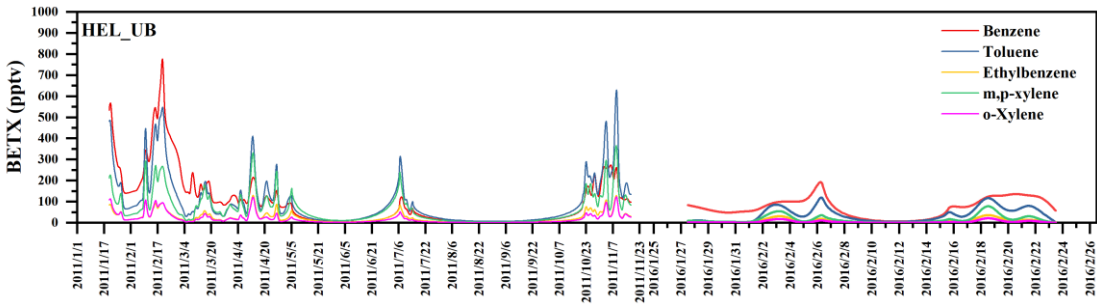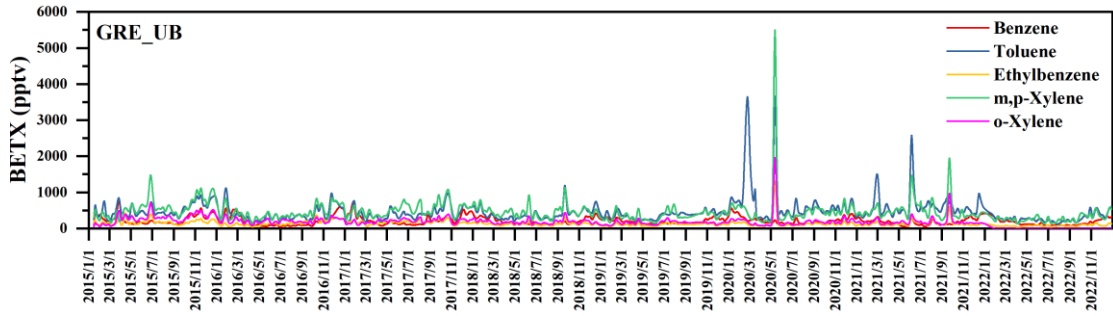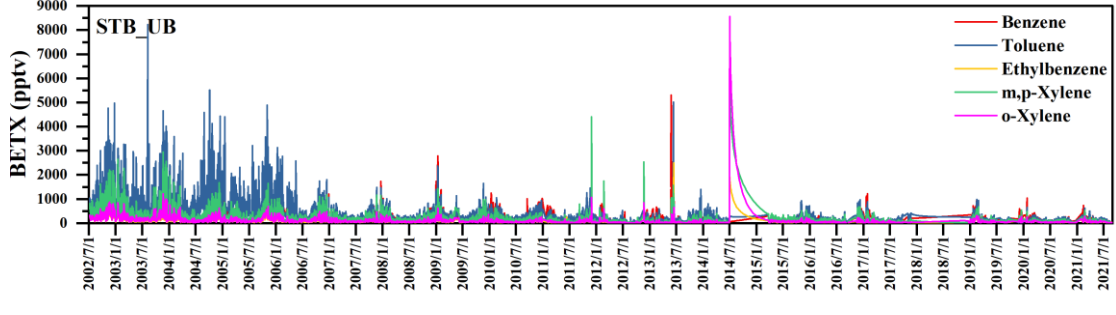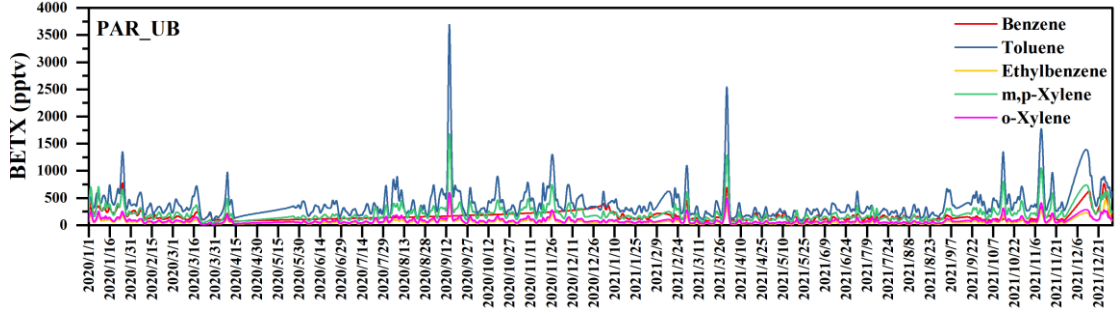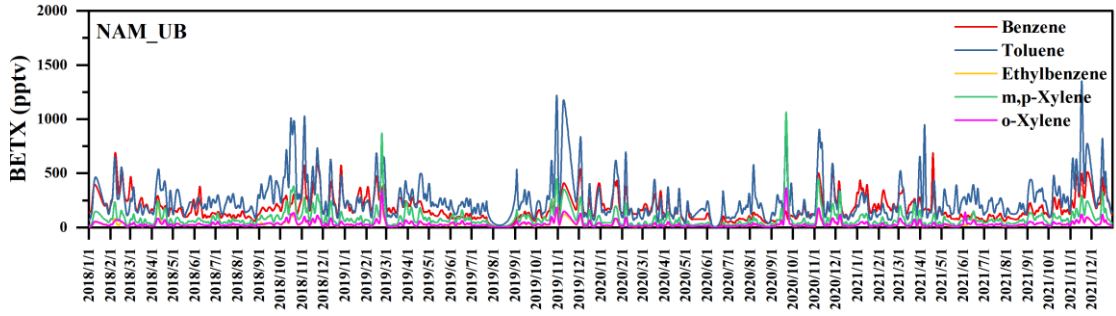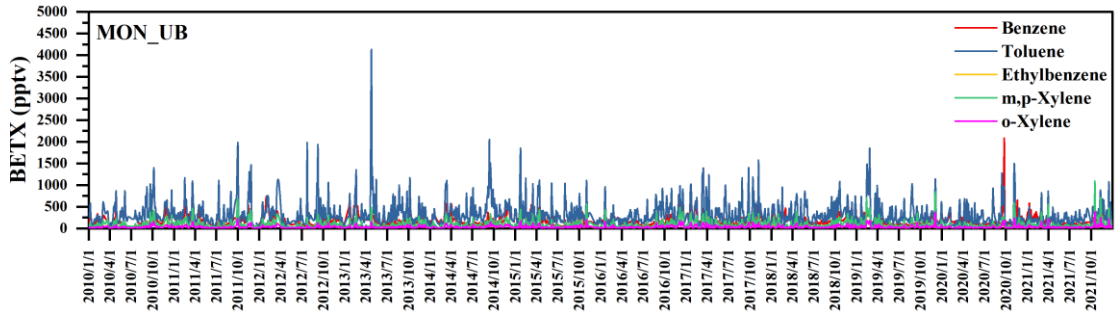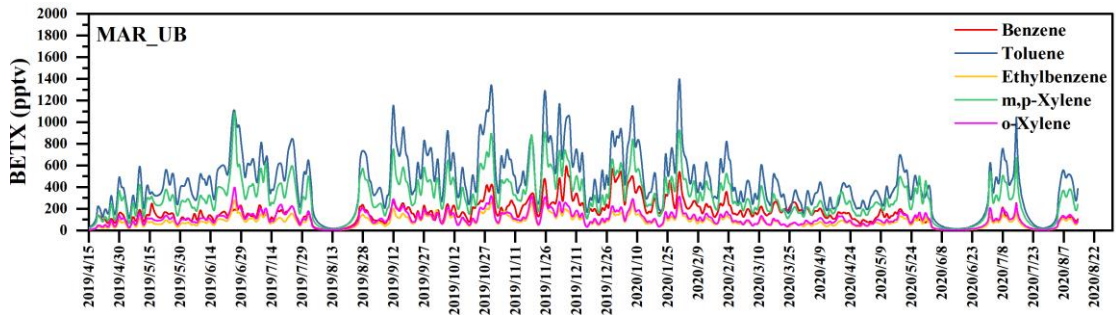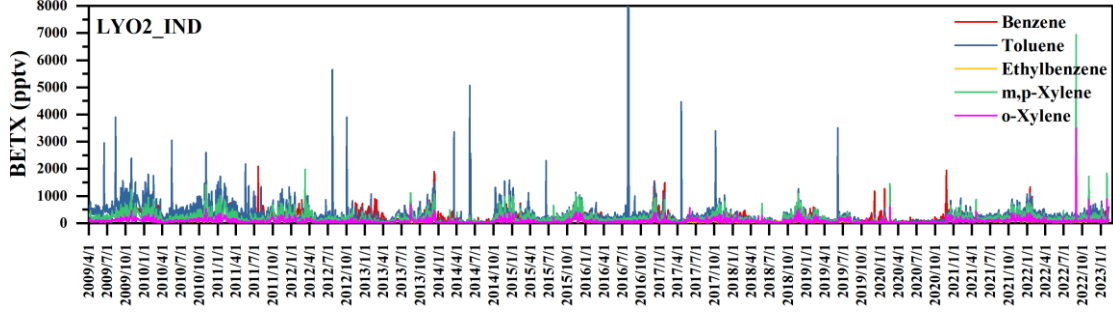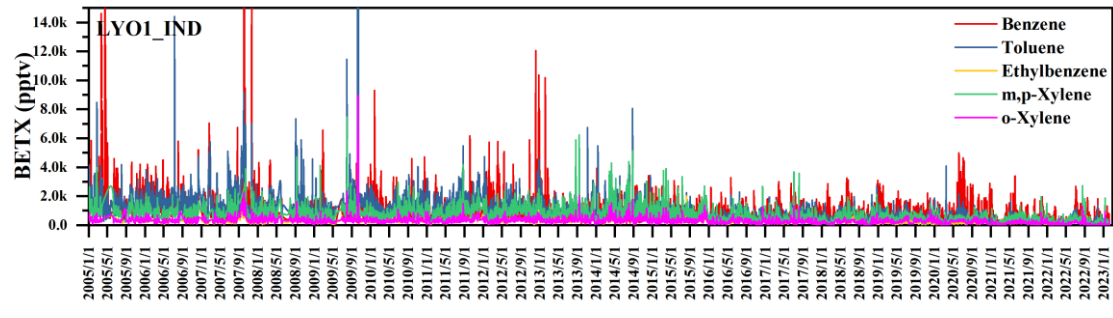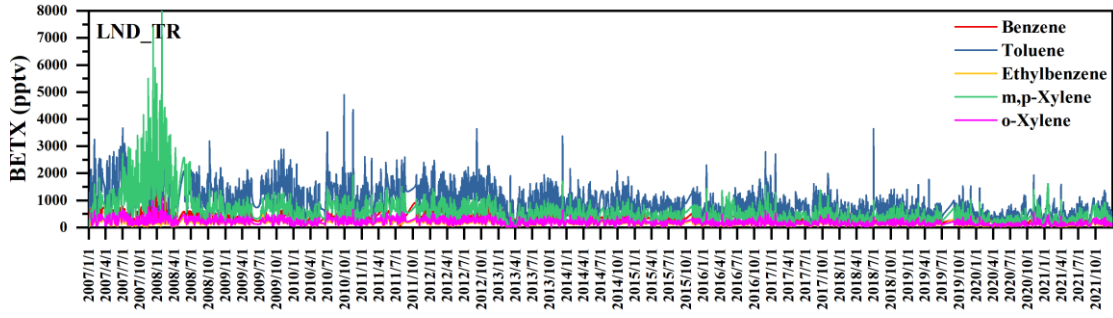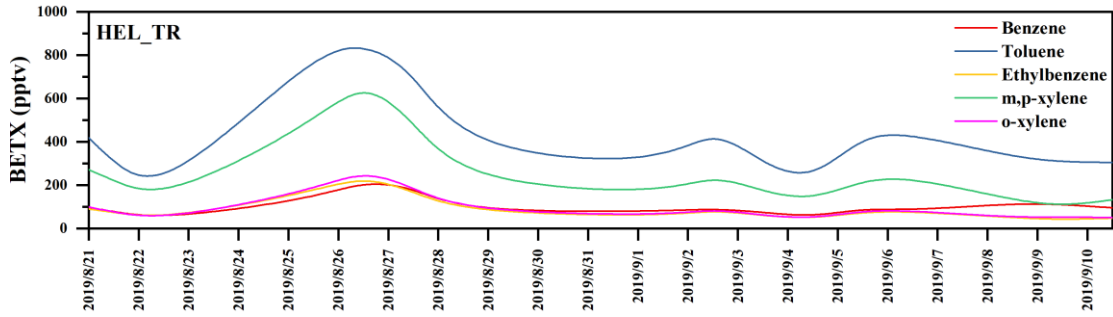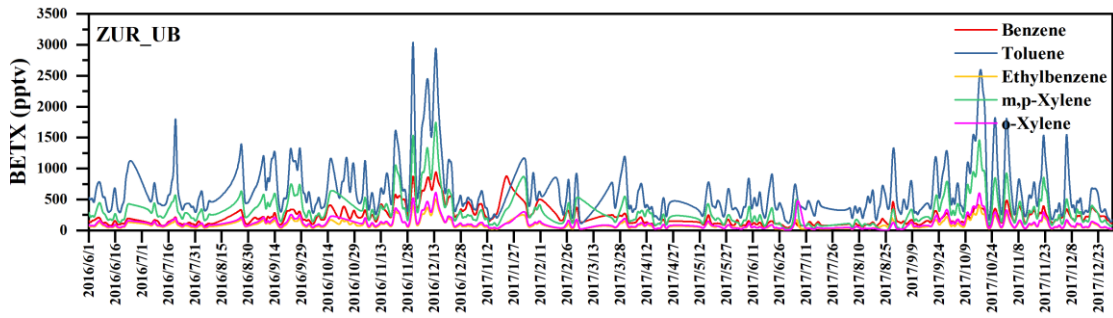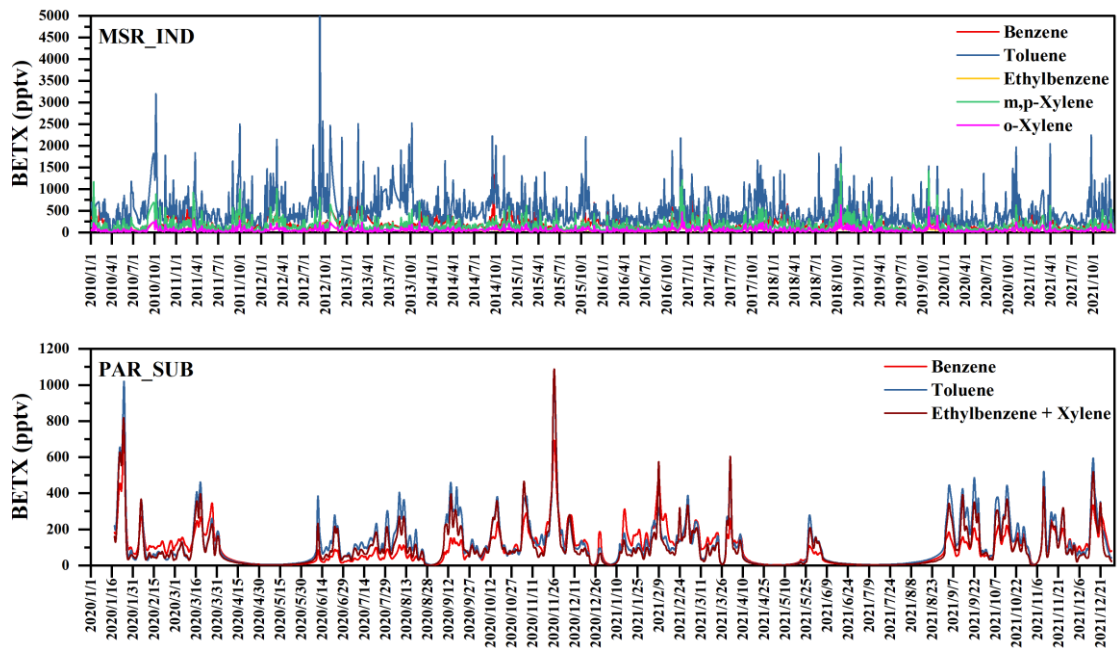
***Figure S2***. *Time series of the variations of BTEX (benzene, toluene, ethylbenzene, m,p-xylene, o-xylene) mixing ratios at 22 sites in seven EU countries (Greece, France, Belgium, Finland, United Kingdom, Switzerland, and Spain). Please note that the BTEX observations at BCN_UB and PAR_SUB were not able to distinguish the mixing ratios of ethylbenzene separate from xylenes, and at BAQS_UB did not included m,p-xylene data.*

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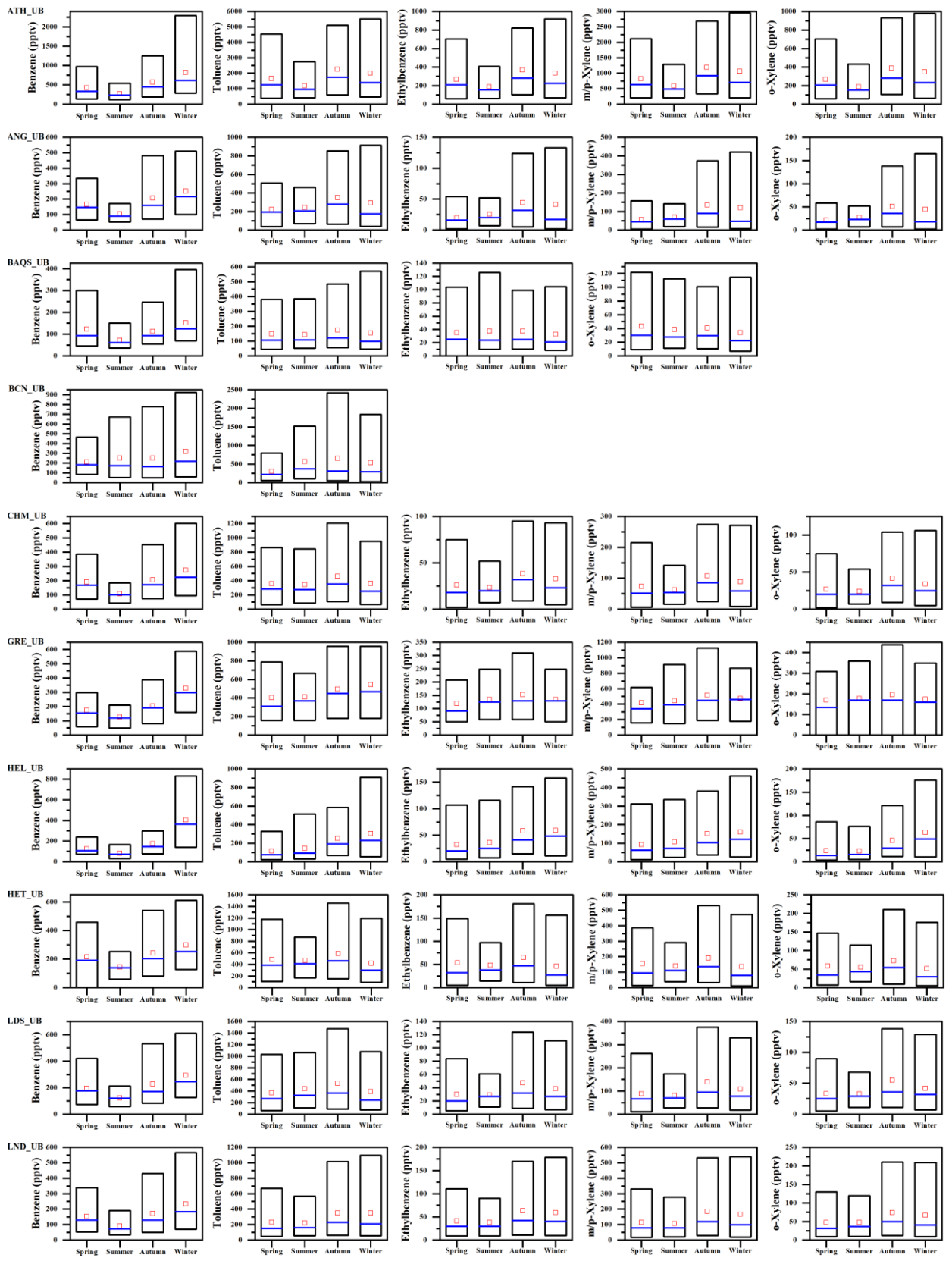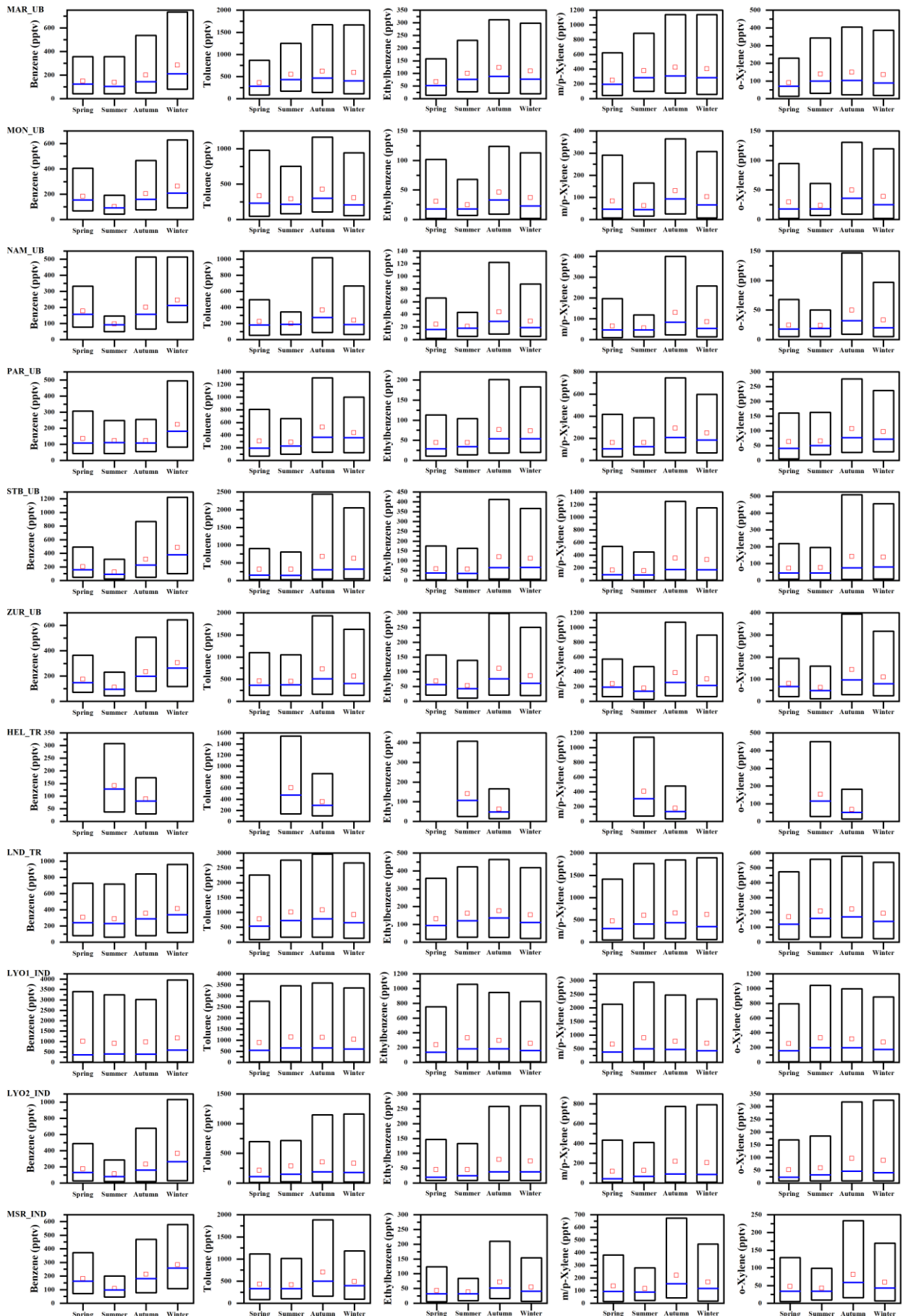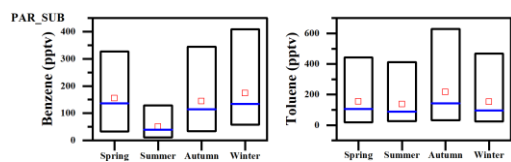
***Figure S3***. *Seasonal variations of BTEX (benzene, toluene, ethylbenzene, xylene) mixing ratios for all the studied sites. The box represents the 5th–95th percentiles of mixing ratios. The middle line and middle square represent the median values and mean values of mixing ratios, respectively. Blank means no available data.*

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75  PAR_SUB
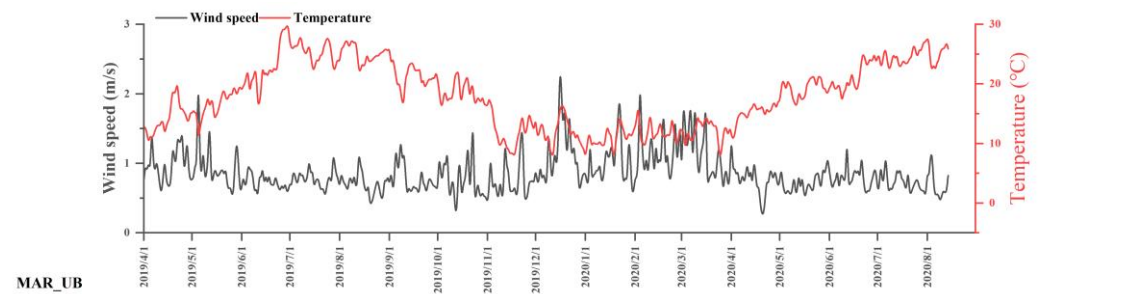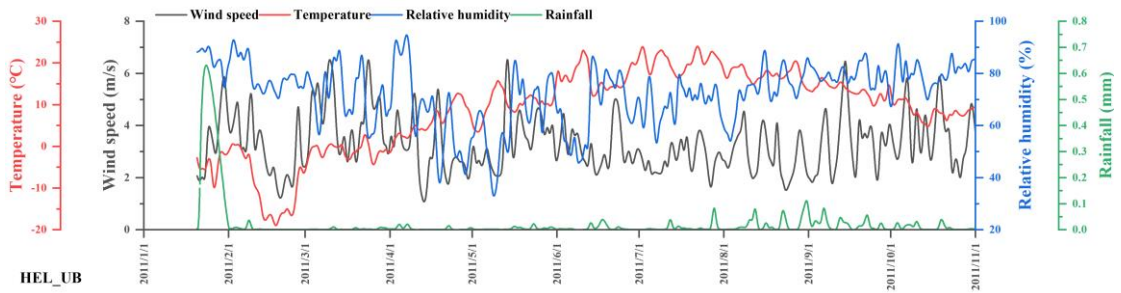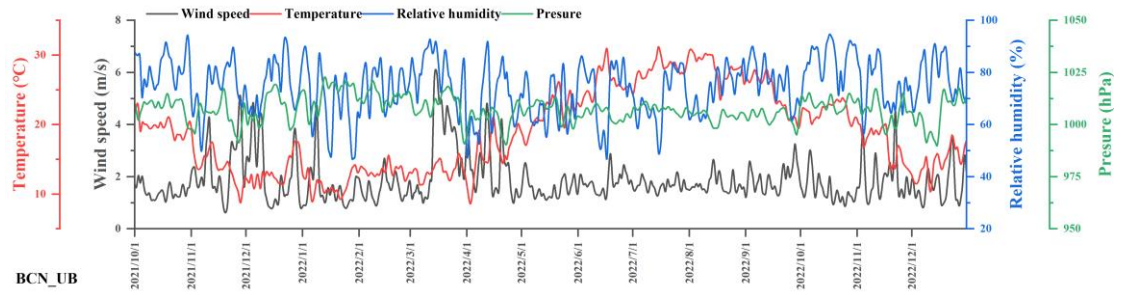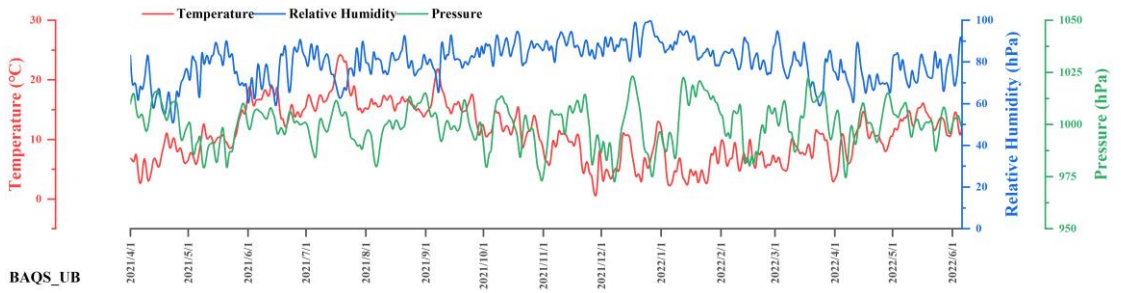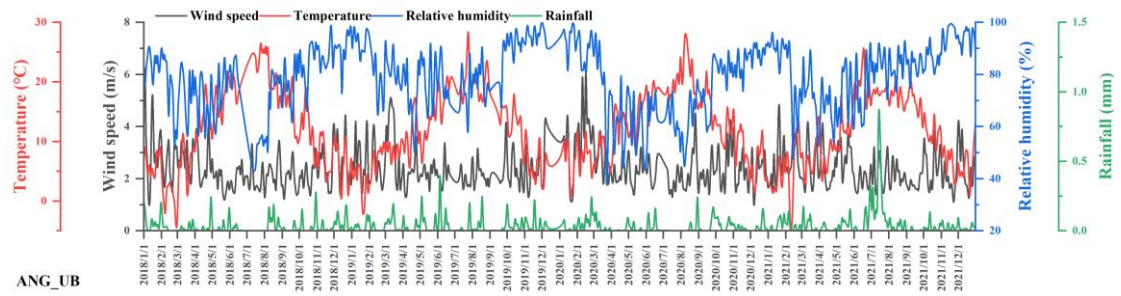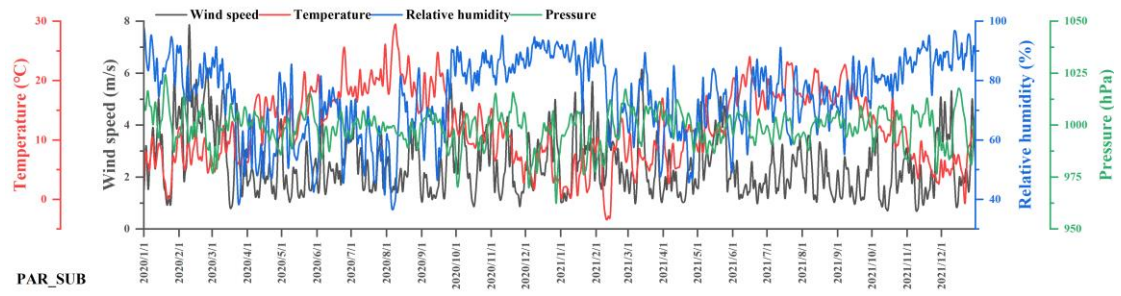
***Figure S4***. *Time series of meteorological parameters at a few monitoring locations.*

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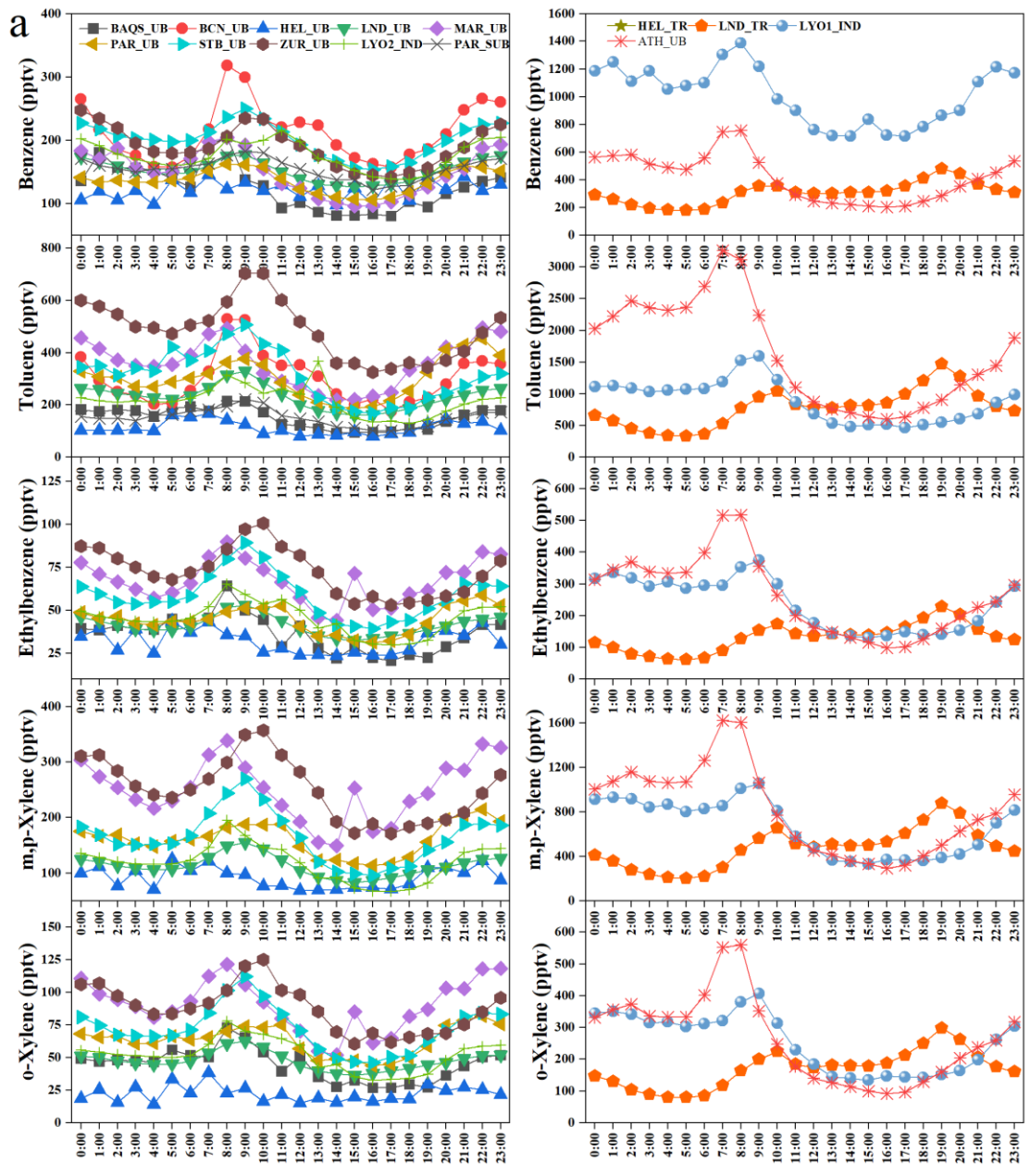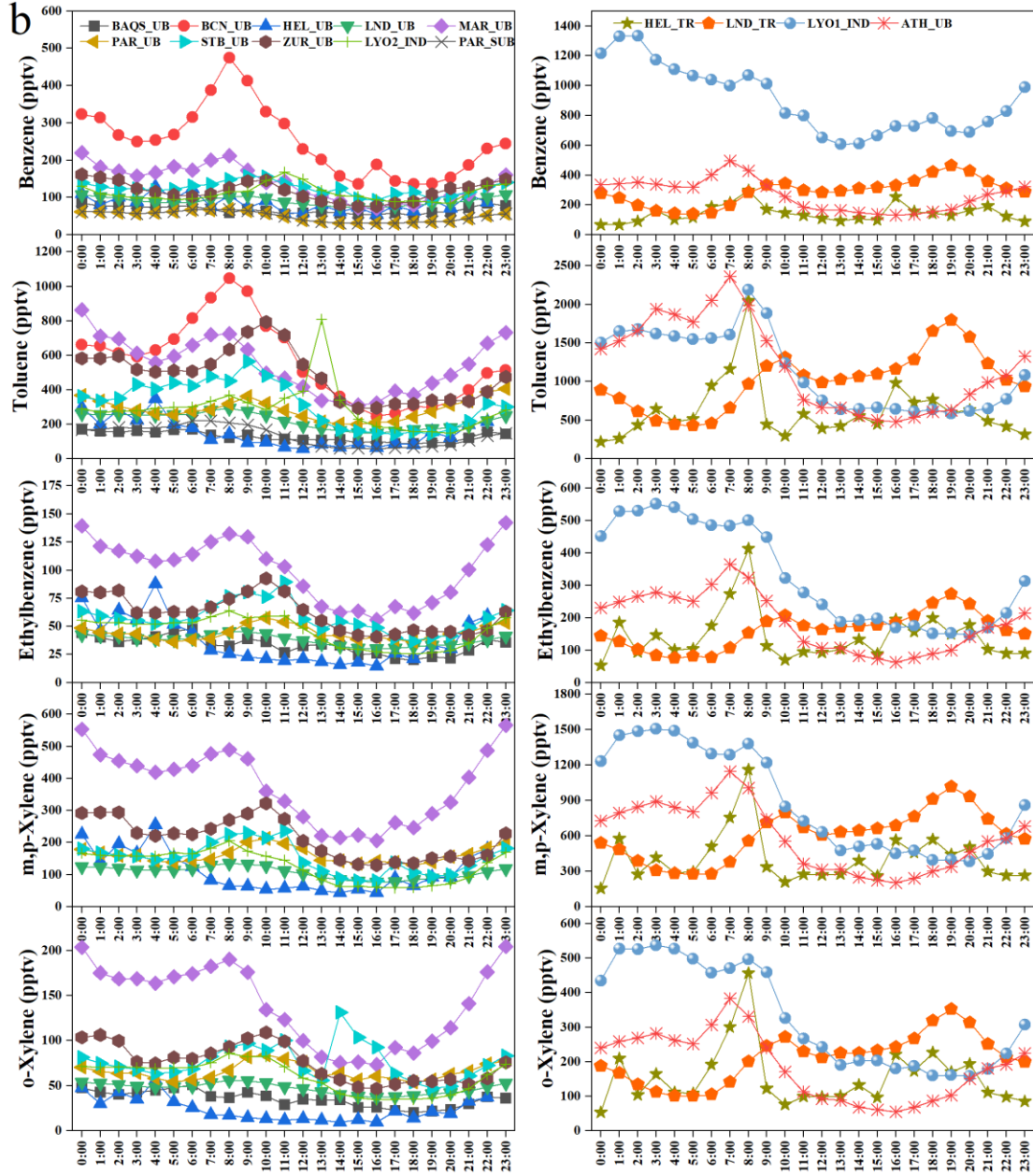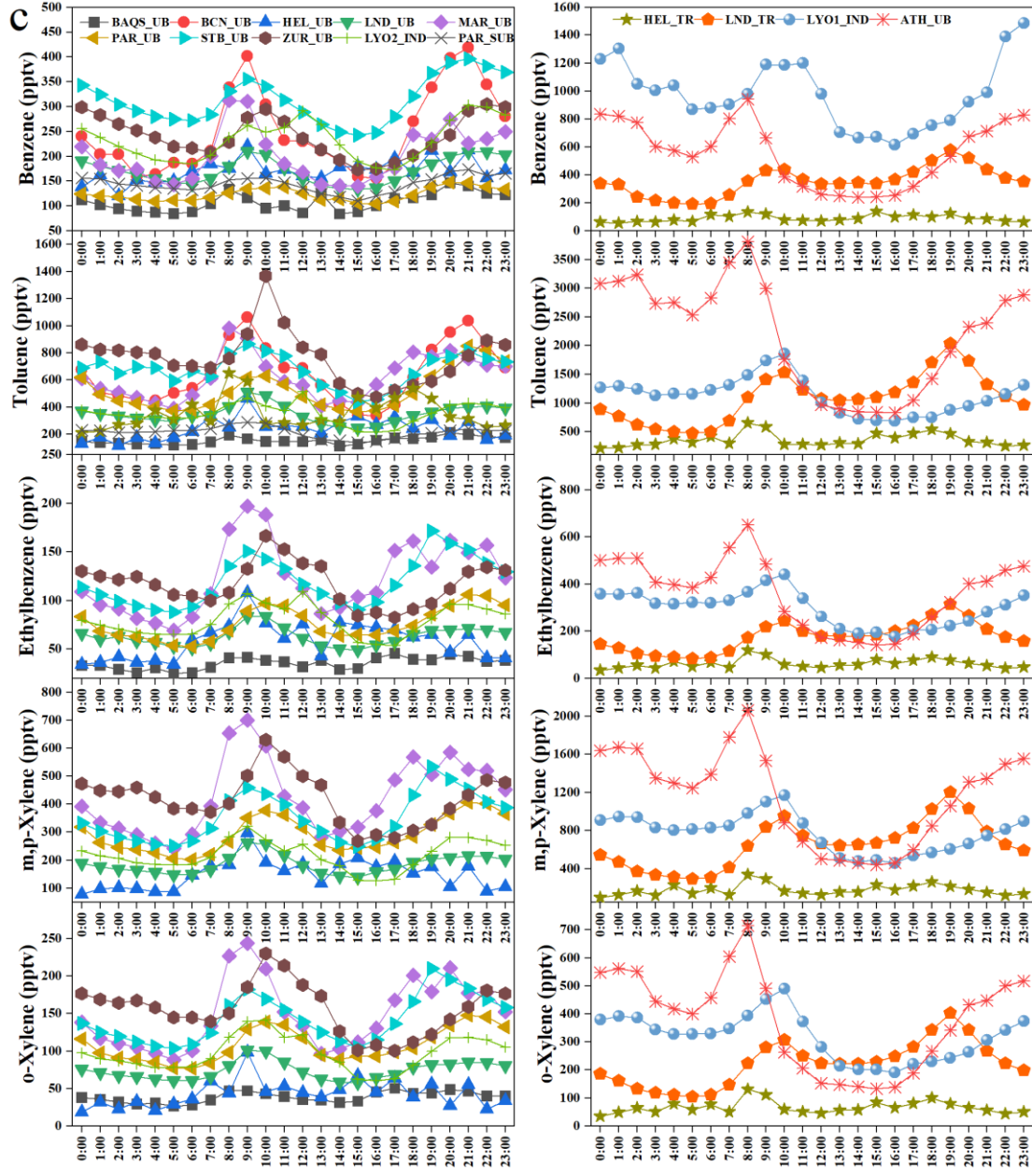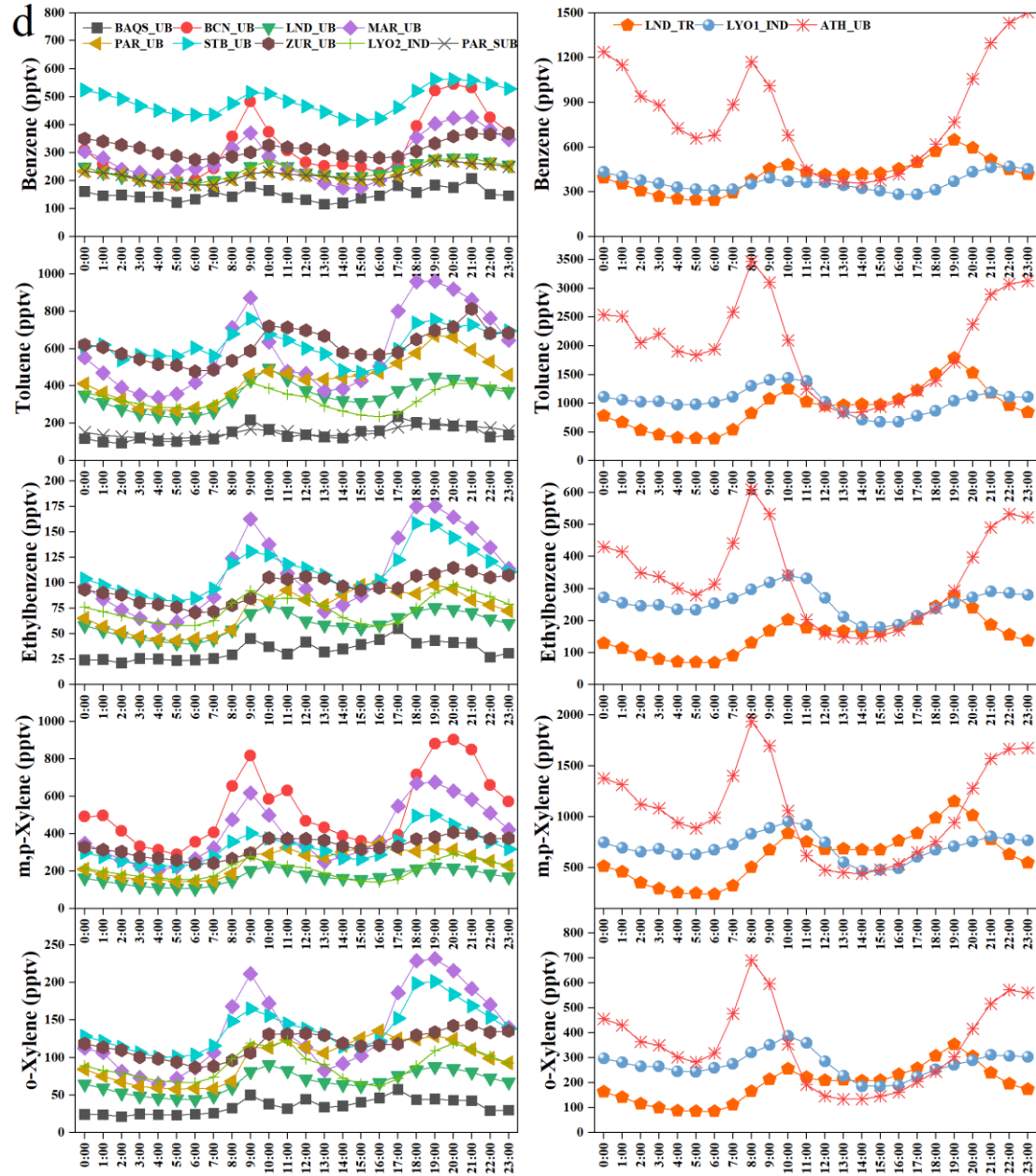
*Figure S5. Diel variations of BTEX (benzene, toluene, ethylbenzene, m,p-xylene, o-xylene) mixing ratios for 14 out of the 22 studied sites during spring (a), summer (b), autumn (c), and winter (d).*

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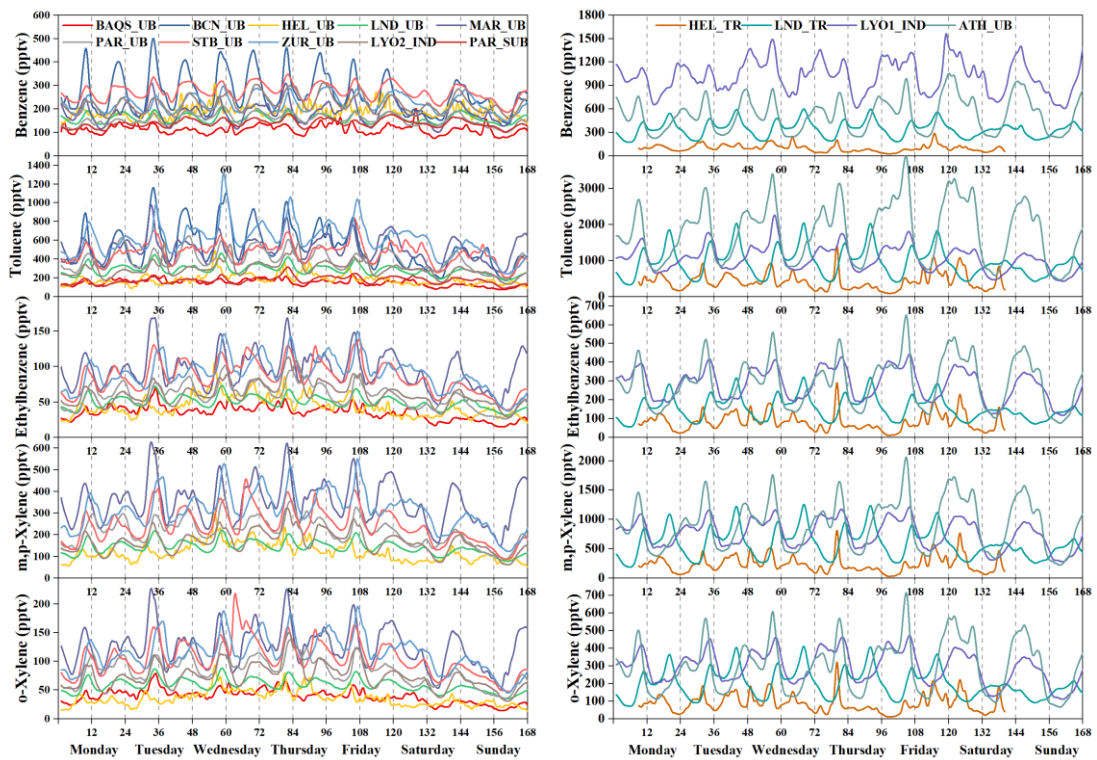
***Figure S6****. Mean weekly profiles of the hourly BTEX (benzene, toluene, ethylbenzene, m,p-xylene, o-*

*xylene) average mixing ratios for 14 out of the 22 studied sites.*

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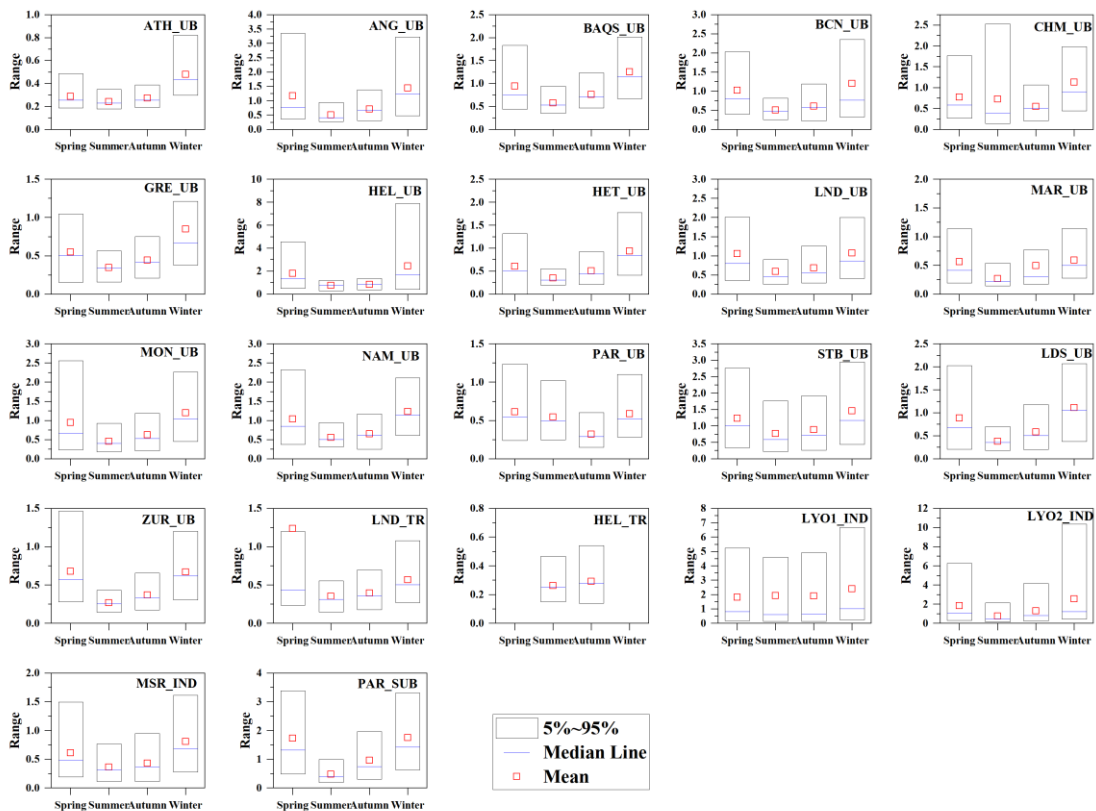
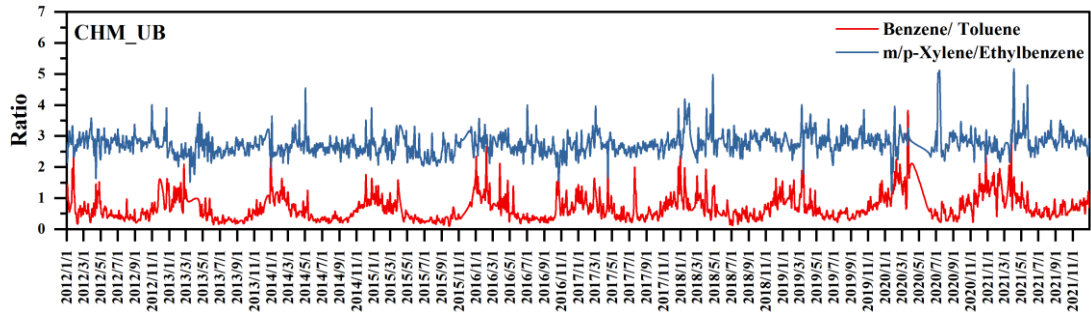
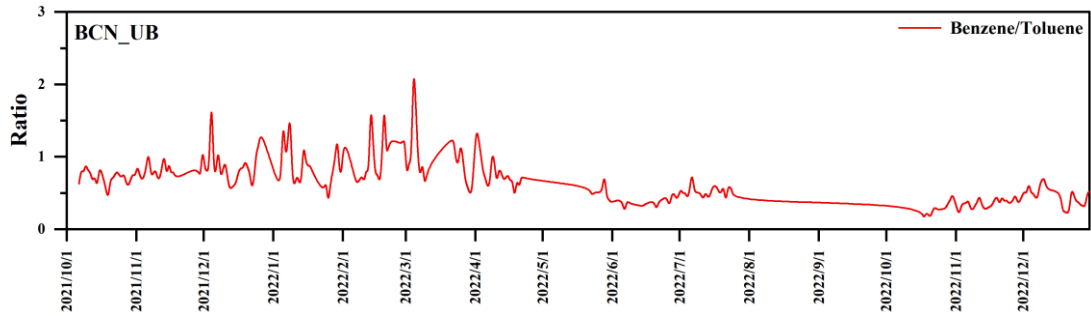
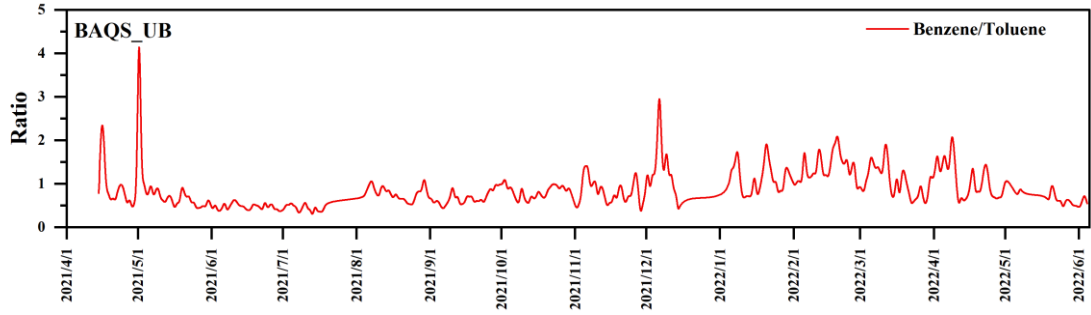
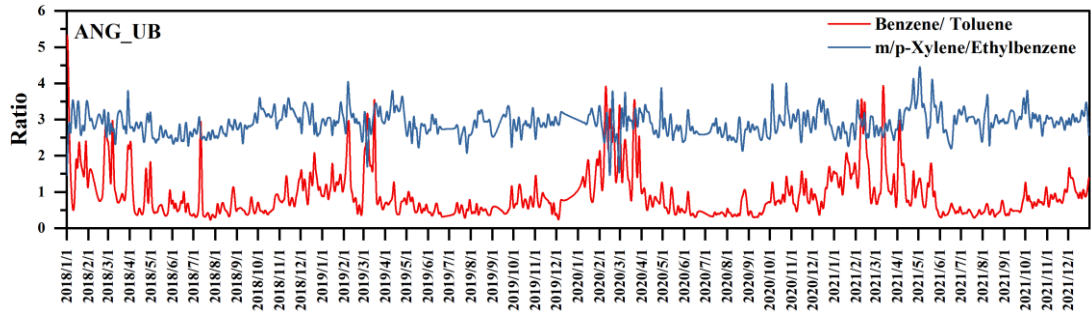
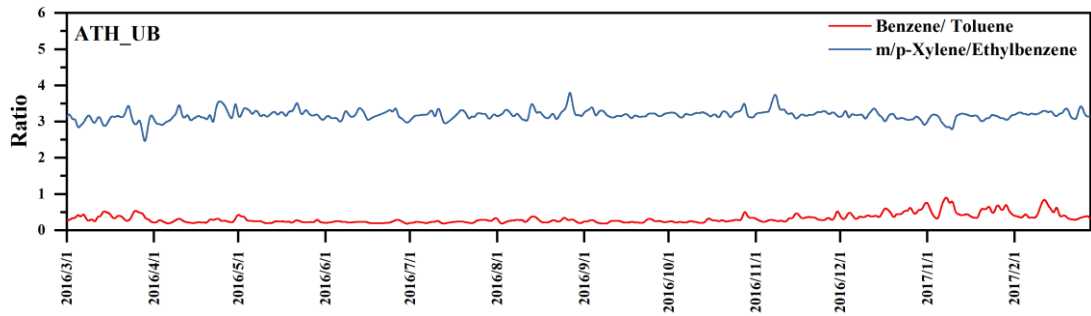


**Figure S7**. *Seasonal variations of benzene to toluene ratio (B/T) at all monitoring sites. The box represents the 5th–95th percentiles of the ratio. The middle line and middle square represent the median and mean values of the ratio, respectively. Blank means no available measurement.*

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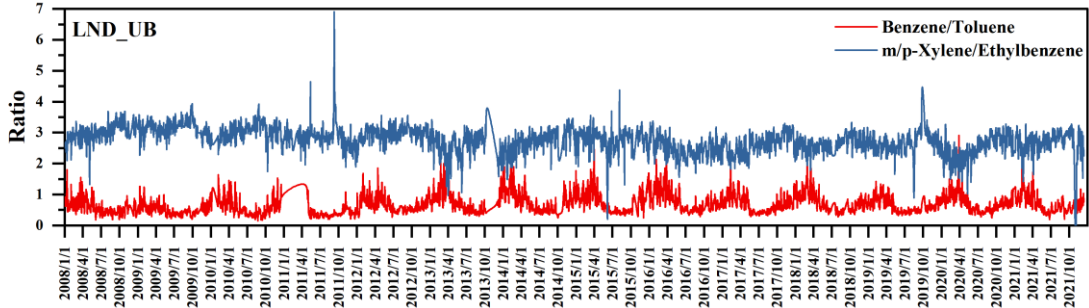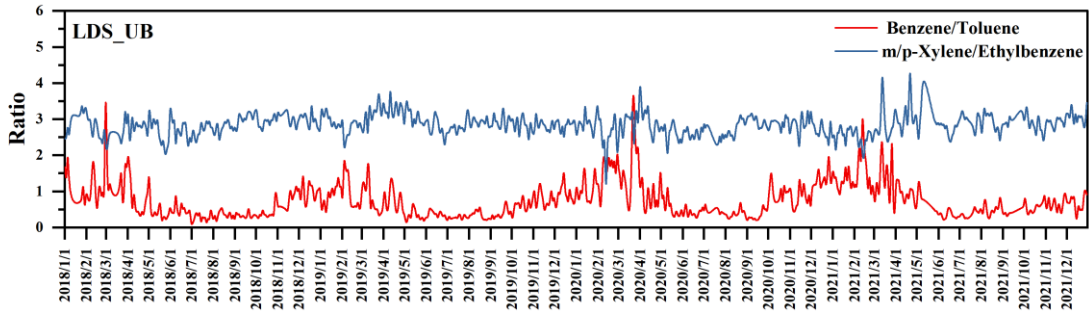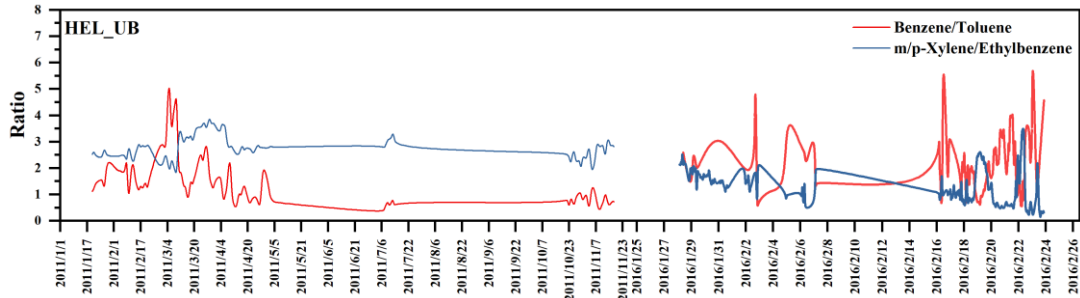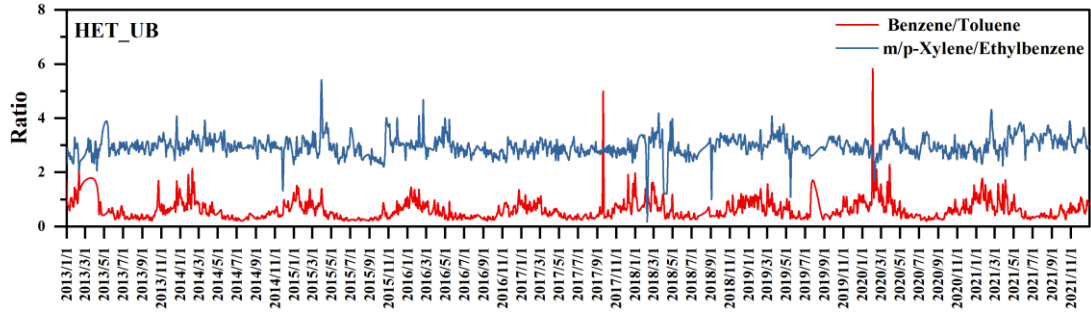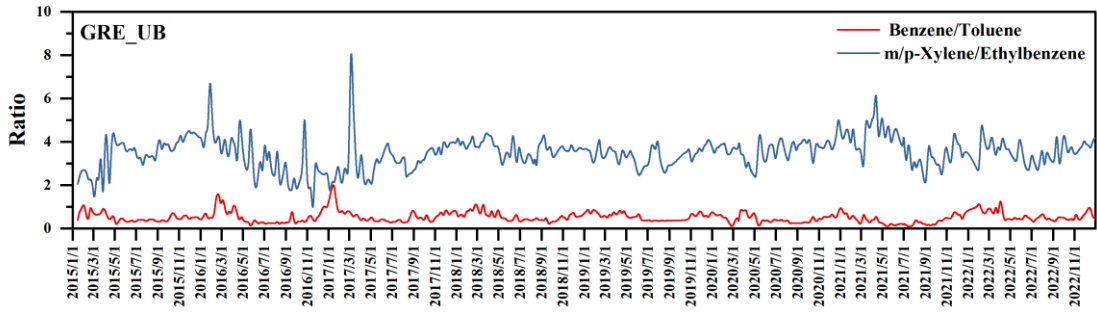
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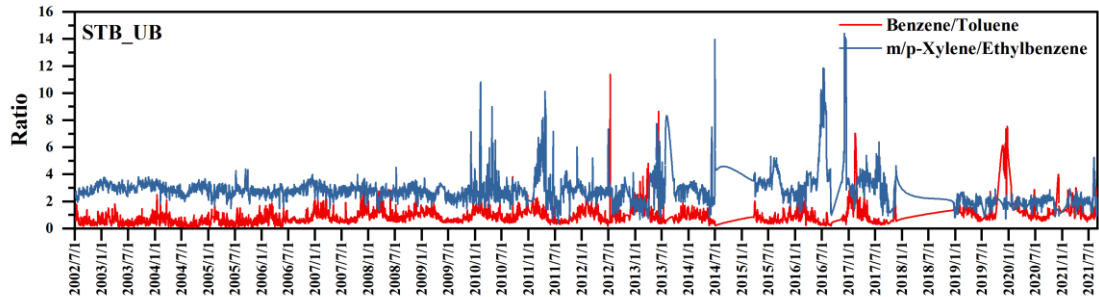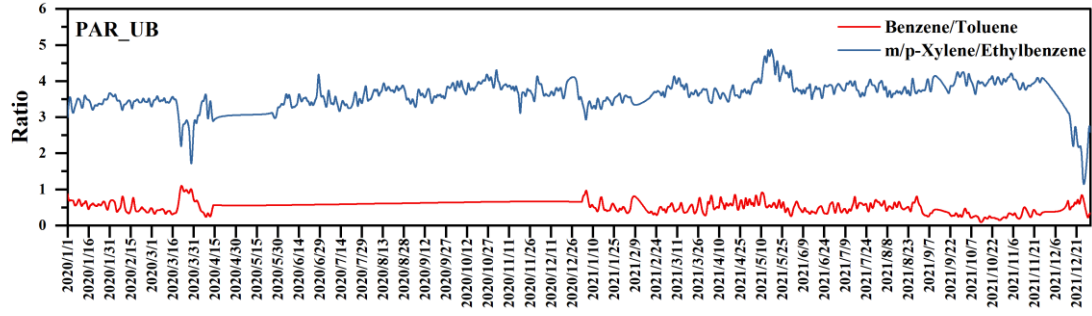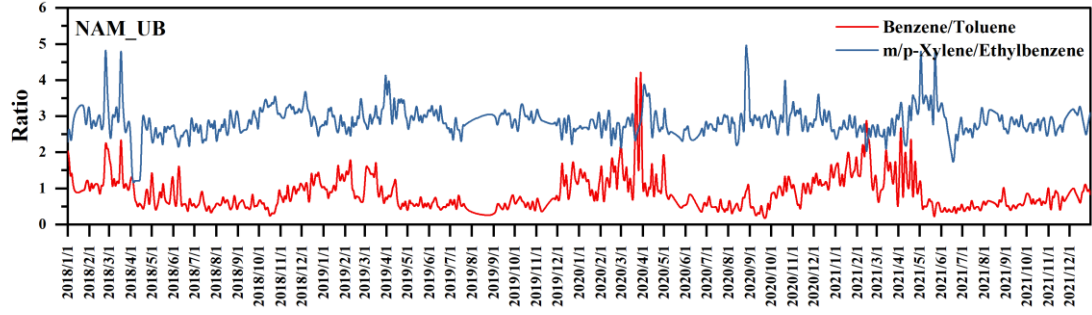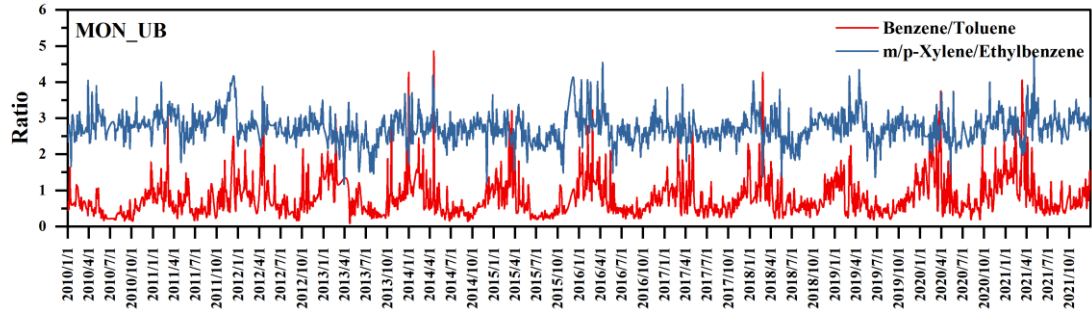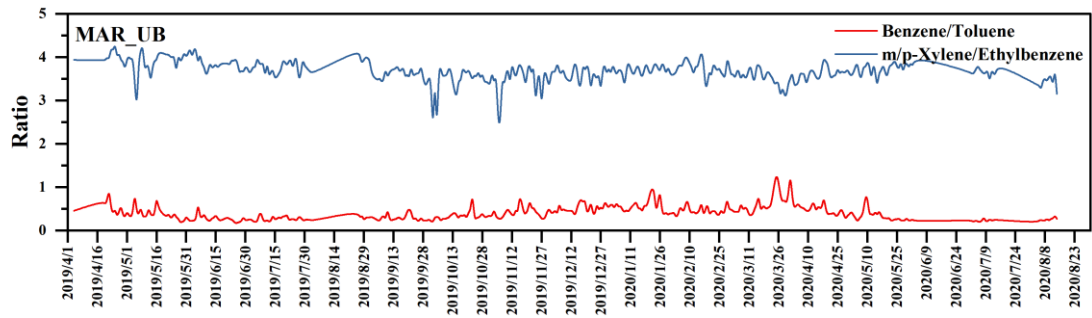
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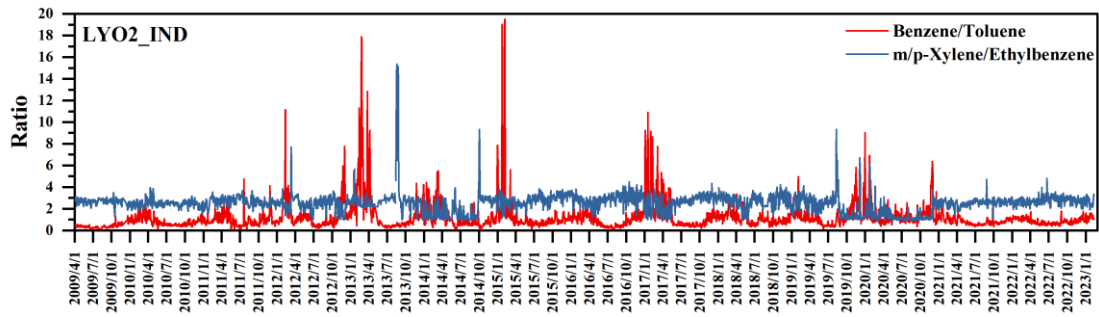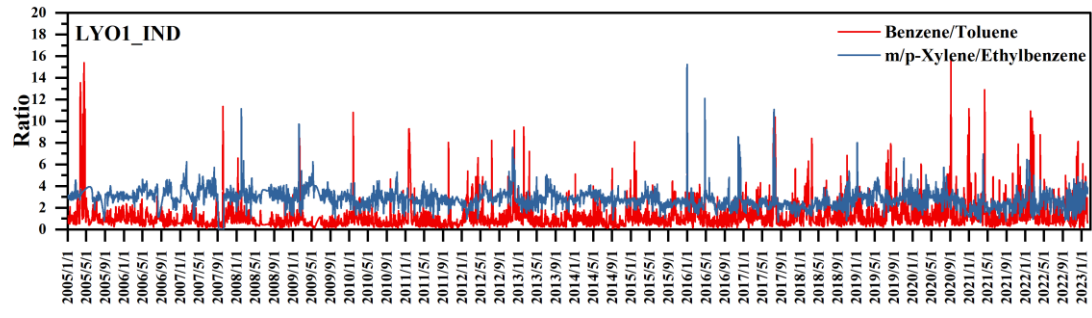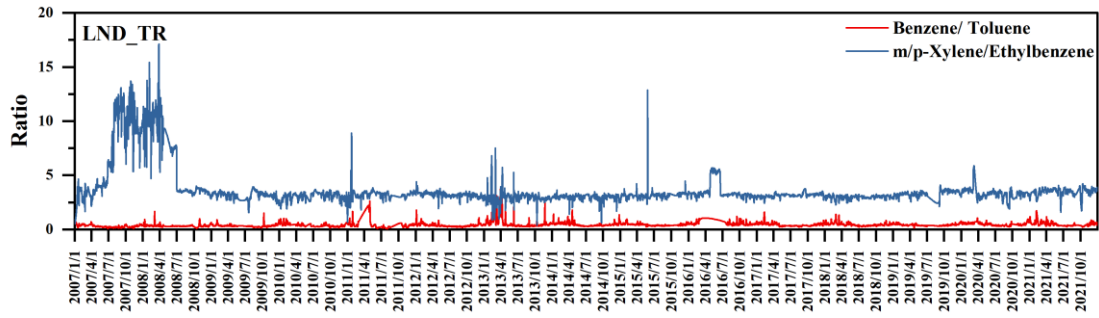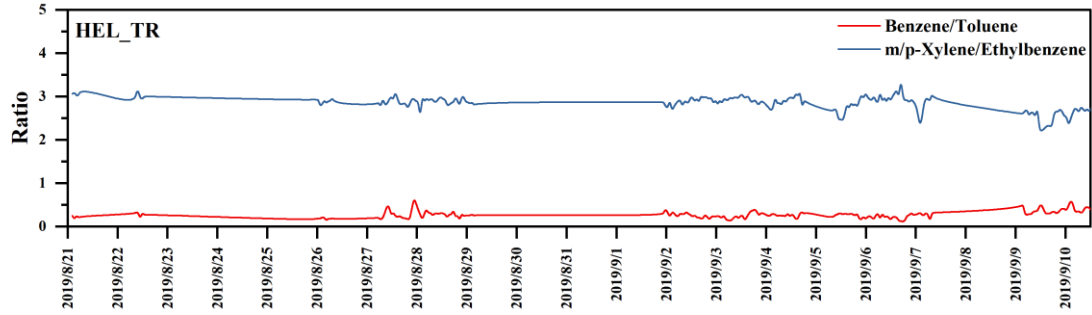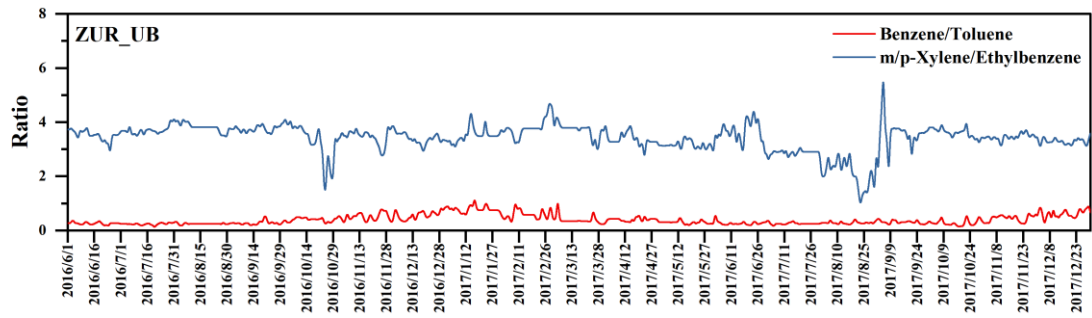
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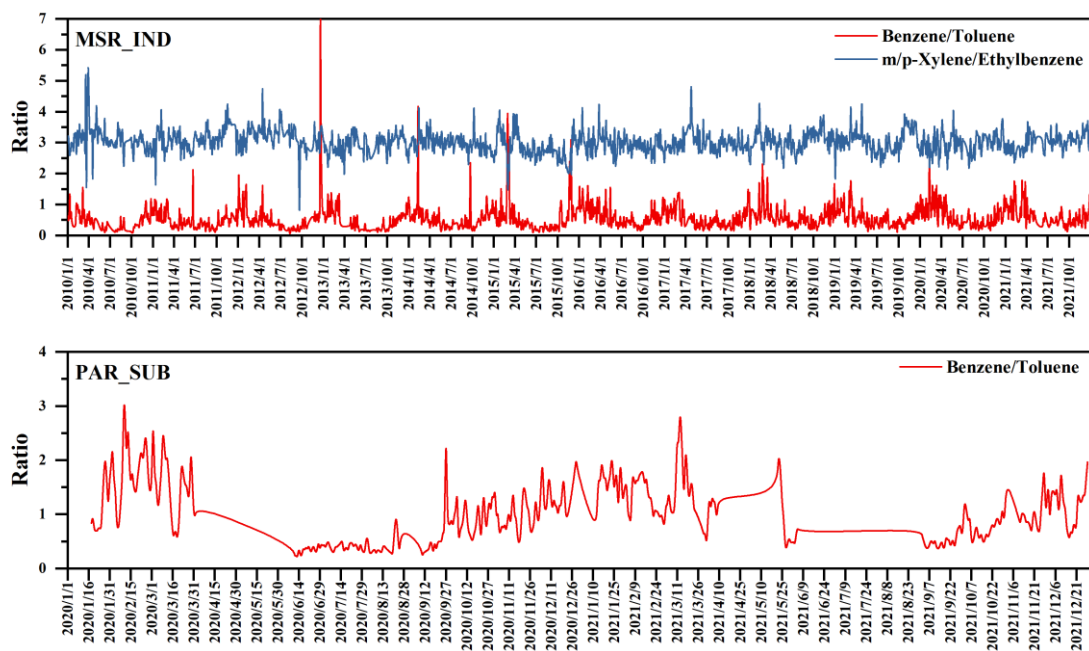
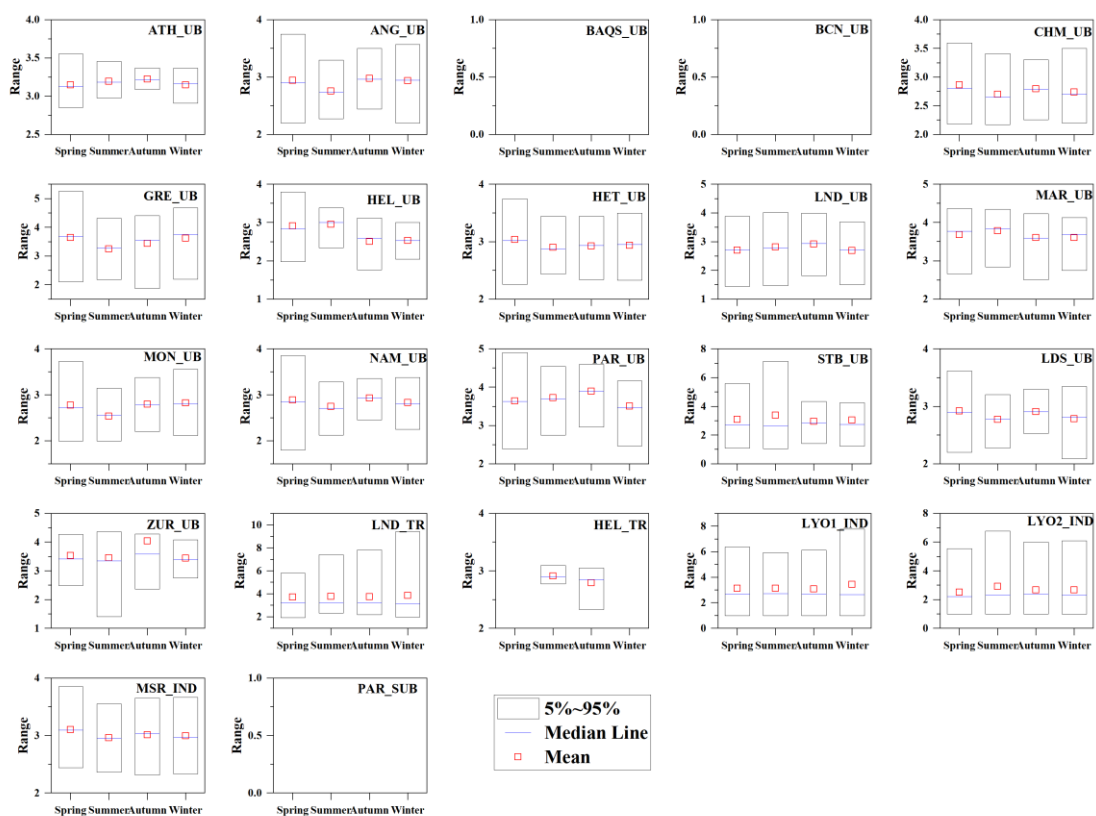

120 ***Figure S8****. Time series of the variations of benzene to toluene (B/T) and meta/para-xylene to ethylbenzene (X/E) ratios in all monitoring sites.*

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**Figure S9**. *Seasonal variations of m,p-Xylene to ethylbenzene ratios (X/E) at all monitoring sites. The box represents the $5^{th}$–$95^{th}$ percentiles of ratios. The middle line and middle square represent the median and mean values of ratios, respectively. Blank means without available measurement data.*

130 ***Table S1***. *Coefficient of Determination (r²) of the linear correlation between BTEX in the study area. (p* *< 0.01 \*\*).*

| Sites | | Benzene | Toluene | Ethylbenzene | m,p-Xylene | o-Xylene |
|---|---|---|---|---|---|---|
| ATH_UB | Benzene | 1 | | | | |
| | Toluene | 0.78** | 1 | | | |
| | Ethylbenzene | 0.82** | 0.98** | 1 | | |
| | m,p-Xylene | 0.81** | 0.98** | 0.996** | 1 | |
| | o-Xylene | 0.82** | 0.97** | 0.992** | 0.996** | 1 |
| ANG_UB | Benzene | 1 | | | | |
| | Toluene | 0.49** | 1 | | | |
| | Ethylbenzene | 0.5** | 0.42** | 1 | | |
| | m,p-Xylene | 0.5** | 0.74** | 0.74** | 1 | |
| | o-Xylene | 0.52** | 0.45** | 0.98** | 0.77** | 1 |
| BAQS_UB | Benzene | 1 | | | | |
| | Toluene | 0.31** | 1 | | | |
| | Ethylbenzene | 0.21** | 0.71** | 1 | | |
| | o-Xylene | 0.14** | 0.77** | 0.81** | | |
| BCN_UB | Benzene | 1 | | | | |
| | Toluene | 0.56** | 1 | | | |
| CHM_UB | Benzene | 1 | | | | |
| | Toluene | 0.35** | 1 | | | |
| | Ethylbenzene | 0.38** | 0.18** | 1 | | |
| | m,p-Xylene | 0.52** | 0.4** | 0.76** | 1 | |
| | o-Xylene | 0.38** | 0.18** | 0.98** | 0.79** | 1 |
| HEL_TR | Benzene | 1 | | | | |
| | Toluene | 0.41** | 1 | | | |
| | Ethylbenzene | 0.72** | 0.56** | 1 | | |
| | m,p-Xylene | 0.42** | 0.77** | 0.79** | 1 | |
| | o-Xylene | 0.71** | 0.61** | 0.98** | 0.83** | 1 |
| HEL_UB | Benzene | 1 | | | | |
| | Toluene | 0.48** | 1 | | | |
| | Ethylbenzene | 0.26** | 0.71** | 1 | | |
| | m,p-Xylene | 0.26** | 0.79** | 0.9** | 1 | |
| | o-Xylene | 0.37** | 0.76** | 0.92** | 0.81** | 1 |
| HET_UB | Benzene | 1 | | | | |
| | Toluene | 0.46** | 1 | | | |
| | Ethylbenzene | 0.59** | 0.35** | 1 | | |
| | m,p-Xylene | 0.45** | 0.5** | 0.74** | 1 | |
| | o-Xylene | 0.59** | 0.36** | 0.98** | 0.77** | 1 |
| LDS_UB | Benzene | 1 | | | | |
| | Toluene | 0.34** | 1 | | | |
| | Ethylbenzene | 0.72** | 0.21** | 1 | | |
| | m,p-Xylene | 0.81** | 0.4** | 0.9** | 1 | |
| | o-Xylene | 0.72** | 0.22** | 1 | 0.9** | 1 |
| LND_TR | Benzene | 1 | | | | |
| | Toluene | 0.46** | 1 | | | |
| | Ethylbenzene | 0.49** | 0.64** | 1 | | |
| | m,p-Xylene | 0.35** | 0.53** | 0.56** | 1 | |

|         |              |         |         |         |         |   |
|---------|--------------|---------|---------|---------|---------|---|
|         | o-Xylene     | 0.52**  | 0.71**  | 0.9**   | 0.62**  | 1 |
|         | Benzene      | 1       |         |         |         |   |
|         | Toluene      | 0.45**  | 1       |         |         |   |
| LND_UB  | Ethylbenzene | 0.53**  | 0.52**  | 1       |         |   |
|         | m,p-Xylene   | 0.53**  | 0.67**  | 0.81**  | 1       |   |
|         | o-Xylene     | 0.5**   | 0.55**  | 0.92**  | 0.85**  | 1 |
|         | Benzene      | 1       |         |         |         |   |
|         | Toluene      | 0.08**  | 1       |         |         |   |
| LYO1_UB | Ethylbenzene | 0.03**  | 0.29**  | 1       |         |   |
|         | m,p-Xylene   | 0.03**  | 0.36**  | 0.76**  | 1       |   |
|         | o-Xylene     | 0.03**  | 0.34**  | 0.72**  | 0.83**  | 1 |
|         | Benzene      | 1       |         |         |         |   |
|         | Toluene      | 0.05**  | 1       |         |         |   |
| LYO2_UB | Ethylbenzene | 0.46**  | 0.06**  | 1       |         |   |
|         | m,p-Xylene   | 0.46**  | 0.07**  | 0.9**   | 1       |   |
|         | o-Xylene     | 0.38**  | 0.05**  | 0.85**  | 0.81**  | 1 |
|         | Benzene      | 1       |         |         |         |   |
|         | Toluene      | 0.52**  | 1       |         |         |   |
| MAR_UB  | Ethylbenzene | 0.35**  | 0.56**  | 1       |         |   |
|         | m,p-Xylene   | 0.41**  | 0.66**  | 0.92**  | 1       |   |
|         | o-Xylene     | 0.42**  | 0.66**  | 0.88**  | 0.96**  | 1 |
|         | Benzene      | 1       |         |         |         |   |
|         | Toluene      | 0.27**  | 1       |         |         |   |
| MON_UB  | Ethylbenzene | 0.34**  | 0.66**  | 1       |         |   |
|         | m,p-Xylene   | 0.3**   | 0.56**  | 0.96**  | 1       |   |
|         | o-Xylene     | 0.37**  | 0.55**  | 0.94**  | 0.96**  | 1 |
|         | Benzene      | 1       |         |         |         |   |
|         | Toluene      | 0.16**  | 1       |         |         |   |
| MSR_IND | Ethylbenzene | 0.26**  | 0.44**  | 1       |         |   |
|         | m,p-Xylene   | 0.23**  | 0.4**   | 0.96**  | 1       |   |
|         | o-Xylene     | 0.23**  | 0.38**  | 0.92**  | 0.94**  | 1 |
|         | Benzene      | 1       |         |         |         |   |
|         | Toluene      | 0.42**  | 1       |         |         |   |
| NAM_UB  | Ethylbenzene | 0.27**  | 0.55**  | 1       |         |   |
|         | m,p-Xylene   | 0.25**  | 0.53**  | 0.94**  | 1       |   |
|         | o-Xylene     | 0.26**  | 0.55**  | 0.9**   | 0.96**  | 1 |
| PAR_SUB | Benzene      | 1       |         |         |         |   |
|         | Toluene      | 0.56**  | 1       |         |         |   |
|         | Benzene      | 1       |         |         |         |   |
|         | Toluene      | 0.52**  | 1       |         |         |   |
| PAR_UB  | Ethylbenzene | 0.44**  | 0.71**  | 1       |         |   |
|         | m,p-Xylene   | 0.4**   | 0.74**  | 0.96**  | 1       |   |
|         | o-Xylene     | 0.41**  | 0.74**  | 0.94**  | 0.96**  | 1 |
|         | Benzene      | 1       |         |         |         |   |
|         | Toluene      | 0.14**  | 1       |         |         |   |
| STB_UB  | Ethylbenzene | 0.31**  | 0.15**  | 1       |         |   |
|         | m,p-Xylene   | 0.22**  | 0.12**  | 0.61**  | 1       |   |
|         | o-Xylene     | 0.29**  | 0.14**  | 0.61**  | 0.94**  | 1 |

| | | Benzene | Toluene | Ethylbenzene | m,p-Xylene | o-Xylene |
|---|---|---|---|---|---|---|
| ZUR_UB | Benzene | 1 | | | | |
| | Toluene | 0.41** | 1 | | | |
| | Ethylbenzene | 0.54** | 0.61** | 1 | | |
| | m,p-Xylene | 0.52** | 0.63** | 0.98** | 1 | |
| | o-Xylene | 0.50** | 0.62** | 0.97** | 0.98** | 1 |