

Performance of the AOTF-based NO₂ camera for urban pollution imaging

Dekemper, Emmanuel; Vanhamel, J.; Van Roozendael, Michel

DOI

[10.5194/egusphere-egu22-3572](https://doi.org/10.5194/egusphere-egu22-3572)

Publication date

2022

Citation (APA)

Dekemper, E., Vanhamel, J., & Van Roozendael, M. (2022). *Performance of the AOTF-based NO₂ camera for urban pollution imaging*. Abstract from EGU General Assembly 2022, Vienna, Austria.
<https://doi.org/10.5194/egusphere-egu22-3572>

Important note

To cite this publication, please use the final published version (if applicable).
Please check the document version above.

Copyright

Other than for strictly personal use, it is not permitted to download, forward or distribute the text or part of it, without the consent of the author(s) and/or copyright holder(s), unless the work is under an open content license such as Creative Commons.

Takedown policy

Please contact us and provide details if you believe this document breaches copyrights.
We will remove access to the work immediately and investigate your claim.

EGU22-3572

<https://doi.org/10.5194/egusphere-egu22-3572>

EGU General Assembly 2022

© Author(s) 2022. This work is distributed under the Creative Commons Attribution 4.0 License.



Performance of the AOTF-based NO₂ camera for urban pollution imaging

Emmanuel Dekemper¹, Jurgen Vanhamel^{1,2}, and Michel Van Roozendael¹

¹Royal Belgian Institute for Space Aeronomy (BIRA-IASB), Brussels, Belgium

²Faculty of Aerospace Engineering, Technical University of Delft (TU Delft), Delft, The Netherlands

An instrument capable of imaging the field of NO₂ in various open-air situations has been designed, manufactured, and tested. It is an improved version of the NO₂ camera relying on an AOTF (acousto-optical tunable filter) which has demonstrated, amongst other things, its capability to quantify the NO₂ released by power plant smokestacks. The improved version which is presented has a larger field of view, a higher frame rate, and better spectral registration performance.

The working principle of the instrument has been preserved: by driving the AOTF with the appropriate acoustic frequency, a spectral image of the scene captured by the camera is recorded at a particular wavelength. The recording of a number of spectral images allows to form an hypercube: two spatial dimensions, and a spectral one.

While the earlier instrument was relying on a handful of wavelengths to quantify the slant column density of NO₂ observed in each pixel line of sight, the new instrument can now record "continuous" portions of the visible-light spectrum, typically between 440, and 460nm, where the NO₂ exhibits some of its largest absorption lines.

When the target is stable, like the air observed above a city skyline, the NO₂ camera has enough time to build a large hypercube, and the spectrum measured in each pixel can be processed by the DOAS (differential optical absorption spectroscopy) method. This approach is better suited when NO₂ is expected across the entire scene, not just in the plume of a smokestack for instance.

The new instrument will be presented, and results of measurements performed in an urban context will be shown. The performance of the NO₂ camera will be discussed based on the results of an intercomparison with the MAX-DOAS of Uccle, Brussels, and other air quality stations.