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# ALMA: DEVELOPING A LOW COST AEROSOL CHARACTERISATION SYSTEM FOR STRATOSPHERIC EXPERIMENTS

**Abstract**

Aerosols with varying compositions, and mainly sulphuric aerosols, are a common product of volcanic eruptions. Sulphuric aerosols pose a threat for the environment, as they influence the absorption of the incoming solar radiation by the atmosphere. This type of aerosols are able to remain in the stratosphere for up to three years, as well as follow the global circulations. To analyse and research the impact of volcanic aerosols in the atmosphere, various satellite-borne, ground-based and balloon-borne techniques can be utilised.

Balloon missions conducting atmospheric experiments usually carry expensive off-the-shelf instruments to take measurements. Project ALMA (Atmospheric Laser Measurements of Aerosols) presents a low-cost platform for atmospheric research. The main technical objective is to design and build an affordable open-source optical aerosol counter for future balloon-borne missions. This instrument aims to characterise the aerosols and determine their size and concentration at a high latitude location in the troposphere and stratosphere. The main principle used for this counter is Mie scattering, by detecting the aerosols that cross a laser beam. As the goal of the experiment is to correlate the acquired measurements with the global volcanic activity, another off-the-shelf measuring system called ozonesonde will be utilised at the

same time. The aim of this instrument is to measure depletion in the ozone levels at different altitudes. This reduction is expected due to interactions of ozone with sulphuric aerosols. With both instruments, ALMA measures vertical profiles of ozone and aerosol concentrations during the balloon ascending phase.

This project is being developed and tested as part of the German-Swedish student programme REXUS/BEXUS by students of Luleå University of Technology (LTU) at the Kiruna Space Campus. As such, ALMA will be launching on-board BEXUS 33 in October 2022. The obtained measurements of each instrument will be analysed and compared to each other. The results will also be compared with data from previous experiments and atmospheric satellite measurements of the same region, such as data from Sentinel 5P. The performance of the system will be published on an open-source basis. This will ensure the availability and customisation of ALMA for future balloon borne missions, especially student and other low-cost research projects.