**Supplementary material**

**Figure SM1**: Vehicular emissions of CO in North Brazil derived from BRAVES database. Spatial resolution of 0.05°x0.05°.

Mapa

Descrição gerada automaticamente

**Figure SM2:** Vehicular emissions of CO in Northeast Brazil derived from BRAVES database. Spatial resolution of 0.05°x0.05°.

Mapa

Descrição gerada automaticamente

**Figure SM3:** Vehicular emissions of CO in Mid west Brazil derived from BRAVES database. Spatial resolution of 0.05°x0.05°.

Mapa

Descrição gerada automaticamente

**Figure SM4:** Vehicular emissions of CO in Southeast Brazil derived from BRAVES database. Spatial resolution of 0.05°x0.05°.

Mapa

Descrição gerada automaticamente

**Figure SM5:** Vehicular emissions of CO in South Brazil derived from BRAVES database. Spatial resolution of 0.05°x0.05°.

Mapa

Descrição gerada automaticamente

**Table SM6:** Speciate 5.1 profiles used in this work for exhaust and evaporative emissions. Profiles depicted by vehicle type (light and heavy) and source type (exhaust, wear, and road dust).

|  |  |  |
| --- | --- | --- |
| Fleet category | Speciate 5.1 profile ID | Exhaust emissions of VOC to species Profile name |
| Light | 8908 | Gasoline Exhaust - E10 gasoline, winter grade, LA92 cycle composite |
| 95792 | Gasoline Exhaust - E10 gasoline - US06 Composite - 75 oF |
| 100VBS | On-road gasoline vehicle cold-start with VBS |
| Heavy | 8775 | Diesel Exhaust Emissions from 2007 Model Year Heavy-Duty Diesel Engines with Controls |
| 95335a | Diesel Exhaust - Heavy-heavy duty truck - 2011 model year corrected |
| 4674 | Diesel Exhaust - Medium Duty Trucks |
| 103VBS | Heavy Duty diesel with DPF, combination of previous measurements with VBS |
|  |  |  |
| Source type | Speciate 5.1 profile ID | PM to species Profile name |
| Light exhaust | 8993VBS | Light-duty Gasoline Vehicles Exhaust - Stabilized Running, VBS |
| Heavy exhaust | 8996VBS | Diesel Exhaust - Heavy-heavy duty truck - 2007 model year with NCOM, VBS |
| 8994VBS | Conventional Diesel Exhaust - Idle Cycle, VBS |
| 8995VBS | Conventional Diesel Exhaust - Transient Cycle, VBS |
| Tire wear | 3156 | Tire Wear |
| Brake wear | 95457 | Brake Wear |
| Road dust | 95780 | Paved Road Dust |
|  |  |  |
| Fleet category | Speciate 5.1 profile ID | Evaporative emissions of VOC to species Profile name |
| Light | 1204 | Light-Duty Gasoline Vehicles - Evaporative |
| 2495 | Vehicle - Current Fleet (1989) Hot Soak Evaporative |
| 2567 | Vehicle Hot Soak - Atlanta, 1990 |
| 2493 | Vehicle - Current Fleet (1989) Diurnal Evaporative |
| Heavy | DIESEVP | Diesel Headspace Vapor Composite |

**Table SM7:** Total emission of CO, NOx, MP, and NMVOC aggregated in Brazilian territory from available national inventories.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **National**  **Inventory** | **Base Year** | **CO** | **NOx** | **MP** | **NMVOC** |
| BRAVES | 2013 | 1433499 | 924752 | 30322 | 272430 |
| SEEGv8.0 | 2013 | 1337408 | 1196302 | - | 236108 |
| MMA 2013 | 2012 | 1251596 | 1100801 | 37231 | 250000 |
| EDGARv5.0 | 2013 | 9129167 | 1691271 | 89206 | 1650005 |

**Figure SM8:** CO spatial distribution provided by a) MERRA-2, b) EDGAR, and c) BRAVES. Scatter plots of CO vehicle emission and CO surface concentrations in SP in 2015.

Mapa

Descrição gerada automaticamente

**Table SM9.** Spearman correlation and associated p-values of CO vehicular emission and CO surface concentrations in Brazilian states. Comparison between EDGAR and BRAVES database using annual average of CO surface concentration from MERRA-2 in 2015.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Brazilian State** | **EDGAR x MERRA-2** | | **BRAVES x MERRA-2** | |
| **rho** | **p-value** | **rho** | **p-value** |
| São Paulo | **0.66** | **1.96e-12** | **0.63** | **3.3e-11** |
| Paraná | **0.34** | **0.002** | 0.18 | 0.10 |
| Santa Catarina | - 0.26 | 0.07 | **- 0.30** | **0.04** |
| Rio Grande do Sul | **0.63** | **8.7e-11** | **0.60** | **6.14e-10** |
| Minas Gerais | **0.56** | **2.3e-18** | **0.58** | **5.6e-20** |
| Espírito Santo | 0.09 | 0.7 | **0.63** | **0.002** |
| Rio de Janeiro | 0.24 | 0.32 | 0.41 | 0.09 |
| Bahia | **- 0.47** | **5.9e-12** | **- 0.47** | **3.3e-12** |
| Goiás | 0.06 | 0.49 | - 0.18 | 0.06 |
| Mato Grosso do Sul | **- 0.29** | **0.001** | **- 0.40** | **6.8e-6** |
| Mato Grosso | - 0.06 | 0.25 | 0.04 | 0.53 |
| Amazonas | 0.11 | 0.01 | 0.02 | 0.67 |
| Pará | 0.03 | 0.56 | 0.02 | 0.71 |
| Tocantins | - 0.02 | 0.86 | - 0.011 | 0.90 |
| Maranhão | 0.07 | 0.41 | - 0.033 | 0.72 |
| Piauí | **- 0.29** | **0.003** | **- 0.44** | **4.8e-6** |
| Roraima | -0.07 | 0.52 | - 0.18 | 0.11 |
| Rondônia | -0.17 | 0.13 | - 0.02 | 0.80 |
| Acre | **0.47** | **0.0005** | **0.51** | **0.0001** |
| Rio Grande do Norte | 0.22 | 0.30 | - 0.51 | 0.81 |
| Sergipe | 0.013 | 0.96 | 0.04 | 0.87 |
| Pernambuco | - 0.05 | 0.76 | 0.11 | 0.49 |
| Paraíba | - 0.13 | 0.43 | - 0.05 | 0.77 |
| Alagoas | - 0.45 | 0.11 | - 0.23 | 0.41 |
| Ceará | - 0.10 | 0.46 | - 0.18 | 0.19 |
| Amapá | - 0.26 | 0.07 | **- 0.40** | **0.004** |