Geophysical Research Abstracts
Vol. 16, EGU2014-10524, 2014
EGU General Assembly 2014
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Observing lowermost tropospheric ozone pollution with a new multispectral synergic approach of IASI infrared and GOME-2 ultraviolet satellite measurements

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Tropospheric ozone is currently one of the air pollutants posing greatest threats to human health and ecosystems. Monitoring ozone pollution at the regional, continental and global scale is a crucial societal issue. Only space-borne remote sensing is capable of observing tropospheric ozone at such scales. The spatio-temporal coverage of new satellite-based instruments, such as IASI or GOME-2, offer a great potential for monitoring air quality by synergism with regional chemistry-transport models, for both inter-validation and full data assimilation. However, current spaceborne observations using single-band either UV or IR measurements show limited sensitivity to ozone in the atmospheric boundary layer, which is the major concern for air quality.
Very recently, we have developed an innovative multispectral approach, so-called IASI+GOME-2, which combines IASI and GOME-2 observations, respectively in the IR and UV. This unique multispectral approach has allowed the observation of ozone plumes in the lowermost troposphere (LMT, below 3 km of altitude) over Europe, for the first time from space. Our first analyses are focused on typical ozone pollution events during the summer of 2009 over Europe. During these events, LMT ozone plumes at different regions are produced photo-chemically in the boundary layer, transported upwards to the free troposphere and also downwards from the stratosphere. We have analysed them using IASI+GOME-2 observations, in comparison with single-band methods (IASI, GOME-2 and OMI). Only IASI+GOME-2 depicts ozone plumes located below 3 km of altitude (both over land and ocean). Indeed, the multispectral sensitivity in the LMT is greater by 40% and it peaks at 2 to 2.5 km of altitude over land, thus at least 0.8 to 1 km below that for all single-band methods. Over Europe during the summer of 2009, IASI+GOME-2 shows 1% mean bias and 21% precision for direct comparisons with ozonesondes and also good agreement with CHIMERE model simulations. Furthermore, current work also aims at the assimilation of IASI+GOME-2 observations into CHIMERE model by a Kalman ensemble approach, for evaluating the contribution of these multispectral observations of ozone for air quality monitoring systems. In the current presentation, we will show an overview of the capacity of IASI+GOME-2 for describing these European lowermost ozone pollution episodes, in synergism with modeling tools.