



## *Earth System Science Pathfinder 3 (ESSP3) Lidar Simulator*

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Field: Atmospheric Science, Degree: M.S.

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### Abstract

CaliopSim is a high-fidelity lidar simulation that has been developed to simulate the expected instrument performance of the lidar named, Cloud-Aerosol Lidar with Orthogonal Polarization (CALIOP), on-board the Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observations (CALIPSO) spacecraft. The CALIPSO mission is being developed by NASA Langley Research Center, in collaboration with the French Space Agency (CNES). The simulation tool is designed to generate realistic lidar data that models the CALIOP measurement data including the noise characteristics inherent to analog detection. These data are used for testing the CALIOP algorithms and production processing software. This paper describes the CaliopSim models for the atmosphere, CALIOP instrument laser transmitter and receiver subsystems, CALIPSO payload operations, and CALIPSO spacecraft operations. The atmosphere model provides complete flexibility in defining the molecular, aerosol, and cloud composition relative to locations along the CALIPSO orbit track. The instrument and operation models convert the model atmospheres into the simulated CALIOP measurements. The output simulated data includes digitized 1064 nm total backscatter profiles and 532 nm backscatter profiles for both the parallel and perpendicular polarization states.