

# An instrument for sampling volcanic plumes from a UAV

Instrument for unbiased (isokinetic) sampling of particulates alongside gas concentration measurements using COTS sensors – **available for use by the community for AQ applications after flight testing**

## Motivation

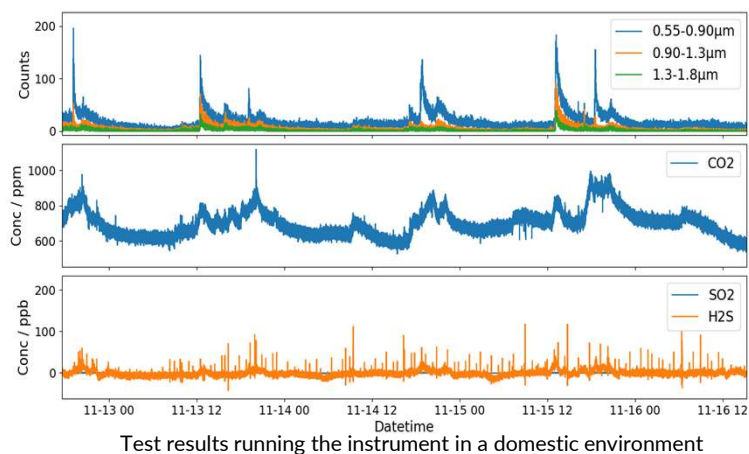
- Erupting volcanoes emit both **particulates** (ash) and **gasses** (e.g.  $\text{SO}_2$ ) with detrimental effects to local air quality
- Unmanned Aerial Vehicles (UAVs) offer a means to sample air **within the plume** as it travels

## Isokinetic Sampling

- Sampling from turbulent airflows introduces biases to particulate measurements - a particular concern on multirotor UAVs
- We tackle this using an **isokinetic inlet** extended in front of the UAV

## Components

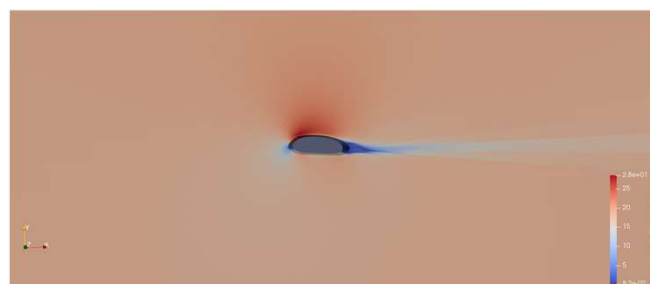
- Optical particle counter – Alphasense OPC-R2
- NDIR  $\text{CO}_2$  sensor
- Electrochemical  $\text{SO}_2$  and  $\text{H}_2\text{S}$  sensors
- Control – Raspberry Pi / Arduino



Test results running the instrument in a domestic environment



E384 UAV payload bay with instrument payload



CFD model showing the turbulent boundary around a test airfoil



• Dan Peters, Connor McGurk, Stefano Rolfo, Jean-François Smekens, Cunjia Liu