Geophysical Research Abstracts
Vol. 20, EGU2018-19565, 2018
EGU General Assembly 2018

Global distribution lowermost tropospheric ozone pollution from multispectral synergism of IASI infrared and GOME-2 ultraviolet satellite measurements

Juan Cuesta (1), Gaëlle Dufour (1), Maxim Eremenko (1), Gilles Foret (1), Mathias Beekmann (1), Johannes Orphal (2), Cathy Boonne (3), and Jean-marie Flaud (1)

(1) (1) Laboratoire Interuniversitaire des Systèmes Atmosphériques (LISA), UMR CNRS 7583, Université Paris-Est Créteil et Université Paris Diderot, Créteil, France, (2) (2) Karlsruher Institut für Technologie (KIT), Institut für Meteorologie und Klimaforschung, Karlsruhe, Germany, (3) (3) Institut Pierre Simon Laplace (IPSL), Paris, France

Air pollution is now the world's largest single environmental health risk, causing 7 million premature deaths worldwide every year (WMO, 2016). The most hazardous gaseous pollutant is tropospheric ozone. Therefore, monitoring and understanding the spatiotemporal evolution of ozone pollution at the regional, continental and global scale is a crucial societal issue. At such scales, the observation of tropospheric ozone is only possible by spaceborne remote sensing. The enhanced coverage and performance of new satellite-based instruments, such as IASI or GOME-2, offer a great potential for monitoring air quality in synergism with regional chemistry-transport models, for both inter-validation and full data assimilation. However, standard spaceborne observations using single-band approaches using either UV or IR measurements show limited sensitivity to ozone in the atmospheric boundary layer, which is the major concern for air quality.

A new capacity to observe the daily distribution of ozone located at the lowermost troposphere (below 3 km of altitude) has been shown by an innovative multispectral synergism of IASI and GOME-2 measurements at the IR and UV respectively (Cuesta et al., 2013; 2017). This novel method called IASI+GOME2 retrieves ozone at the lowermost troposphere with a low mean bias (3%), a linear correlation of 0.86 and a mean precision of 16% as compared to reference ozonesonde measurements around the world during all seasons. The retrieval sensitivity peaks down to 2 to 2.5 km over land during summer. This multispectral product is available at the IASI spatial resolution (12 km diameter pixels spaced by 25 km at nadir) and for cloud fractions below 30%. IASI+GOME2 retrievals also show a good and currently unique agreement with respect to in situ surface measurements of ozone, over East Asia and Europe, for both ozone outbreak events and the seasonal evolution.
The current presentation will focus on the global observations of lowermost tropospheric ozone observations from IASI+GOME2, provided by the French national data centre AERIS/ESPRI (http://cds-espri.ipsl.fr). This new publicly available database allows us to analyse the global distribution of lowermost tropospheric ozone at daily to seasonal evolution. We particularly focus our study on the main transport pathways of lowermost tropospheric ozone at continental and intra-continental scales, in link with meteorological and dynamical conditions.

References :

Cuesta, J., Eremenko, M., Liu, X., Dufour, G., Cai, Z., Höpfner, M., von Clarmann, T., Sellitto, P., Foret, G., Gaubert, B., Beekmann, M., Orphal, J., Chance, K., Spurr, R., and Flaud, J.-M.: Satellite observation of lowermost tropospheric ozone by multispectral synergism of IASI thermal infrared and GOME-2 ultraviolet measurements over Europe, Atmos. Chem. Phys., 13(19), 9675–9693, 2013

Cuesta, J., Y. Kanaya, M. Takigawa, G. Dufour, M. Eremenko, G. Foret, K. Miyazaki and M. Beekmann, Transboundary ozone pollution across East Asia: daily evolution and photochemical production analysed by IASI+GOME2 multispectral satellite observations and models, [Atmospheric Chemistry and Physics], https://doi.org/10.5194/acp-2017-972, Soumis et Publié dans Atmos. Chem. Phys. Discuss, 2017

World Health Organization (WHO), Ambient air pollution: A global assessment of exposure and burden of disease, ISBN: 9789241511353, 2016.