Use of high-resolution NO2 sonde profiles for the validation of tropospheric NO2 from satellites

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The Royal Netherlands Meteorological Institute (KNMI) has developed a working NO2 sonde. The sonde is attached to a small meteorological balloon and measures a tropospheric NO2 profile. The NO2 sonde has a vertical resolution of 5m and a measurement range between 1 and 100 ppbv. The instrument is light in weight (0.7 kg), cheap, disposable, energy efficient and not harmful to the environment or to any person who finds the sonde after use. The sonde uses the chemiluminescent reaction of NO2 in an aqueous luminol solution, which is optimised to be specific to NO2. An on-ground comparison with an in-situ NO2 monitor of The National Institute for Public Health and the Environment (RIVM), shows that both instruments measure similar NO2 variations in ambient air. The NO2 sonde can be operated in a similar way as an ozone sonde, and can be made suitable for application in a global network.

In the summer of 2009, during the Cabauw Intercomparison of Nitrogen Dioxide measuring Instruments campaign (CINDI), and in the winter of 2010-2011, several NO2 sondes were launched. The NO2 profiles are compared with MAXDOAS measurements and profiles measured with an NO2 LIDAR. The high-resolution profiles from the sondes can be used for satellite validation in two ways: they can be used to validate the tropospheric NO2 profiles that are used as input for the satellite retrievals, and they can be used in a direct comparison of the tropospheric columns. This presentation will demonstrate these applications using satellite retrieved NO2 from OMI, SCIAMACHY, and GOME-2.