

Design Considerations and Construction of a Drone Based Miniature Mass Spectrometer System (Drone-MS) for Volcanic Gas Plume Measurements

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This presentation reports the challenges of the design and construction of several miniature Mass Spectrometer System (miniMS) based on the XPR3 miniature quadrupole and MPH high performance quadrupole mass spectrometers from Inficon Inc. in conjunction with portable vacuum systems from Creare LLC. and Pfeiffer Inc., intended to be flown by customized commercial multicomputer drones and larger Unmanned Aircraft Vehicles (UAVs) in order measure the concentration of gases of the plumes of active volcanoes.

Such a project was visualized and started more than 20 years by Dr. Jorge Andres Diaz and carried out by his research team at the GasLab of Universidad de Costa Rica in collaboration with NASA, JPL, Creare LLC and Inficon Inc. to develop and implement miniature mass spectrometer systems on systematic volcanic measurements

The development of the mini-MS instrument involved the design and construction of various prototypes which required to be self-sufficient, easy to operate and portable enough to be carried to the field or to fit into different kind UAVs from mid-size drones as the NASA's SIERRA fix wing UAV and into small-size multicomputer drones (such as the Italdrone and DJI S1000+ Multicopters).

Requirements, specifications, miniMS designs and construction is presented in the poster.