QOS2016-306, 2016
Quadrennial Ozone Symposium of the International Ozone Commission

Biomass burning influences on atmospheric composition: a case study to assess the impact of chemical data assimilation

T.D. Keslake (1), M Chipperfield (1), G. Mann (1), J. Flemming (2), S Dhomse (1), and W. Morgan (3)
(1) University of Leeds, UK, (2) ECMWF, Reading, UK, (3) University of Manchester, UK

The C-IFS (Composition Integrated Forecast System) developed under MACC and continued under CAMS, provides global operational forecasts and reanalyses of atmospheric composition at high spatial resolution (T255, $\sim$80km). Here we present results from C-IFS experiments with and without composition data assimilation, in particular exploring how the approach improves the representation of biomass burning emissions in the Amazon and their influence on tropospheric ozone (O_3) concentrations, by comparing to independent observations from the SAMBBA field campaign in 2012.

Biomass burning emits numerous species into the troposphere, including ozone precursors such as carbon monoxide and nitrogen oxides, often into unpolluted areas with low ozone concentrations, such as the Amazon. The subsequent increase in ozone can damage plant stomata, limit photosynthesis and potentially influence the forests ability to act as a carbon sink. Ozone also influences secondary organic aerosol formation, through the oxidation of isoprene and other organic compounds, changing the composition of aerosol particles and their influence on the local energy budget. C-IFS contains a high resolution model framework with assimilated CO, NO_2 and O_3 columns which is used here to gain an insight into modelled ozone from biomass burning.

In this study we compare concentrations of species from the experiments with and without composition assimilation, including non-assimilated fields, such as formaldehyde, isoprene and the hydroxyl radical, to observed values. This is done to determine the accuracy of the reanalysis values, explain the error associated with the standard model scheme and to test the ability of the chemical scheme to produce more accurate non-assimilated values in the reanalysis.

Initial comparisons to SAMBBA aircraft profiles show the greater accuracy of the assimilation experiment in capturing ozone compared to the standard model scheme however, there is still a significant negative bias. Changes in ozone concentrations, from assimilation, also lead to a significant decrease in isoprene concentrations while increasing formaldehyde, leading to a more realistic representation of both species.