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(G*) Comparison Between Ground-based Lidar Measurements from MPLCAN and Simulated Retrievals from the Aerosol Limb Imager

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There is increasing demand for measurements of atmospheric properties as the climate continues to change at an unprecedented rate. Remote sensing allows us to acquire information about our atmosphere from the ground and from space by detecting reflected or emitted radiation. I will present initial results of a comparison using simulated space-based measurements from the HAWC ALI satellite instrument with ground-based measurements from a network of micro-pulse lidars, MPLCAN.
The Aerosol Limb Imager (ALI) is a part of the High-altitude Aerosol, Water, and Clouds (HAWC) satellite, a Canadian mission which will help fill a critical gap in our understanding of the role of aerosol, water vapour, and clouds in climate forcing. ALI will retrieve aerosol extinction and particle size in the troposphere and stratosphere.
The Canadian Micro-Pulse Lidar Network (MPLCAN) is a network consisting of five micro-pulse lidars (MPLs) across eastern and northern Canada. The MPLs can detect particulates produced from wildfire smoke, volcanic ash, and anthropogenic pollutants by collecting backscattered light. They can also differentiate between water and ice in clouds by measuring the polarization state of the backscatter signal.
Coincident measurements between the MPLCAN and ALI instruments have great potential to validate the ALI measurements, and to extend their horizontal coverage. However, the ALI retrieved quantities are not directly comparable to the MPL backscatter measurements, so assumptions must be made about the constituents and optical properties of the atmosphere to compare them. The ALI retrieved quantities were converted to an MPL backscatter measurement for comparison using two methods. First, Mie scattering theory was used based on the ALI retrievals of aerosol particle size to calculate the backscatter coefficient. The second method assumed a lidar ratio, the ratio of backscatter to extinction, appropriate for background stratospheric aerosols. The ALI-derived backscatter coefficient from both methods yielded similar results. Preliminary comparisons between both simulated and actual MPL measurements and the converted ALI retrieval show promising agreement. Future work will aim to model ALI passing over multiple MPLs for realistic HAWC satellite tracks to simulate wildfire smoke events.

Keyword-1

Lidar

Keyword-2

Satellite remote sensing

Keyword-3

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