Geophysical Research Abstracts
Vol. 18, EGU2016-12850, 2016
EGU General Assembly 2016

Characterisation of Central-African emissions based on MAX-DOAS measurements, satellite observations and model simulations over Bujumbura, Burundi.

Clio Gielen (1), Francois Hendrick (1), Gaia Pinardi (1), Isabelle De Smedt (1), Trissevgeni Stavrakou (1), Huan Yu (1), Caroline Fayt (1), Christian Hermans (1), Maité Bauwens (1), Eugene Ndenzako (2), Pierre Nzohabonayo (2), Rachel Akimana (2), Sébastien Niyonzima (2), Jean-Francois Müller (1), and Michel Van Roozendael (1)

(1) Royal Belgian Institute for Space Aeronomy, Brussel, Belgium (clio.gielen@aeronomie.be), (2) Department of Physics, University of Burundi, Burundi

Central Africa is known for its strong biogenic, pyrogenic, and to a lesser extent anthropogenic emissions. Satellite observations of species like nitrogen dioxide (NO_2) and formaldehyde (HCHO), as well as inverse modelling results have shown that there are large uncertainties associated with the emissions in this region. There is thus a need for additional measurements, especially from the ground, in order to better characterise the biomass-burning and biogenic products emitted in this area.

We present MAX-DOAS measurements of NO_2, HCHO, and aerosols performed in Central Africa, in the city of Bujumbura, Burundi (3°S, 29°E, 850m). A MAX-DOAS instrument has been operating at this location by BIRA-IASB since late 2013. Aerosol-extinction and trace-gases vertical profiles are retrieved by applying the optimal-estimation-based profiling tool bePRO to the measured O_4, NO_2 and HCHO slant-column densities. The MAX-DOAS vertical columns and profiles are used for investigating the diurnal and seasonal cycles of NO_2, HCHO, and aerosols. Regarding the aerosols, the retrieved AODs are compared to co-located AERONET sun photometer measurements for verification purpose, while in the case of NO_2 and HCHO, the MAX-DOAS vertical columns and profiles are used for validating GOME-2 and OMI satellite observations.

To characterise the biomass-burning and biogenic emissions in the Bujumbura region, the trace gases and aerosol MAX-DOAS retrievals are used in combination to MODIS fire counts/radiative-power and GOME-2/OMI NO_2 and HCHO satellite data, as well as simulations from the NOAA backward trajectory model HYSPLIT. First results show that HCHO seasonal variation around local noon is driven by the alternation of rain and dry periods, the latter being associated with intense biomass-burning agricultural activities and forest fires in the south/south-east and transport from this region to Bujumbura. In contrast, NO_2 is seen to depend mainly on local emissions close to the city, due to the short lifetime of this species (typically 1-2 hours). Regarding the biogenic emissions, it is found that they play only a minor role in the observed HCHO seasonality. These results are further assessed using the tropospheric 3D-CTM IMAGES.