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Open hardware, low cost, air quality stations for monitoring ozone in coastal area

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Ozone concentrations in urban and coastal area are a great concern for citizens and, consequently regulator. In the last 20 years the Ozone concentration is almost doubled and it has attracted the public attention because of the well know harmful impacts on human health and biosphere in general. Official monitoring networks usually comprise high precision, high accuracy observation stations, usually managed by public administrations and environmental agency; unfortunately due to their high costs of installation and maintenance, the monitoring stations are relatively sparse. This kind of monitoring networks have been recognized to be unsuitable to effectively characterize the high variability of air quality, especially in areas where pollution sources are various and often not static.
We present a prototype of a low cost station for air quality monitoring, specifically developed for complementing the official monitoring stations improving the representation of air quality spatial distribution. We focused on a semi-professional product that could guarantee the highest reliability at the lowest possible cost, supported by a consistent infrastructure for data management. We test two type of Ozone sensor electrochemical and metal oxide. This work is integrated in the ACRONET Paradigm ® project: an open-hardware platform strongly oriented on environmental monitoring. All software and hardware sources will be available on the web. Thus, a computer and a small amount of work tools will be sufficient to create new monitoring networks, with the only constraint to share all the data obtained. It will so possible to create a real “sensing community”.
The prototype is currently able to measure ozone level, temperature and relative humidity, but soon, with the upcoming changes, it will be able also to monitor dust, carbon monoxide and nitrogen dioxide, always through the use of commercial sensors. The sensors are grouped in a compact board that interfaces with a data-logger able to transmit data to a dedicated server through a GPRS module (no ad hoc radio infrastructure needed). Due to the GPRS low latency transmission the data are transmitted in near-real time. The prototype has an independent power supply.
The sensors outputs are directly compared with the measurement of the official fixed monitoring stations. We present preliminary tests of a ozone level assessment obtained without laboratory calibration during a first field campaign in Savona (Italy); the preliminary verification and test show reasonable agreement between low cost sensors and fixed monitoring station ozone level trends (low cost sensors detect gas concentration at ppb level). The preliminary results are promising for complementing the fixed official monitoring networks with low-cost sensors.