Correlation analysis between regional carbon monoxide and black carbon from satellite measurements

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PII: S0169-8095(16)30644-5
DOI: doi: 10.1016/j.atmosres.2017.04.004
Reference: ATMOS 3916

To appear in: *Atmospheric Research*

Received date: 23 November 2016
Revised date: 21 March 2017
Accepted date: 3 April 2017

Please cite this article as: Jungbin Mok, Sang Seo Park, Hyunkwang Lim, Jhoon Kim, David Edwards, Jaehwa Lee, Jongmin Yoon, Yun Gon Lee, Ja-Ho Koo , Correlation analysis between regional carbon monoxide and black carbon from satellite measurements. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. Atmos(2017), doi: 10.1016/j.atmosres.2017.04.004

Manuscript Details

Manuscript number	ATMOSRES_2016_281
Title	Correlation analysis between regional carbon monoxide and black carbon from satellite measurements
Article type	Research Paper

Abstract

In this study, we present and compare regional correlations between CO total column density (TCDCO) from the data set of Measurement of Pollution in the Troposphere (MOPITT), and high-absorbing BC dominant aerosol optical depth (AODBC) from the retrieval algorithm using Moderate Resolution Imaging Spectroradiometer (MODIS) and Ozone Monitoring Instrument (OMI) (MODIS-OMI algorithm, MOA). TCDCO shows positive relationship to both fine-mode AOD (AODFM) and AODBC in general, but TCDCO better correlates with AODBC than AODFM. This enhanced correlation between TCDCO and AODBC appears more clearly during spring and summer. Correlation between TCDCO and AODBC is exceptionally poor in Northern Africa where the BC-dominated aerosols are frequently mixed with mineral dust particles from the Sahara. Another issue is also found in Southern Africa; the correlation between AODBC and TCDCO in this region is not much higher than that between the AODFM and TCDCO in spite of large occurrence of biomass burning and wildfire. This can be explained by the cloud perturbation near the source regions and dispersion effect due to the typical wind pattern. Correlations between AODBC and TCDCO increase further when fire detected areas are only considered, but does not change much over the urban area. This difference clarifies the large contribution of burning events to the positive relationship between BC and CO. All findings in this study demonstrates a possible use of satellite CO product in evaluating the BC-dominated aerosol product from satellite remote sensing over the globe.

Keywords	black carbon; carbon monoxide; biomass burning; wildfire
Manuscript category	Atmospheric chemistry
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Suggested reviewers	Yong-Sang Choi, Zhengqiang Li, Ryan Spackman