CALIPSO Quality Statements Summary: Lidar Level 2 Cloud and Aerosol Layer

Lidar Level 2 Cloud and Aerosol Layer Information *Half orbit (Night and Day) lidar cloud and aerosol layer products describe both column and layer properties*					
Release Date	**Version**	**Data Date Range**	**Product Quality Statement**	**Detailed Quality Statement**	**Maturity Level**
December 2011	3.02	November 1, 2011 to present	3.02 Version Summary	QS 3.01, 3.02	• 1/3 km: Validated Stage 1 • 1 km: Validated Stage 1 • 5 km: Provisional
May 2010	3.01	June 13, 2006 to February 16, 2009 March 17, 2009 to October 31, 2011	3.01 Version Summary	QS 3.01, 3.02	• 1/3 km: Validated Stage 1 • 1 km: Validated Stage 1 • 5 km: Provisional
October 2008	2.02	September 14, 2008 to October 29, 2009	2.02 Version Summary	QS 2.01, 2.02	• Provisional
January 25, 2008	2.01	June 13, 2006 to September 13, 2008	2.01 Version Summary		• Layer Heights - Provisional • Aerosol/Cloud /Stratospheric Classifications - Beta
December 8, 2006	1.10	June 13, 2006 to November 11, 2007	1.10 Version Summary	QS 1.10	• Layer Heights - Provisional • Aerosol/Cloud /Stratospheric Classifications - Beta

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Data Release Date: December 2011
Version: 3.02
Data Date Range: November 1, 2011 to present

The CALIPSO Team is releasing Version 3.02 which represents a transition of the Lidar, IIR, and WFC processing and browse code to a new cluster computing system. No algorithm changes were introduced and very minor changes were observed between V 3.01 and V 3.02 as a result of the compiler and computer architecture differences. Version 3.02 is being released in a forward processing mode beginning November 1, 2011.

Data Release Date: May 2010
Version: 3.01
Data Date Range: June 13, 2006 to February 16, 2009 and March 17, 2009 to October 31, 2011

The primary geophysical variables reported by Cloud and Aerosol Layer Products are the spatial locations of layers (e.g., layer base and top altitudes), an evaluation of layer type (e.g., cloud or aerosol), and a number of measured and derived optical properties. Optical properties that are directly measured include integrated attenuated backscatter, volume depolarization ratio, and attenuated total color ratio. Derived optical properties are those that can only be obtained via application of the CALIPSO extinction retrieval. Optical depth is the primary derived optical property reported in the layer products. The 1/3-km and 1-km cloud layer products report only spatial properties and directly measured

optical properties. Derived optical properties are only reported in the 5-km cloud and 5-km aerosol layer products. For version 3, several new parameters are reported in the 5-km layer products. Among these are particulate depolarization ratio, ice water path (cloud product only), and particulate color ratio (aerosol product only). Uncertainty estimates are now reported for all derived optical properties.

The layer boundaries reported in the Lidar Level 2 Cloud and Aerosol Layer Products generally appear to be quite accurate. Some false positives are still found beneath optically thick layers; these, however, can generally be identified by their very low CAD scores (e.g., |CAD score| <= 20). In opaque layers, the lowest altitude where signal is reliably observed is reported as the base; however, this "apparent base" may lie well above the true base. As in all previous releases, the layers reported in the version 3 layer products represent a choice favoring high reliability over maximum detection sensitivity. As a result, weakly scattering layers sometimes will go unreported, in the interest of minimizing the number of false positives.

The discrimination between cloud and aerosol layers is substantially improved in the version 3 release, due largely to the implementation of a more comprehensive set of probability distribution functions (see Liu et al., 2010 (PDF)). Similarly, an entirely new algorithm has been implemented for cloud thermodynamic phase identification, resulting in improved separation of ice clouds and water clouds. Bug fixes in the CALIOP extinction solver have increased the accuracy of the cloud and aerosol optical depth estimates.

Data Release Date: October 2008
Version: 2.02
Data Date Range: September 14, 2008 to October 29, 2009

Please refer to the Data Detailed Quality Statement for information about this release.

Data Release Date: January 25, 2008
Version: 2.01
Data Date Range: June 13, 2006 to September 13, 2008

Please refer to the Data Detailed Quality Statement for information about this release.

Latest Data Release Date: December 8, 2006
Version: 1.10
Data Date Range: June 13, 2006 to November 11, 2007

Given the accuracy of altitude registration, reported layer heights appear to be quite accurate. In optically dense layers, the lowest altitude where signal is observed is reported as the base. This point may lie above the true base. In this release, the layers which are reported represent a choice in favor of high reliability over maximum sensitivity. Weakly scattering layers sometimes will go unreported, in the interest of minimizing the number of false positives.

A preliminary version of the algorithm to discriminate cloud and aerosol has been used in this release. Overall, the algorithm performance is fairly good at labeling cloud as cloud and somewhat less successful in labeling aerosol as aerosol. Several types of misclassifications are fairly common and should be watched for. The most common misclassification is portions of dense aerosol layers being labeled as cloud. The algorithm operates on individual profiles so small regions within an aerosol layer are sometimes labeled as cloud. These misclassifications are often apparent from study of Level 1 browse images. Actual clouds occurring within aerosol layers appear to be correctly classified as cloud most of the time. Additionally, portions of the bases of some cirrus clouds are mislabeled as aerosol and some tropospheric polar clouds are erroneously labeled as aerosol. Improvements to the cloud/aerosol discrimination algorithm are underway and misclassifications should be greatly reduced in future data releases.