https://ntrs.nasa.gov/search.jsp?R=20190034107 2020-03-11T16:12:41+00:00Z

Leveraging Thousands of Contrail Observations from GLOBE Citizen Scientists

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What is GLOBE?

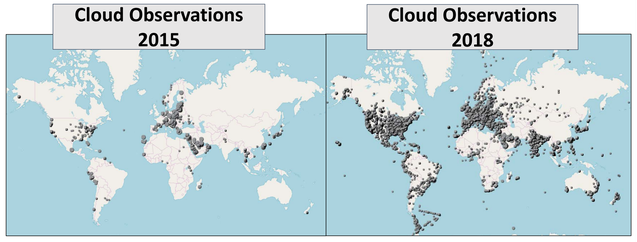
The GLOBE Program is ***NASA's largest and longest lasting citizen science program about the Earth***. The GLOBE Program began on Earth Day 1995 and for nearly 25 years has invited students in countries around the world to collect cloud and other environmental observations. In 2017, the program debuted the GLOBE Observer mobile app to engage the wider public, including GLOBE alumni (adults who previously participated in GLOBE as students), in the collection of data using a mobile device.

GLOBE Program is composed of:

- 123 countries
- 34,000 schools
- 142,000 citizen scientists
- 400+ publications

The GLOBE Program: Global Learning and Observations to Benefit the Environment

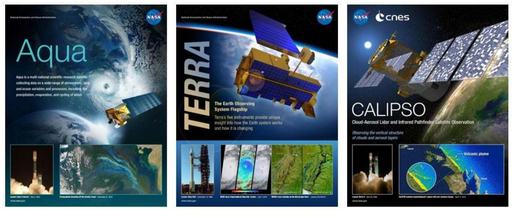
Sponsored by: NASA Supported by: NSF NOAA DOS



Impact of data density from the release of the GLOBE Observer mobile app.

GLOBE Cloud Observations

Observations are collocated with satellite data from the CERES instrument onboard Terra and Aqua, or to Geostationary satellites, or to CALIPSO

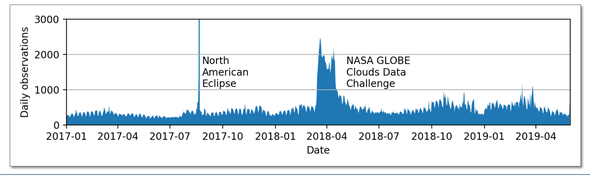


Total Cloud Observations since 2017: 500,000+

Total Satellite Matched Observations: 300,000+ (60%)

Total Contrail Observations: 147,000+

- Short Lived: 38,067
- Persistent, non-spreading: 70,313
- Persistent, spreading: 39,272

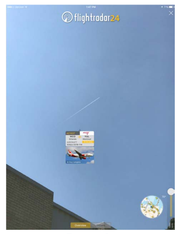


Contrails Investigations Project

Track which airplanes are or are not creating contrails

Date Example 08292018 for August 29, 2018 (Value should match the time of cloud observations entered in GLOBE)	Local Time Example 10:49am (Value should match the time of cloud observations entered in GLOBE)	Airplane Type Example E75L (Please include those that produce and do not produce contrails)	Airplane Calibrated Altitude or Height (ft) Example 34,000 (Use the app to get this information)	Airplane Track (degrees) Example 28 Use the app. Value should be between 0-359.	Contrail Type Click on the arrow and choose one of the options.
10032018	13:54	DL1859	16,000	163	No contrail
10032018	14:03	AAL18	17,404	167	No contrail
11082018	13:18	CRJ7	27,000	63	No contrail
12032018	10:25	A320	36,000	231	S or short-lived
12032018	10:29	WG706	35,000	143	S or short-lived
12062018	13:05	UA655	33,000	50	S or short-lived

Flight observations courtesy of ***Lexington School for the Deaf*** (presented at 2019 GLOBE Northeast SRS)



Step 1: Flighradar24 for airplane info

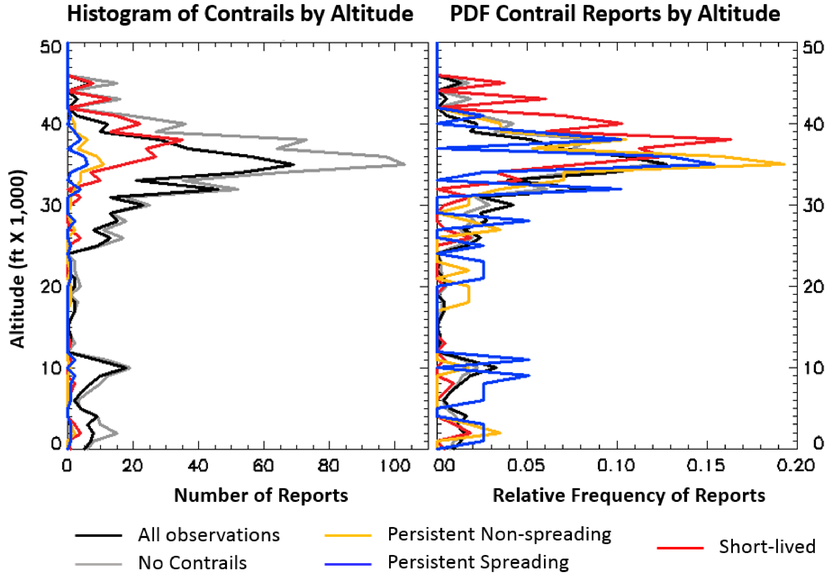
Step 2: Report contrails via GLOBE

A handful of schools are participating of this project, using the FlightRadar24 app (https://www.flightradar24.com/) to find airplanes in their area, record the airplane type, cruising altitude, and track. Students then note if the airplane is creating or NOT creating a contrail and report this using the GLOBE Observer app. The citizen science observations are then collocated with satellite data from the CERES instrument onboard Terra and Aqua, or to Geostationary satellites, or to CALIPSO to provide insight into the impact of commercial aviation on contrail formation and local atmospheric conditions during contrail formation

NASA Cloud Observation and Satellite Match

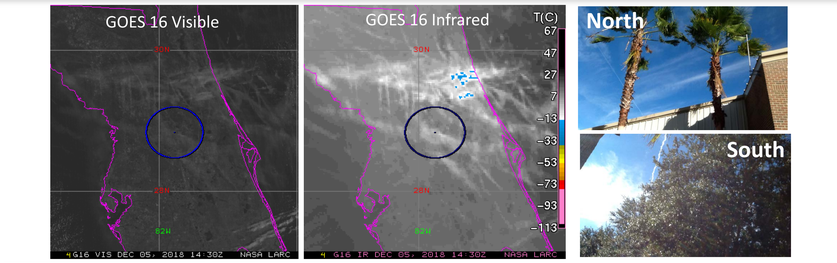
Satellite	GEO	Your Observation
Universal Date/Time 2018-12-05	14:33	14:21
Latitude Range Longitude Range	28.52 to 29.16 -82.1 to -81.46	Latitude 28.84 Longitude -81.78
Total Cloud Cover	Scattered 35.29%	Scattered (25-50%)
HIGH Cloud Cover Cloud Altitude Cloud Phase Cloud Opacity	Scattered 27.45% 9.62 (km) Ice 243.19 (K) Transparent	Contrails: Spreading 2 Isolated (10-25%) Transparent
MID Cloud Cover Cloud Altitude Cloud Phase Cloud Opacity	Few (5.23%) 3.61 (km) Mixed 265.17 (K) Transparent	
LOW Cloud Cover Cloud Altitude Cloud Phase Cloud Opacity	Few (2.61%) 1.43 (km) Water 274.42 (K) Transparent	
Corresponding NASA Satellite Images Click to view image --->	GOES-16 Visible / Infrared GEO Tutorial	Sky Visibility : Clear Sky Color : Light Blue North East South West Up Down
Are there any comments you would like to add? Be sure to add the name of the satellite for our record.		Surface Conditions Snow/Ice No Standing Water No Muddy No Dry Ground Yes Leaves on Trees Yes Raining or Snowing No

Summary of Observations



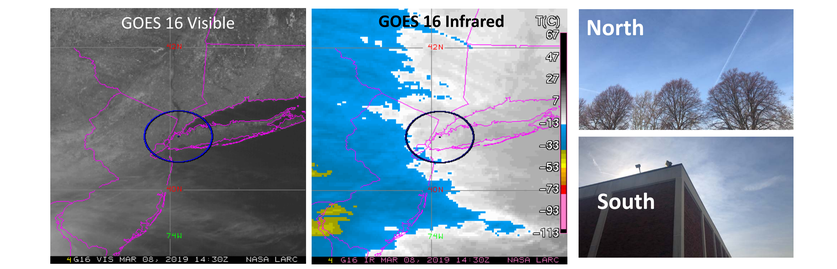
Summary of observations collected June 2018 – October 2019.

Sample Satellite Collocated Data



Date: 12/5/2018 14:33 UTC

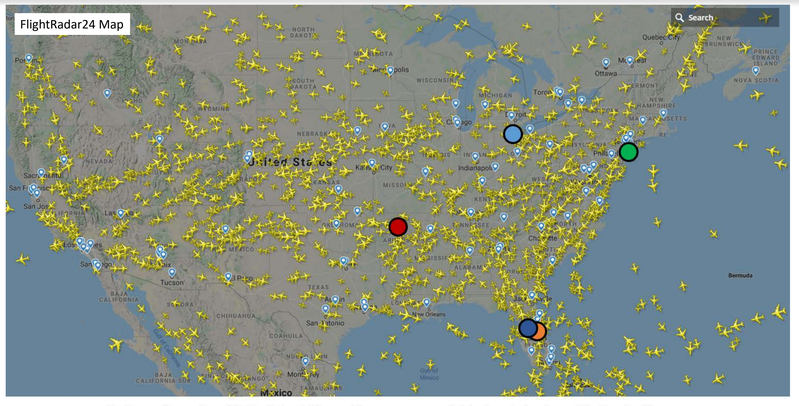
Airplane Type	Airplane Height	Track	Contrail Type
GLF6	36,000	9	Persistent Spreading
A320	35,000	170	Persistent Spreading



Date: 3/8/2019 14:33 UTC

Airplane Type	Airplane Height	Track	Contrail Type
B738	35,000	141	Persistent

Schools Taking Contrail and Airplane Observations



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