# The CERES S'COOL Project: Overview and Data Analysis

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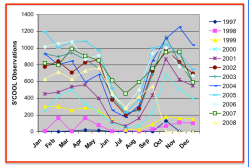
## What is S'COOL?

- Education and Public Outreach arm of CERES
- Backbone of Terra/Aqua formal education effort
- A simple way to involve K-12 students in authentic science
- A source of validation data for the CERES cloud retrievals

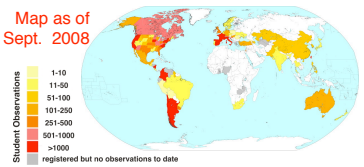
http://scool.larc.nasa.gov

## The S'COOL Project

- More than 72,000 observations from 53 countries and all 50 states
- 45 % from outside the US (77% US participants)
- More than 2,570 registered participants from 75 countries




Map as of Sept. 2008




## Data Analysis

### Aqua-Correspondences

| | | Ground Observers (all) | | |
|---|---|---|---|---|
| | | No Cloud | Single | Multi |
| S A T | No Cloud | 415 | 164 | 30 |
| | Single | 408 | 964 | 240 |
| | Multi | 561 | 5654 | 3004 |

| | | Ground Observers (all) | | | |
|---|---|---|---|---|---|
| | | Clear | Partly cld | Mostly cld | Overcast |
| S A T | Clear | 1115 | 222 | 68 | 36 |
| | Partly cld | 863 | 1040 | 671 | 263 |
| | Mostly cld | 317 | 854 | 1296 | 1050 |
| | Overcast | 139 | 337 | 832 | 2337 |

**Aqua – Correspondences**
Total obs= 11,440

Ground Obs
No Cloud = 1384 (12%)
Single = 6782 (59%)
Multi = 3274 (29%)

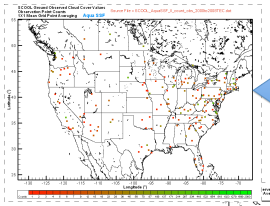
### Terra-Correspondences

**Terra – Correspondences**
Total obs= 28,859

Ground Obs
No Cloud = 4448 (15%)
Single = 18018 (63%)
Multi = 6393 (22%)

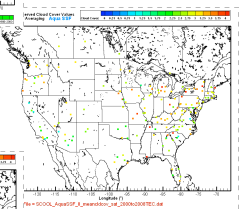
| | | Ground Observers (all) | | |
|---|---|---|---|---|
| | | No Cloud | Single | Multi |
| S A T | No Cloud | 1885 | 1028 | 108 |
| | Single | 1364 | 3711 | 782 |
| | Multi | 1199 | 13279 | 5503 |

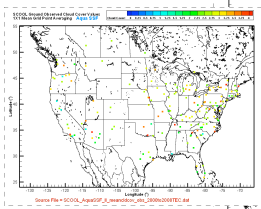
| | | Ground Observers (all) | | | |
|---|---|---|---|---|---|
| | | Clear | Partly cld | Mostly cld | Overcast |
| S A T | Clear | 4358 | 1045 | 328 | 139 |
| | Partly cld | 1981 | 2498 | 1683 | 783 |
| | Mostly cld | 605 | 1566 | 2654 | 2603 |
| | Overcast | 343 | 520 | 1688 | 6065 |



**Aqua-SSF**
Total observation counts of cloud cover for 1x1° lat/lon grid boxes over the continental US

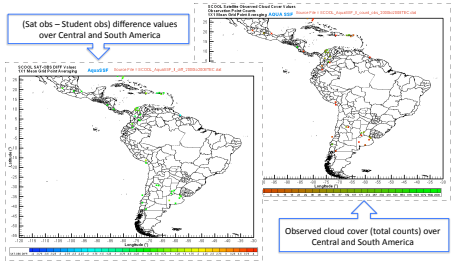
**Aqua-SSF**
Satellite obs mean cloud cover for 1x1° lat/lon grid boxes over the continental US



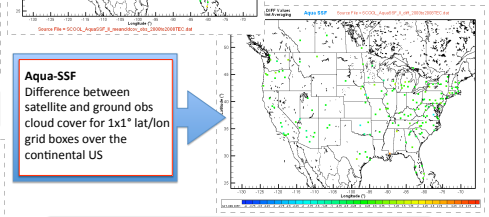


**Aqua-SSF**
Ground obs mean cloud cover for 1x1° lat/lon grid boxes over the continental US

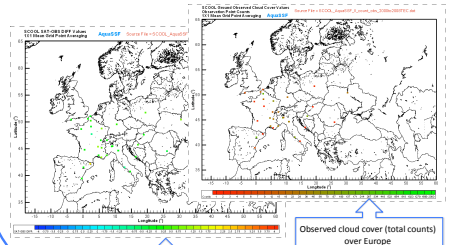
(Sat obs – Student obs) difference values over Central and South America



Observed cloud cover (total counts) over Central and South America



**Aqua-SSF**
Difference between satellite and ground obs cloud cover for 1x1° lat/lon grid boxes over the continental US



Observed cloud cover (total counts) over Europe

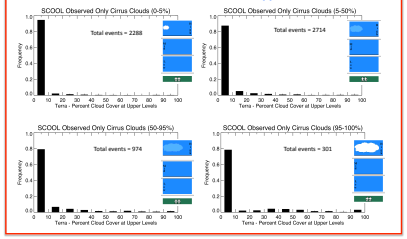
(Sat obs – Student obs) difference values over Europe

### Findings Thus Far

- Overall the satellite retrievals and ground observations tend to be in pretty good agreement
- There are still inconsistencies that require further investigation
- One inconsistency is where the satellite observes multiple cloud layers while ground obs report a single cloud layer
- We also plan to look closer at cirrus cases, and those where snow is observed at the surface

## Special Cases

### Terra-SSF Percent Cloud Cover at Upper Levels

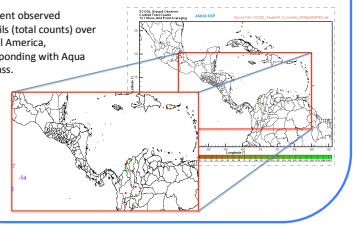



### S'COOL Observed Contrails

| S'COOL Obs for Aqua – SSF Matches (total=11347) | |
|---|---|
| Persistent and/or Short Lived Contrails Reported | 14% |
| Only Contrails – Short or Persistent (no cirrus) | 5% |
| Only Persistent Contrails (no cirrus) | 1.4% |
| Only Short Lived Contrails (no cirrus) | 2.6% |
| Only Cirrus (no contrails) | 54% |
| Either Contrails or Cirrus Reported | 68% |

| S'COOL Obs for Terra – SSF Matches (total=11611) | |
|---|---|
| Persistent and/or Short Lived Contrails Reported | 10% |
| Only Contrails – Short or Persistent (no cirrus) | 4.5% |
| Only Persistent Contrails (no cirrus) | 1.6% |
| Only Short Lived Contrails (no cirrus) | 2% |
| Only Cirrus (no contrails) | 46% |
| Either Contrails or Cirrus Reported | 56% |

- Student observed contrails (total counts) over Central America, corresponding with Aqua overpass.



## S'COOL Rover

**DID YOU KNOW…**

- NASA uses multiple instruments on several satellites, but can still use your help? You can provide "ground truth" observations about the clouds that are present.

- you can contribute to this project anywhere you go??

**Become a S'COOL Rover Today!**

http://asd-www.larc.nasa.gov/Rover