CO and aerosols: application in air quality

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Goals

Help assess the quantitative use of satellite CO and aerosol data for air quality studies.
Simulate multi-year CO and aerosols (2000-2006) with GOCART

- CO tagged by fossil fuel, biofuel, biomass burning, biogenic emission, and methane oxidation

- Aerosols including sulfate, black carbon and organic carbon, dust, and sea-salt

- Obtain concurrent observations for CO and aerosols from satellite (AIRS, MOPITT, MODIS), surface (GMD/AERONET) and aircraft (GMD)
Stations and regions in analyses

Stations: NH high latitude, Land, Ocean, SH high latitude

Regions
Column CO vs surface CO

Year 2004

Error for the fitting?
Monthly column CO vs surface CO in six NH regions

Slope is low in pollutant regions and high in clean regions
Monthly column CO vs surface CO in four SH regions

Graphs showing the correlation between column CO (10^18 / cm²) and surface CO (ppb) for different regions:

- **afa**: R = 0.77, slope = 0.003
- **sam**: R = 0.82, slope = 0.006
- **sas**: R = 0.83, slope = 0.013
- **spc**: R = 0.98, slope = 0.017
Monthly column CO vs surface CO over east Asia and western Europe
Monthly column CO vs surface CO over two US regions

**euS**
- Jan = 0.60
- Feb = 0.57
- Mar = 0.77
- Apr = 0.66
- May = 0.69
- Jun = 0.57
- Jul = 0.55
- Aug = 0.83
- Sep = 0.80
- Oct = 0.61
- Nov = 0.76
- Dec = 0.72

**WUS**
- Jan = 0.62
- Feb = 0.51
- Mar = 0.74
- Apr = 0.84
- May = 0.82
- Jun = 0.87
- Jul = 0.79
- Aug = 0.84
- Sep = 0.85
- Oct = 0.81
- Nov = 0.68
- Dec = 0.62
Monthly column CO vs surface CO in South Africa region

Two slopes in the data
Monthly column CO vs surface CO NH and SH ocean regions

npc

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<th>R</th>
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<tbody>
<tr>
<td>Jan</td>
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<tr>
<td>Feb</td>
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SpC

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Conclusions

• The relationship between column CO and surface CO over different regions from model simulation helps us understanding the origins of pollution and assist in application of satellites in air quality studies.

• Regions with column CO dominated by local pollution, such as over east Asia and east US, have a relatively small slope for linear fitting line.

• Regions with column CO presumably contributed from inflow pollution from high altitudes, such as clean land regions and most ocean regions, have a relatively large slope.

• Regions with column CO determined by pollutants from different origins have no clear linear relationship.
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