

Aerospace Europe Conference 2023

Joint 10th EUCASS – 9th CEAS Conference

Abstract #XXX (to be filled by the organizers)

Preferred Topics: AEROST, UAVFUT

Corresponding author: TOSON Federico

e-mail of corresponding author: federico.toson@phd.unipd.it

Type: Oral

Status of corresponding author: Student

For student corresponding author: student member of AIDAA

Title

Design and development of the ATEMO atmosphere monitoring device.

Authors

Federico TOSON ^{1*}, Carlo Bettanini ²

** Corresponding author*

¹ CISAS G. Colombo – University of Padova, via Venezia 15, 35131, PADOVA Italy, federico.toson@phd.unipd.it

² DII – University of Padova, via Venezia 1, 35131, PADOVA Italy, carlo.bettanini@unipd.it

Abstract

To date, deaths and impacts of air pollution on ecosystems are well known and in need of action [1]. In this context the aerospace sector plays a central role in both atmospheric analysis and determination of pollutants. Concerning the technologies currently in use, these primarily include satellite analysis [2] and static ground sampling.

In relation to this, the PhD project ATEMO (Aerospace Technologies for Earth Monitoring and Observation), involves the design and assembly of a device for in situ measurement of pollutants (mainly chemical and light) and correlation of these data not only with similar ones collected by other technologies, but also with environmental values of interest such as the vegetative index. To fill the "analysis gap" left by satellites and ground stations, ATEMO proposes the development of an instrument that can be integrated on drones and stratospheric balloons so as to improve spatial but also temporal resolution.

One of the main objectives of ATEMO, in addition to the analysis of chemical pollutants from combustion such as VOC_s (Volatile Organic Compounds), NO_x (Oxides of Nitrogen), SO_x (Oxides of Sulphur), CO₂ (Carbon Dioxide), and O₃ (Ozone), is to determine the degree of light pollution and then correlate it with the afore mentioned chemical compounds. In fact, it is well known how cities that are highly polluted from a chemical point of view are affected by various by-products effect of photochemical reactions due to light pollution [3]. Therefore, for in-depth analysis, the device will provide a comprehensive image of the area under investigation.

To achieve these objectives, ATEMO will be equipped with several sensors to measure pollutants, but the heart of the instrument will be the camera compartment (one monochromatic camera and the one colour camera) that, with the appropriate filtering, will provide information and images of the status of sources of chemical and light emission and on the well-being of the vegetation below.

Future developments for this type of instrument are innumerable; certainly, an improvement and integration of technologies already in operation, but certainly, a compact device such as the one described, to be deployed in situ, would provide a better understanding of aspects related to emissions from industries, crop monitoring and ecosystem health.

This paper will therefore describe the design choices and subsequent development of ATEMO in preparation for field testing and data analysis.

References

- [1] J. Schwartz, "The distributed lag between air pollution and daily deaths.," *Epidemiology*, vol. 11, no. 3, pp. 320-326, 2000.
- [2] "Europe's eyes on the earth," European Union, 2022. [Online]. Available: <https://www.copernicus.eu/en>.
- [3] F. E. Blacet, "Photochemistry in the Lower Atmosphere," in *Symposium on Air Pollution*, New York, 1951.