3.142 Biomass burning influence on ozone and precursors over the Amazon: trends and regional source contributions.

Presenting Author:
Steve Arnold, Institute for Climate and Atmospheric Science, School of Earth & Environment, University of Leeds, Leeds, UK., s.arnold@leeds.ac.uk

Co-Authors:
Richard Pope, Institute for Climate and Atmospheric Science, School of Earth & Environment, University of Leeds, Leeds, UK; National Centre for Earth Observation, University of Leeds, UK.
Louisa Emmons, Atmospheric Chemistry Observations and Modeling Division, NCAR, Boulder, USA.
Brian Kerridge, Rutherford Appleton Laboratory, UK.
Barry Latter, Rutherford Appleton Laboratory, UK.
Richard Siddans, Rutherford Appleton Laboratory, UK.
Carly Reddington, Institute for Climate and Atmospheric Science, School of Earth & Environment, University of Leeds, Leeds, UK.
Ed Butt, Institute for Climate and Atmospheric Science, School of Earth & Environment, University of Leeds, Leeds, UK.
Amos Tai, Chinese University of Hong Kong, Hong Kong.
Mehliyar Sadiq, Chinese University of Hong Kong, Hong Kong.

Abstract:

Biomass burning is a large source of reactive trace gases and aerosol to the tropical atmosphere, with substantial impacts on the atmospheric radiation balance and surface air quality. In the Amazon, fires are mainly caused by human activity, being used as a tool for land clearance during conversion of forest to agricultural land. These fires produce smoke and trace gases, which are observed across widespread regions of the Amazon basin. A downward trend in deforestation over the Amazon has recently been shown, with associated reductions in biomass burning-sourced aerosol. The effects of fires and temporal changes in fire activity on ozone and precursors in the Amazon region may differ from those on aerosol, due to different emission dependencies on fuel type and fire regimes.

We use long-term satellite datasets (2005-2015) of tropospheric column NO_2 and sub-column (0-6 km) ozone from the Ozone Monitoring Instrument (OMI), to investigate biomass burning contributions to NO_2 and ozone concentrations over the Amazon region, and trends over the 11-year period. Large enhancements in Amazon region NO_2 and ozone are detected in the satellite data during the dry season. Our model simulations show these enhancements are sourced mainly from South American biomass burning emissions, with smaller ozone contributions over the eastern Amazon from easterly import of African biomass burning emissions. The 11-year satellite time-series shows statistically significant trends in observed NO_2 both in the deforestation region of the Amazon (negative trend) and in Eastern Brazil (positive trend). These trends appear to be related to trends in deforestation and savannah fire burned area in South America. We

use the TOMCAT chemical transport model to investigate the effects of these trends in NO_2 emissions on regional tropospheric ozone concentrations. We discuss implications of the observed NO_2 trends for ozone air quality in the Amazon region.