Monitoring Ozone using Low-Cost Gas Sensors and Deep Neural Network

Marco Magoni (1,2*), Andrea Gaiardo (2), Matteo Valt (2), Pietro Tosato (2), Antonio Orlando (2,3), Barbara Fabbri (1), Vincenzo Guidi (1)

1) Department of Physics and Earth Sciences, University of Ferrara, via Saragat 1/C, Ferrara, Italy
2) Sensors and Devices center, Bruno Kessler Foundation, Via Sommarive 18, Trento 38123, Italy
3) Sensing Technologies Lab, Faculty of Engineering, Free University of Bolzano-Bozen, Piazza Università 5, 39100 Bolzano, Italy
*Correspondance: marco.magoni@unife.it.

Ozone is an essential element of Earth's stratosphere, playing a critical role in shielding the planet from ultraviolet radiation. However, at the tropospheric level, ozone becomes a major pollutant, significantly influencing the oxidative capacity of the atmosphere. Additionally, its concentration can vary significantly across different regions, leading to adverse effects on human health and environmental balance. For this reason, it is important to monitor it with high spatio-temporal resolution. The emergence of low-cost sensor technology can pave the way for affordable and accessible gas sensor monitoring solutions that can complement existing technologies.

In this presentation, we aimed to calibrate a low-cost gas sensing platform that utilizes chemoresistive devices to monitor the environmental concentration of ozone. The calibration process involves the use of a deep neural network to compare ozone concentration measured by the sensor with the collected concentration by the local environmental protection agencies using certified tools. The current results are promising, suggesting that the integration of low-cost sensors and machine learning algorithms can enhance the accuracy and accessibility of ozone monitoring. This development could help us better understand and manage this critical atmospheric component.