SUbsonic aircraft: Contrail & Clouds Effects Special Study (SUCCESS) University of Utah Polarization Diversity LIDAR (PDL) Langley DAAC Data Set Document

Summary:

SUCCESS is a NASA field program using scientifically instrumented aircraft and ground based measurements to investigate the effects of subsonic aircraft on contrails, cirrus clouds and atmospheric chemistry. The experiment is cosponsored by NASA's Subsonic Assessment Program and the Radiation Sciences Program which are part of the overall Aeronautics and Mission to Planet Earth Programs, respectively. SUCCESS has well over a hundred direct participants from several NASA Centers, other agencies, universities and private research companies. Additional information can be found at the SUCCESS Home Page.

SUCCESS coordinated with the Department of Energy's Atmospheric Radiation Measurements Program (ARM) which operates the Clouds and Radiation Testbed (CART) site located in Northern Oklahoma, and Southern Kansas. In addition to the extensive ground based measurements at the CART site, ARM also made airborne measurements with the scientifically instrumented Remotely Piloted Aircraft (RPA).

This document describes the SUCCESS_UTAH_PDL dataset, which contains ground-based measurements made by the University of Utah Polarization Diversity LIDAR at the CART site during the April-May 1996 SUCCESS Mission.

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1. Data Set Overview:

Data Set Identification:

SUCCESS_UTAH_PDL:	SUbsonic aircraft: Contrail & Clouds Effects Special Study (SUCCESS) University of Utah Polarization Diversity LIDAR (PDL) Data Set Document

Data Set Introduction:

In support of all NASA SUCCESS aircraft missions into the vicinity of the DOE Southern Great Plains CART site (36.605 degrees N, 97.488 degrees W) near Lamont, OK, ground-based remote sensing measurements were collected by a mobile remote sensing platform from the University of Utah, including the dual-wavelength scanning Polarization Diversity LIDAR (PDL), coaligned midinfrared radiometer and video recorder, and all-sky video and 35-mm photography. Additional data were obtained at other times during periods of cirrus cloudiness and from extensive fields of contrails generated by local commercial jet aircraft. A radar-based laser safety shutdown device for automatic aircraft identification was successfully tested using a variety of aircraft, allowing PDL scans of cirrus and contrails to be made for the first time. Exceptionally high resolution PDL data were also obtained at 1.5-m range and 0.1-s time resolutions, revealing a surprising amount of fine scale structures in cirrus clouds and contrails.

A preliminary inspection of the SUCCESS PDL dataset reveals that although portions of contrails created by the participating NASA aircraft were sampled, the extensive fields of contrails from nearby commercial jet corridors, including subvisual sheets of spreading contrails, were the most notable and extensively studied.

Objective/Purpose:

The purpose of PDL participation in the SUCCESS field program is to collect supporting in situ and multiple remote sensor data for use in the validation of remote sensing techniques and algorithms for retrieving various cloud microphysical and radiative quantities, and to increase general understanding of contrails and cirrus clouds.

Summary of Parameters:

LIDAR Relative Backscatter

Discussion:

Related Data Sets:

2. Investigator(s):

Investigator(s) Name and Title:

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Title of Investigation:

SUbsonic aircraft: Contrail & Clouds Effects Special Study (SUCCESS) University of Utah Polarization Diversity LIDAR (PDL)

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3. Theory of Measurements:

4. Equipment:

Sensor/Instrument Description:

A description of the lidar is given in Sassen, K., 1994: "Advances in polarization diversity lidar for cloud remote sensing," *Proc. IEEE*, 82, 1907-1914

Collection Environment:

Source/Platform:

Ground Station

Source/Platform Mission Objectives:

Key Variables:

LIDAR Relative Backscatter

Principles of Operation:

Sensor/Instrument Measurement Geometry:

Manufacturer of Sensor/Instrument:

Sensor/Instrument:

LIDAR

Calibration:

Specifications:

Tolerance:

Frequency of Calibration:

Other Calibration Information:

5. Data Acquisition Methods:

6. Observations:

Data Notes:

Field Notes:

7. Data Description:

Spatial Characteristics:

Spatial Coverage:

Data Set	Min Lat	Max Lat	Min Lon	Max Lon
SUCCESS_UTAH_PDL	36.60	36.60	-97.49	-97.49

Spatial Coverage Map:

Spatial Resolution:

Data collected at 1.5 m to 6.0 m vertically and averaged to 30 m for archive

Projection:

Grid Description:

Temporal Characteristics:

Temporal Coverage:

Data Set	Begin Date	End Date
SUCCESS_UTAH_PDL	04-12-1996	05-02-1996

Temporal Coverage Map:

Temporal Resolution:

Averaged to 10 seconds

Data Characteristics:

Parameter/Variable:

LIDAR Relative Backscatter

Variable Description/Definition:

Relative backscattered LIDAR signals from air, aerosols and clouds, background substracted, not corrected for range and attenuation effects.

Unit of Measurement:

Arbitrary units

Data Source:

Ground site, LIDAR backscattered return signal at 1064 nm

Data Range:

Minimum value=0, Maximum value=204800, Scaling Factor=100

Sample Data Record:

```
YEAR=1996
Month= 4
DAY=12
Hour=18
MINUTE=57
SECOND=40
TIME_INT=10
HIGHT_INT=30
POINTS= 409
HIGHT_BOT=     0
HIGHT_TOP= 12270
  392       504       594       616       628       680       800       946
 1168      1436      1824      2654      4452      7604     11580     15148
17948     20032     21266     21812     21912     21708     21276     20686
19996     19236     18440     17620     16802     15964     15178     14408
13688     12988     12308     11648     11004     10316      9544      8676
 3230      2930      2630      2396      2184      2004      1838      1672
 1572      1442      1390      1280      1198      1154      1058      1002
  996       950       880       816       798       798       794       794
  836       952      1014      1116      1200      1304      1378      1432
 1530      1590      1626      1708      1764      1782      1800      1796
 1774      1708      1616      1594      1556      1476      1412      1398
 1354      1270      1214      1182      1120      1032       998       976
  906       836       808       796       786       762       706       652
  624       624       620       620       618       658       682       704
  728       736       740       736       732       710       702       668
  652       626       612       606       600       598       598       598
  588       584       564       548       536       514       516       510
  500       536       556       568       556       562       572       578
  568       556       538       526       496       476       486       460
  450       436       420       406       404       400       398       398
```

398	394	382	376	356	348	314	280
248	244	220	208	208	202	198	198
198	198	198	196	198	194	190	188
188	184	184	176	176	172	172	174
164	172	152	160	146	160	144	146
132	130	144	140	138	140	144	132
142	136	132	132	130	128	138	128
116	120	112	106	114	108	88	112
108	116	128	152	168	184	190	190
198	204	220	242	256	268	274	248
212	212	202	196	196	198	196	190
188	182	166	158	146	138	138	124
122	108	106	106	92	90	100	84
82	66	84	78	92	88	108	144
212	394	682	1082	1570	2150	2772	3472
4148	4684	5000	5112	4944	4732	4524	4322
4192	4067	3942	3788	3626	3498	3360	3236
3104	2972	2820	2674	2500	2368	2230	2096
1972	1844	1720	1610	1496	1398	1298	1218
1128	1042	974	902	828	772	716	636
600	584	540	464	412	396	376	312
242	204	198	196	188	180	164	128
108	64	64	64	70	84	114	126
144	156	148	158	160	146	130	84
68	46	44	24	22	8	20	4
8	0	6	8	2	4	4	4
4	4	2	4	0	8	2	2
6	0	0	2	2	0	0	0
0	0	0	2	0	2	0	0
0	2	0	0	2	0	0	2
0							

8. Data Organization:

Data Granularity:

PDL data granules are composed of one or more files of data acquired on a given day.

A general description of data granularity as it applies to the IMS appears in the EOSDIS Glossary.

Data Format:

The PDL data files are ASCII data. The files contain data records where each record consists of an eleven line header section followed by the data values. Units in the header section are seconds for the Time Interval and meters for the height parameters.

9. Data Manipulations:

Formulae:

Derivation Techniques and Algorithms:

Data Processing Sequence:

Processing Steps:

Processing Changes:

Calculations:

Special Corrections/Adjustments:

Calculated Variables:

Graphs and Plots:

10. Errors:

Sources of Error:

Quality Assessment:

Data Validation by Source:

Confidence Level/Accuracy Judgement:

Measurement Error for Parameters:

Additional Quality Assessments:

Data Verification by Data Center:

The Langley DAAC performs an inspection process on data received by the data producer via ftp. The DAAC checks to see if the data transfer completed and the data were delivered in their entirety. An inspection software was developed by the DAAC to make sure every granule is readable. The code also checks to see if every data value falls within the range specified by the data producer. This same code extracts the metadata required for ingesting the data into the IMS. If any discrepancies are found, the data producer is contacted. The discrepancies are corrected before the data are archived at the DAAC.

11. Notes:

Limitations of the Data:

Known Problems with the Data:

Usage Guidance:

Any Other Relevant Information about the Study:

12. Application of the Data Set:

13. Future Modifications and Plans:

14. Software:

No read software was developed for this data.

Software Description:

Not applicable.

Software Access:

Not applicable.

15. Data Access:

Contact Information:

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Data Center Identification:

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E-mail: support-asdc@earthdata.nasa.gov

Procedures for Obtaining Data:

The Langley DAAC Information Management System (IMS) is an on-line system that features a graphical user interface (GUI) which allows users to query the Langley DAAC data set holdings, to view pre-generated browse products, and to order specific data products.

The Langley DAAC User and Data Services (UDS) staff provides technical and operational support for users ordering data.

Data Center Status/Plans:

16. Output Products and Availability:

17. References:

Sassen, K., 1994: "Advances in polarization diversity lidar for cloud remote sensing," *Proc. IEEE*, 82, 1907-1914

Sorlie, S., February 1993. "Langley DAAC Handbook." NASA/Langley Research Center, Hampton, Virginia.

18. Glossary of Terms:

EOSDIS Glossary.

19. List of Acronyms:

NASA - National Aeronautics Space Administration
URL - Uniform Resource Locator

EOSDIS Acronyms.

20. Document Information:

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