

ABSTRACT

A Low-Cost Sulphur Dioxide Monitoring Device as a tool for use in a Citizen-Science Volcanic Monitoring Framework

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Volcanic monitoring plays an important role in indicating the activity of a volcano as well as aids in identifying potential risks that communities living near them may face. However, this is a costly enterprise and has at times warranted more cost-effective alternatives within resource-constrained territories. Concerns were raised by staff and visitors to the Sulphur Springs Park (SSP) in St. Lucia about the concentrations of the gases in the air and their potential health effects. At present, no continuous air quality monitoring exists at the Park due to its restrictive costs.

As a result, this research sought to develop a cost-effective, easy to operate device that could be used to monitor airborne concentrations of SO₂, due to its susceptibility to individuals at concentrations as low as 0.175 µL/L(ppm). The device was successfully designed and built, for approximately \$25 USD, using an active sampler approach and easy to obtain materials. Volunteers were selected among the staff at the Park, who were trained in use of the device to measure

ambient concentrations over a six-month period. Based on the concentrations measured, the baseline ambient levels were found to fluctuate between 0.01-0.32 $\mu\text{L/L}$ (ppm) for sites close to the vents, generally within the WHO 10-min AQG (0.175 ppm). This meant that concentrations generally remained within tolerable levels, even for the susceptible populace.

It was found that the instrument was effectively used, and its measurements could be favourably compared to commercial instruments/methods, notably SO_2 passive diffusion tubes and the ToxiRAE Pro SO_2 meter. Furthermore, the economic and social advantage of having a cost-effective volcanic monitoring instrument that can be built and used in resource-constrained countries, adds this novel body of literature to the overarching principle of the relevance and benefits of citizen science in the 21st century.

Keywords: Viveka Jackson; sulphur dioxide; volcano-monitoring; citizen science; low-cost samplers; air quality