Application of positive matrix factorization to on-road measurements for source apportionment of diesel- and gasoline-powered vehicle emissions in Mexico City

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Supplemental Material

The following three figures show G-space scatter plots, where each coordinate pair represents the contribution of each of two factors at a single point in time, for each combination of the three factors. Paatero et al. (2005) explain that unrealistic rotations appear in G-space plots as oblique edges that constrain the data points away from at least one of the axes. The first figure shows the background versus gasoline factors. Their contributions span the space, and the anti-correlation indicates that when the contribution from one is high, the contribution from the other is low, as expected from the two dominant factors in this analysis. For example, when the mobile laboratory intercepts a plume, the contribution from gasoline engine exhaust is expected to be high while that of the background factor should be low. The second figure shows the background versus diesel factors. There may be a slight horizontal "edge" along the bottom of the plot at $y = 0.4$, that indicates a lack of independence between the two factors. In this case, even when the diesel factor's contributions are very high, the background factor's rarely drop below 0.4, so there may be some rotational ambiguity, or overlap, between these two factors. The third figure shows the gasoline versus diesel factors. The data points in this plot span the space, suggesting that the two factors are independent.

G-space Plot of Background v. Gasoline
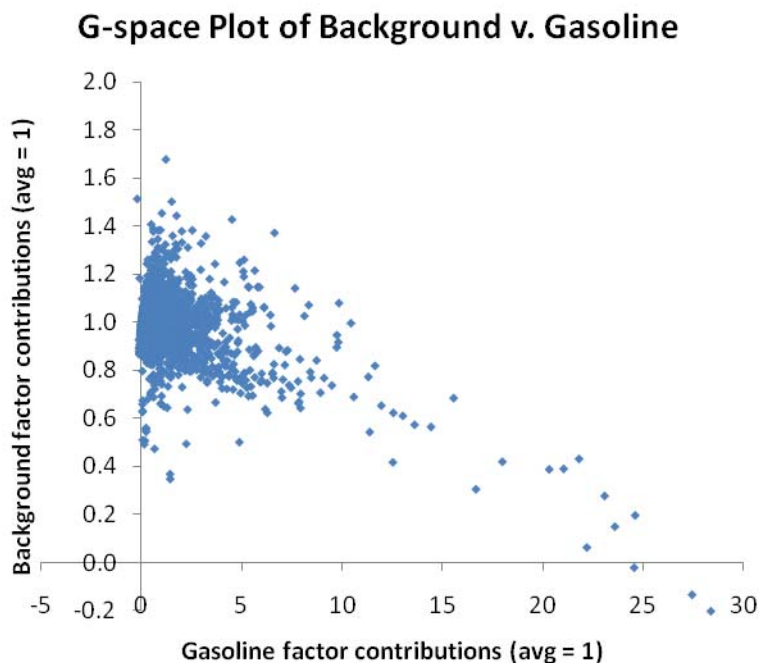
G-space Plot of Background v. Diesel
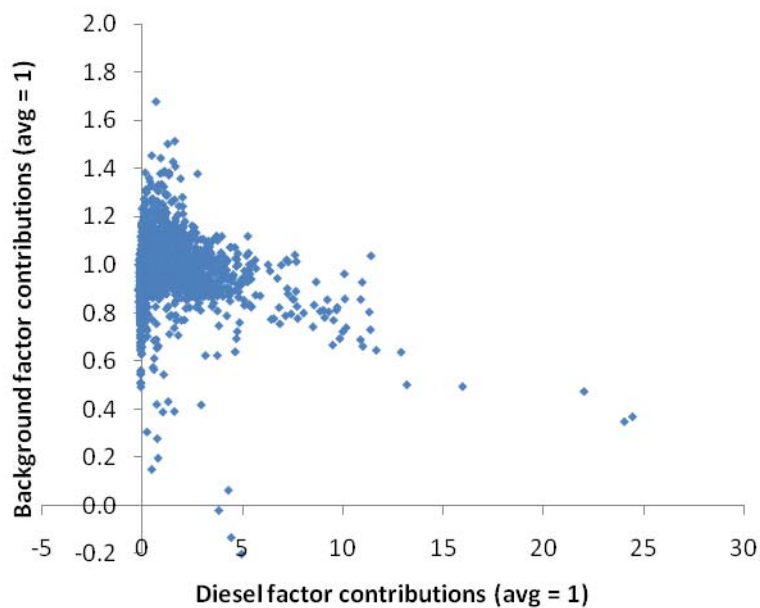
G-space Plot of Gasoline v. Diesel
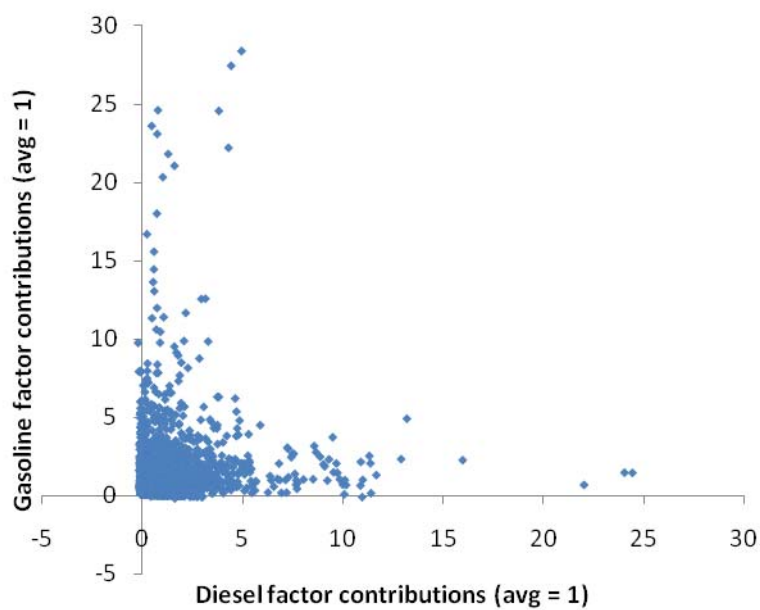
Paatero, P., Hopke, P. K., Begum, B. A., and Biswas, S. K.: A graphical diagnostic method for assessing the rotation in factor analytical models of atmospheric pollution, Atmos. Environ., 39, 193-201, 2005.