

# Data Release Summary Statement

**RELEASE 4.** The fourth release of the CALIPSO data products includes new versions of its standard Level 1 and Level 2 lidar data. The V4.10 CALIOP Level 2 data products are the first major revision to the Level 2 product suite since May 2010. The extensive improvements made in this new release correct numerous artifacts and significantly enhance the content and quality of the science data. In addition to the substantial updates made to all existing Level 2 products, V4.10 introduces a new merged layer product that reports the spatial and optical properties of cloud and aerosol layers in a single file.

The data processing algorithms and code used to generate the updated V4.10 CALIOP Level 1 data product are unchanged from V4.00. The only differences between the two versions are the essential ancillary data sets. The GTOPO30 Digital Elevation Model (DEM) used in V4.00 has been replaced by a substantially more accurate DEM developed by the CloudSat project. Likewise, the Global Modeling and Assimilation Office (GMAO) Forward Processing for Instrument Team (FP-IT) meteorological forecast product has been replaced with the higher quality Modern Era Retrospective-Analysis for Research (MERRA-2) reanalysis product. Use of the MERRA-2 data has been shown to yield more accurate and reliable CALIOP calibration coefficients.

The version 3.x (3.01, 3.02 and 3.30) CALIOP Level 1 and Level 2 data products will continue to be generated and made publically available, with version 4.10 running in parallel. Unlike version 3.x, which is released continuously following 2-3 day latency from downlink, new releases of the version 4.10 Level 1 and Level 2 product will have a latency of several weeks. This change in latency is a direct response to now using the MERRA-2 meteorological data. Generation and distribution of the standard version 3.x will continue until release of an updated version of the IIR Level 2 product, at which point the standard will no longer be supported. Expedited and quick-look datasets, which continue to rely on the GMAO FP-IT, will remain at version 3.x.

**RELEASE 3.** The third release of the CALIPSO data products features a comprehensive restructuring and expansion of the Lidar Level 2 cloud and aerosol profile products; significant enhancements to the Lidar Level 2 cloud and aerosol profile products; and the implementation of an improved calibration technique for the Lidar Level 1 532 nm daytime calibration.

The primary contents of the CALIOP Level 1 product are calibrated profiles of 532 nm perpendicular attenuated backscatter and total attenuated backscatter at 532 nm and 1064 nm. The version 3 CALIOP Level 1 data are released with a product maturity classification of *Validated Stage 1*, indicating that initial validation of the CALIOP attenuated backscatter products has been successful.

The CALIOP Level 2 products consist of the full resolution vertical feature mask, cloud and aerosol layer products reported at several different spatial resolutions, and cloud and aerosol profile products reported at a uniform 5-km horizontal resolution. Validation of the Level 2 products is an on-going process, and some products are better characterized than others. Preliminary validation has been accomplished for the layer detection, cloud-aerosol discrimination, and layer sub-typing algorithms. Data products derived solely from these algorithms are designated as *Validated Stage 1*. Validation of the optical properties algorithms that generate extinction profiles and layer optical depth estimates is a considerably more challenging task. As a consequence, while all studies to date indicate acceptable performance, the status of those data products derived from this second class of algorithms remains *Provisional*. All obvious artifacts have been identified and corrected in these data, but only limited comparisons with independent data sets are currently available.

**RELEASE 2.** The second release of the CALIPSO data are comprised of Level 1 and 2 data from the CALIOP and IIR instruments. Release 2 included initial releases for the Level 2 CALIOP Cloud Profile and Aerosol Profile products and IIR Swath products. Validation of these products is very limited, and the majority of the data products should not be considered to be validated. Release 2 is considered to be a provisional release for the Level 1 data products, in the sense that while all obvious errors have been

identified and corrected, only a limited set of intercomparisons have been performed. Various parameters are more or less reliable (explained in some detail in the data quality summaries), but the responsibility is on the user to determine if the data quality is sufficient for his/her purposes.

The Cloud and Aerosol Profile Products were released as Beta products. The primary contents are profiles of cloud and aerosol extinction and backscatter profiles at a horizontal resolution of 5 km (cloud profiles) and 40 km (aerosol profiles). The products contain known errors and invalid data and, in their current form, are not standalone products. The current products contain no data quality information and must be used in conjunction with the Cloud and Aerosol Layer Product and/or Vertical Feature Mask, which contain data quality parameters and confidence flags. Data assessment and screening procedures have not yet been developed. Because of this, the data products are considered to be not appropriate for scientific publication, but are released to users for evaluation and to provide feedback to the CALIOP algorithm development team. Users should carefully read the section of the Data Quality Summaries related to extinction retrievals. QA and validation are ongoing and data quality information will be included with future releases.

**RELEASE 1.** The initial release of CALIPSO data was comprised of Level 1 data from all three instruments (CALIOP, IIR, and WFC) and a limited set of CALIOP Level 2 Cloud and Aerosol Layer products. Validation of these data is very limited, and the majority of the data products should not be considered to be validated.

Uncertainties for specific parameters are reported in the individual quality statements. Quality designators indicate the maturity of products and individual parameters, and include "Beta", "Provisional", "Validated Stage 1", "Validated Stage 2", and "Validated Stage 3". A product may contain parameters at varying quality levels.