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Improved multi-spectral polarimetric observations of UTLS aerosol and cloud from stratospheric balloon with the Aerosol Limb Imager

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The Aerosol Limb Imager (ALI) is a multi-spectral imager capable designed to observe aerosol extinction and particle size profiles in the upper-troposphere lower-stratosphere. ALI uses a system of linear polarizers, a liquid crystal rotator, and an acoustic-optic tunable filter to select the linear polarization state and wavelength of limb scattered sunlight radiance between 600 nm and 1500 nm. From stratospheric balloon, spectral images have spatial resolution of <100 meters at the tangent point, and can produce useful aerosol observations between 5 km and 30 km in altitude. Of novelty is the polarimetric capability of ALI, which uses the orthogonal polarization states to detect cloud in the spectral data and facilitate its distinction from aerosol. Two previous iterations of the ALI instrument concept have already been successfully demonstrated, once in 2014 and again in 2018. Currently, a third iteration is being developed which improves upon the thermal, structural, and optical performance of the previous iterations. This improved iteration is scheduled for demonstration as part of the HEMERA program out of Kiruna, Sweden in the summer of 2021. This demonstration serves the larger objective of further proving the engineering and scientific readiness of the ALI instrument concept for eventual high-altitude aircraft and satellite platform deployments. ALI is a proposed Canadian contribution to the NASA A-CCP satellite mission study.