The ULISSES Project: Utilization In-Situ Airborne MS based Instrumentation for the Study of Gaseous Emissions at Active Volcanoes

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As part of the on-going research collaboration between the Gas Sensing Lab at the University of Costa Rica and the Hazard and Gas Detection Lab at Kennedy Space Center, on the use of both ground and airborne mass spectrometer systems applied to volcanoes, a new initiative for the study and visualization of gaseous volcanic emission using in-situ mass spectrometer instrumentation is described.

The data provided by the ULISES project is a key step towards a better comprehension of the geophysical phenomena surrounding eruptive activity. In-situ gas data consisting of helium, carbon dioxide, sulfur dioxide, and other gas species, is acquired with a small mass spectrometer system. Mass spectrometry and global position system (GPS) data is plotted over ground imagery, topography, and remote sensing data. This combination of gas and imaging data allows 3-dimensional visualization of the volcanic plume and the mapping of gas concentration at several volcanic structures. The combined set of data can demonstrate a better tool to assess hazardous conditions by visualizing and modeling possible scenarios of volcanic activity. In addition, its further correlation with remote sensing data can be used for inter-comparisons with same time data taken by other aircraft and space borne instruments.

With different transportation platforms, a portable mass spectrometer system, smaller than the previews AVEMS system flown on NASA WB-57 aircraft, using a compact turbo-pump, two miniature diagram pumps, a small mass spectrometer and autonomous control electronics is used for *in-situ* measurement at different volcanic locations in Costa Rica. The first airborne demonstrations this year also points in the direction of using unmanned aerial vehicles (UAVs) as future airborne platform and its unique opportunity to serve in calibration/validation of satellite remote sensing data.