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Observation of an intercontinental smoke plume over Europe on June 2013: some ambiguity in the determination of the source

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During the morning on June 26 2013, LIDAR-ceilometers showed a clear layer of aerosol at an altitude of around 3000-4000 meters over United Kingdom and Belgium. This layer of aerosol originated from biomass burning aerosol released by intense wildfires in North America. The transport of these aerosols over Europe was due to the production of pyrocumulus clouds by these wildfires that injected the aerosols at the top of the troposphere where the configuration of the Jet Stream was suitable for blowing the aerosols across the North Atlantic.

In this work, we would like to illustrate with this intercontinental smoke transport event (not uncommon in Europe) the ambiguity that can happen if one type of remote sensor instrument is used to monitor smoke plumes. Indeed, during this event, some remote sensing scientists claimed that the origin of the observed plume over Europe came from Colorado wildfires (United States) and others claimed that the smoke plume came from Quebec wildfires (Canada) far away of more than 2000 km from Colorado! In this case, a dispersion model was necessary and was employed in this work to discriminate which wildfires contributed mainly to the smoke plume over Europe. We present the absorbing aerosol index images from GOME-2 satellite instrument (used to monitor and to reveal the origin area of the smoke plume), the simulation of our dispersion model (to validate the satellite observations and to discriminate the wildfire sources) and the lidar-ceilometer images (used to estimate the height of the plume and to validate our dispersion simulations). The dispersion model suggests that much of the smoke came from Quebec wildfires. A remarkable agreement between the lidar-ceilometer observations and the dispersion model was observed.

This intercontinental smoke transport event is also a good example to highlight that the lidar-ceilometer is an indispensable element to monitor smoke plumes at fine temporal and spatial scale. However, it is necessary to coordinate the national lidar-ceilometer networks in Europe. In the frame of the development of a coordinated system for the lidar-ceilometer observations in Europe, two European projects supported by EUMETNET (E-PROFILE) and by COST Action (TOPROF) started in 2013 with the goal of making available in near real time the measurements of the European lidar-ceilometers network to the European meteorological community.