# APPLICATION OF GROUND TRANSPORTABLE LIDAR FOR THE CALIBRATION AND VALIDATION OF THE NASA'S GLORY AEROSOL POLARIMETY SENSOR MEASUREMENT

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This study is the result of participation in the Glory Science Advisory Group to provide independent and unique ground-truth measurements for the Glory mission Aerosol Polarimetry Sensor (APS) using existing collocated lidar and sunphotometer instruments that are owned and operated by The Aerospace Corporation (Aerospace).

The National Aeronautics and Space Administration (NASA) Glory mission, a remote sensing Earth-orbiting observatory, which is now scheduled for launch in October of 2010 [1], as part of the A-train constellation (705 km altitude, 98.2 degrees inclination) Sun-Synchronous orbit. The Aerosol Polarimetry Sensor (APS), the primary science instrument onboard Glory, will collect multi-angle, multi-spectral photopolarimetric measurements of the atmosphere along the satellite ground track over a broad visible and near-infrared spectral range, allowing precise aerosol retrievals. Validation of these APS retrievals poses two challenges. First, due to the lack of cross track coverage beyond its nominal instantaneous field of view (IFOV) of 5.6km, collocation of APS measurements with those collected from the ground will be problematic. Secondly, the accuracy of APS aerosol retrievals will likely not be matched by most ground-based instruments [2].

To overcome these validation challenges existing collocated ground lidar and sunphotometer instruments, positioned at Aerospace facilities in El Segundo, California and the Navy's Pacific Missile Range Facility in Kauai, Hawaii [3,4] will be used during Glory's first year and half of mission life. The polarization and Raman scattering capabilities of the lidar instruments provide high precision measurements of aerosol properties, such as the vertical profile of aerosol optical thickness, water mixing ratio, and the presence of high thin clouds the which can be used to validate APS retrievals. The lidar provides polarimetric accuracy equivalent to that of APS. The data generated from this activity will also provide calibration/validation of CALIPSO's Cloud-Aerosol lidar (CALIOP), Aqua's Moderate Resolution Imaging Spectrometer (MODIS), and Terra's Multi-angle Imaging Spectro-Radiometer (MISR) and allow exploiting APS synergy with these instruments.

The common calibration standard to be implemented in this study consists of fixed and a transportable lidar systems and collocated sun photometer instruments. Both lidar and photometer are capable of polarization measurements. In addition, a balloonsonde system is also used to help calibrate the Raman lidar humidity profile. Measurements would be taken at several sites during ambient weather conditions in winter and summer over an eight hour period each day from pre-selected locations within the Glory APS sensor ground-track. This paper presents details of the ground truth validation campaign. An important criterion for the proposed ground truth validation campaign is the collocation of APS measurements with those collected from the ground. Other important criteria for ground site selection include the aerosol characteristics, site accessibility and safety, minimal cloud cover, and cost. A detailed description of the ground instrument suits will also be presented.

## References and Citations


[1] http://nasascience.nasa.gov/missions/glory

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