



## **Affordable technology to monitor degassing at remote volcanoes**

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Half of the volcanoes in eruption in the next century are expected to reawaken after a centuries of repose. Most are unlikely to be monitored and their populations unaware of the hazards they pose. Most will also occur in nations that have limited economic resources for the long-term monitoring of volcanoes. Advances in technology are yielding opportunities for designing and deploying affordable sensors for the real-time acquisition of essential geochemical and geophysical signals of volcanic unrest. Here we present preliminary results from the Evanesce programme, a new initiative for low-cost sensor development.

The first sensors have been designed to monitor ambient and soil CO<sub>2</sub> flux. Gas concentrations are measured by Non-Dispersive Infrared (NDIR) spectroscopy using a commercially-available CO<sub>2</sub> detector. Data from each unit are wirelessly transmitted to a base station, then uploaded to the internet where they can be accessed online in real time. The detector has a total detection range of 0-10 000 ppm and a notional lifetime of at least 15 years.

The sensors have been tested at Sulphur Springs, Saint Lucia, an active hydrothermal area and major tourist attraction on the island. Ambient CO<sub>2</sub> sensors were installed along pathways with the highest foot traffic around the site, whilst units measuring soil flux were deployed in areas of diffuse fumarolic activity. The sensors initially performed well, but, after a day on test, those recording soil flux became corroded due to the acidic gases. The results of the field tests will be used to improve designs, so that they can better withstand site conditions and to inform the development of sensors for other species such as SO<sub>2</sub> and H<sub>2</sub>S. Compared with traditional gas monitoring instruments, these sensors are smaller, lower maintenance and significantly less expensive. They are thus well-suited for deployment for live-volcano monitoring networks. Further applications include environmental health monitoring in actively degassing areas and in citizen science programmes.