



# ATA Onboard Science: Cloud Observations with S'COOL

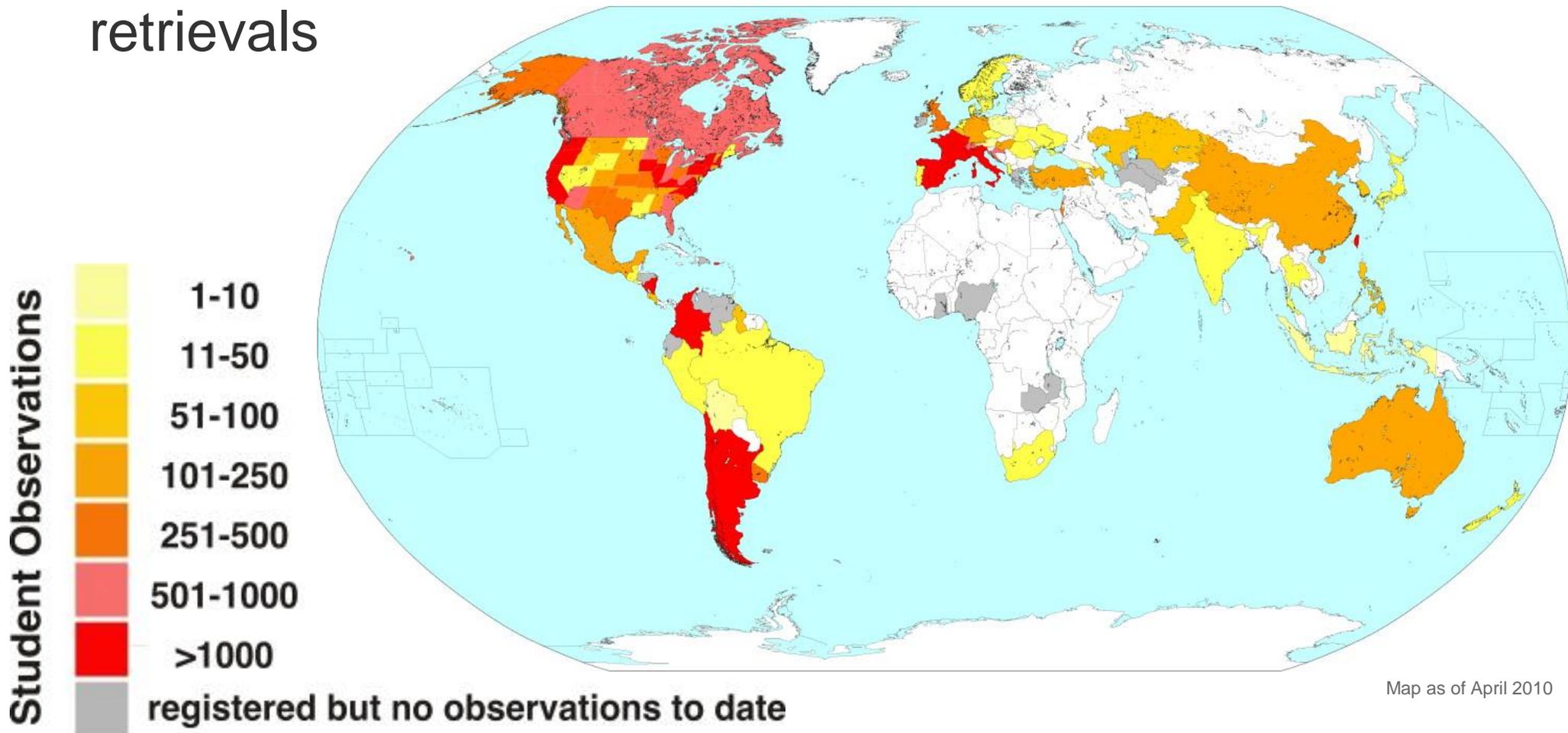
Dr. Lin H. Chambers, NASA Langley Research Center

Marine Health Symposium, June 18, 2010

# What is S'COOL?



- A simple way to involve K-12 students (and others) in authentic science
- A source of validation data for the CERES cloud retrievals



# What is S'COOL?



## S'COOL Rover Report Form

Nickname: \_\_\_\_\_ Age: \_\_\_\_\_ Skill Level: \_\_\_\_\_  
 City: \_\_\_\_\_ State: \_\_\_\_\_ Country: \_\_\_\_\_ Latitude: \_\_\_\_\_  
 Date (ex.. 2007 09 20): Year \_\_\_\_\_ Month \_\_\_\_\_ Day \_\_\_\_\_ Longitude: \_\_\_\_\_  
 Local Time (24 Hour Clock: ex. 14 26): Hour \_\_\_\_\_ Minute \_\_\_\_\_ Universal Time: Hour \_\_\_\_\_ Minute \_\_\_\_\_ DST: Yes or No

**Cloud Observations:** (Select the most prevalent cloud type at each level where clouds exist. Cloud Cover and Visual Opacity must be determined for each level observed. Use the comment section for further descriptions.)

- Clear Sky - No clouds observed (skip to the "Surface Cover" section)
- Clouds Present - (continue to level(s) observed - don't forget to count contrails if present)

### High Level

Number of Persistent Contrails Present \_\_\_\_\_

Number of Short-Lived Contrails Present \_\_\_\_\_

**Cloud Type:**

Cirrus

Cirrocumulus

Cirrostratus

**Cloud Cover:**

Clear (0-5%)

Partly Cloudy (5% - 50%)

Mostly Cloudy (50% - 95%)

Overcast (95% - 100%)

**Visual Opacity:**

Opaque

Translucent

Transparent

### Mid Level

**Cloud Type:**

Altostratus

Altocumulus

**Cloud Cover:**

Clear (0-5%)

Partly Cloudy (5% - 50%)

Mostly Cloudy (50% - 95%)

Overcast (95% - 100%)

**Visual Opacity:**

Opaque

Translucent

Transparent

### Low Level

**Cloud Type:**

Fog

Nimbostratus

Cumulonimbus

Stratus

Cumulus

Stratocumulus

**Cloud Cover:**

Clear (0-5%)

Partly Cloudy (5% - 50%)

Mostly Cloudy (50% - 95%)

Overcast (95% - 100%)

**Visual Opacity:**

Opaque

Translucent

Transparent

**Ground Observations:**

<p><b>Surface Cover:</b> (Mandatory)</p> <p>Yes No</p> <p><input type="checkbox"/> <input type="checkbox"/> Snow/Ice</p> <p><input type="checkbox"/> <input type="checkbox"/> Standing Water</p> <p><input type="checkbox"/> <input type="checkbox"/> Muddy</p> <p><input type="checkbox"/> <input type="checkbox"/> Dry Ground</p> <p><input type="checkbox"/> <input type="checkbox"/> Leaves on Trees</p> <p><input type="checkbox"/> <input type="checkbox"/> Raining/Snowing</p>	<p><b>Surface Measurements:</b> (Optional - you may submit any or all)</p> <p>Temperature: _____ Celsius or _____ Fahrenheit</p> <p>Barometric Pressure: (Select one)</p> <p>_____ hPa _____ psi</p> <p>_____ mb _____ inches Hg</p> <p>_____ atm _____ torr (mm Hg)</p> <p>Relative Humidity : _____ %</p>
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Comments: \_\_\_\_\_

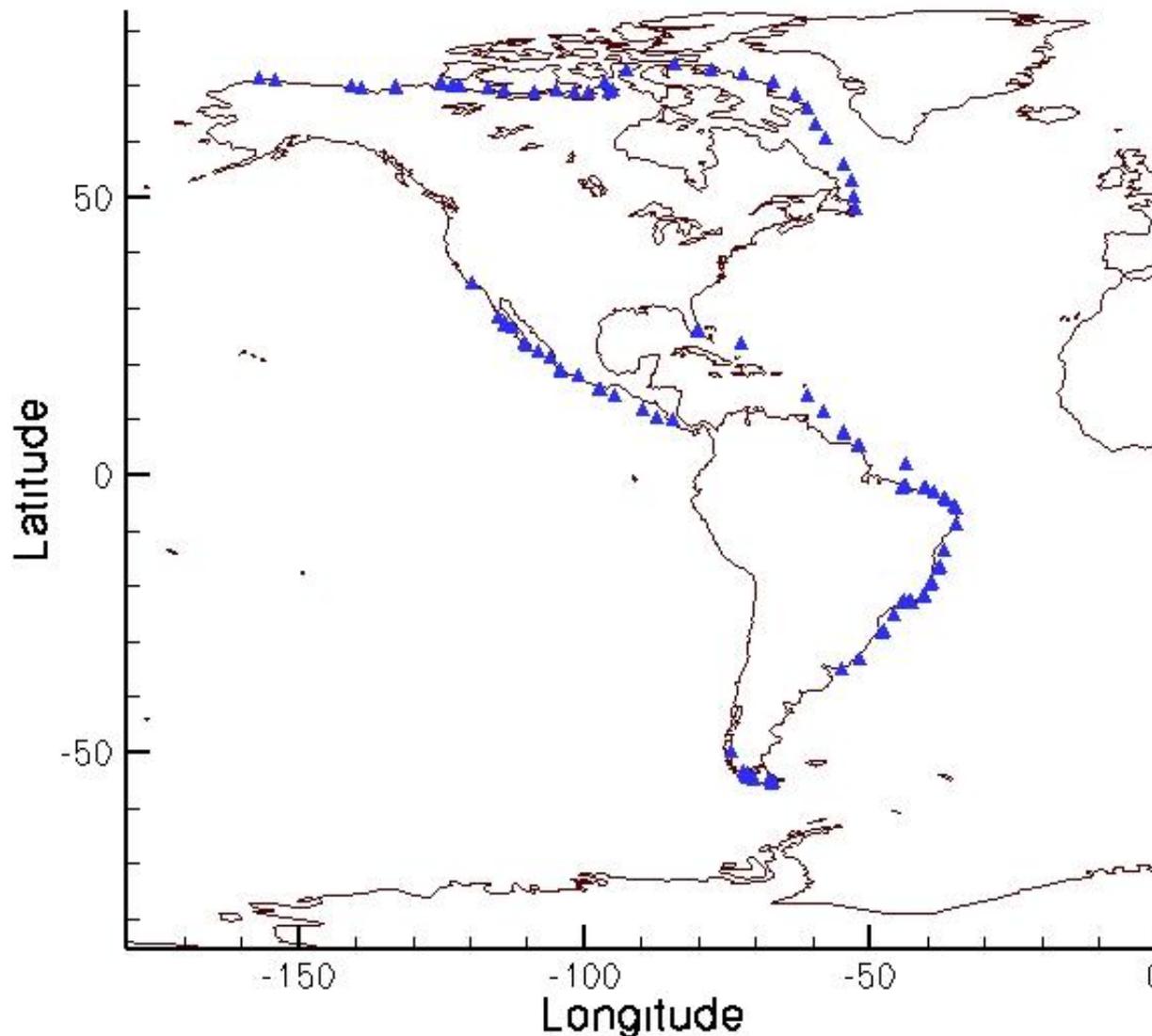
Revised 4/25/08

- A simple observation protocol that anyone can do

<http://scool.larc.nasa.gov>

See especially Rover button

# ATA Contribution: New Locations



Northwest Passage:  
Clouds over broken  
sea ice

Tropical Atlantic:  
Clouds over open  
ocean

Tip of South America:  
Southernmost  
observations for  
S'COOL

California: Marine  
Stratus

# ATA Initial Analysis: Cloud Mask



- Of 168 observation reports, 138 have been matched to satellite date.
- 25 (18%) are in complete agreement on cloud mask (i.e., satellite and ground observer agree on all cloud levels)

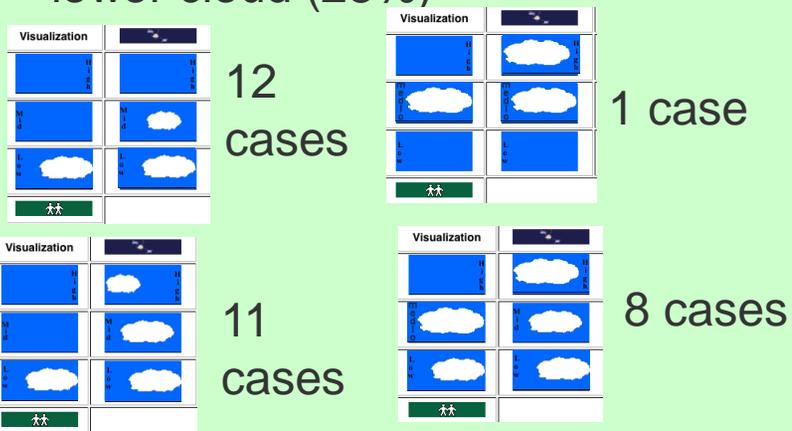
Visualization	

Example: July 22, 2009, in Northwest Passage  
Both ground observer (left) and satellite retrieval (right) report low cloud only

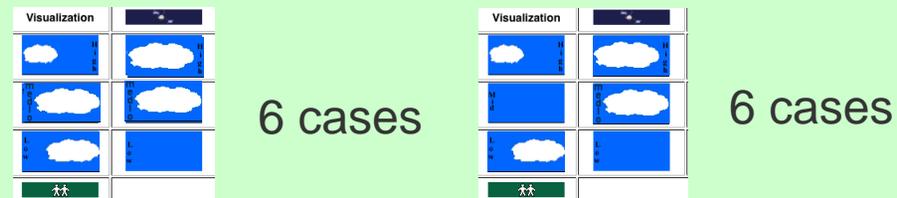
# ATA Initial Analysis: Cloud Mask



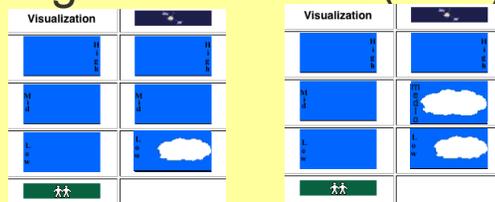
Satellite sees layers above lower cloud (23%)



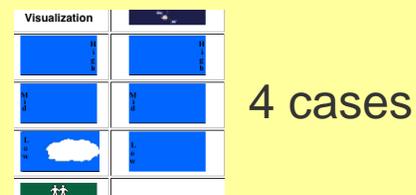
Ground reports layers below higher cloud (9%)



Satellite sees cloud ground doesn't (11%)



Ground sees cloud satellite doesn't (3%)



Other (36%)

No cases: satellite misses thin cirrus reported by ground

# ATA Analysis: Next Steps



- Analysis will be continuing:
  - in depth consideration of individual cases
  - examination of sky photos from crew

