Investigation of the vertical and horizontal spatial distributions of NO$_2$ in Brussels area using MAX-DOAS measurements.

Ermioni Dimitropoulou (1), Michel Van Roozendael (1), Francois Hendrick (1), Alexis Merlaud (1), Frederik Tack (1), Caroline Fayt (1), Christian Hermans (1), Gaia Pinardi (1), and Frans Fierens (2)

(1) Belgian Institute for Space Aeronomy, UV VIS DOAS Group, Belgium (ermioni.dimitropoulou@aeronomie.be), (2) IRCEL-CELINE, Brussels, Belgium

Tropospheric NO$_2$ is an important anthropogenic pollutant emitted by combustion processes associated to traffic, industrial activity and domestic heating. Because its lifetime is short (typically a few hours close to the surface), it displays a large variability in time and space. NO$_2$ is generally seen as a proxy of air pollution, as high concentration of NO$_2$ are often associated with high concentrations of other pollutants such as tropospheric O$_3$ and aerosols. For this reason, its continuous monitoring is of major importance.

In the present study, MAX-DOAS measurements from the BIRA-IASB research grade spectrometer operated in Uccle (Brussels, Belgium) are used to develop and demonstrate new approaches for investigating the vertical and horizontal spatial distributions of NO$_2$ under moderate to high pollution conditions, such as encountered in Brussels and its suburban area. More precisely, we describe how multi-angle static MAX-DOAS measurements can be combined with ancillary in-situ observations from the regional air-quality telemetric network and meteorological data (mostly wind speed and direction) in order to study the horizontal and vertical gradients of NO$_2$ and to identify the most important emission source areas in and around Brussels. The link between surface concentrations and vertical columns of tropospheric NO$_2$ will be also investigated and, together with the observed horizontal gradients, will support the validation of TROPOMI NO$_2$ satellite observations.