



**GLOBE Eclipse: Citizen Scientist
Measurements of Atmospheric Changes during
Astronomical Events**

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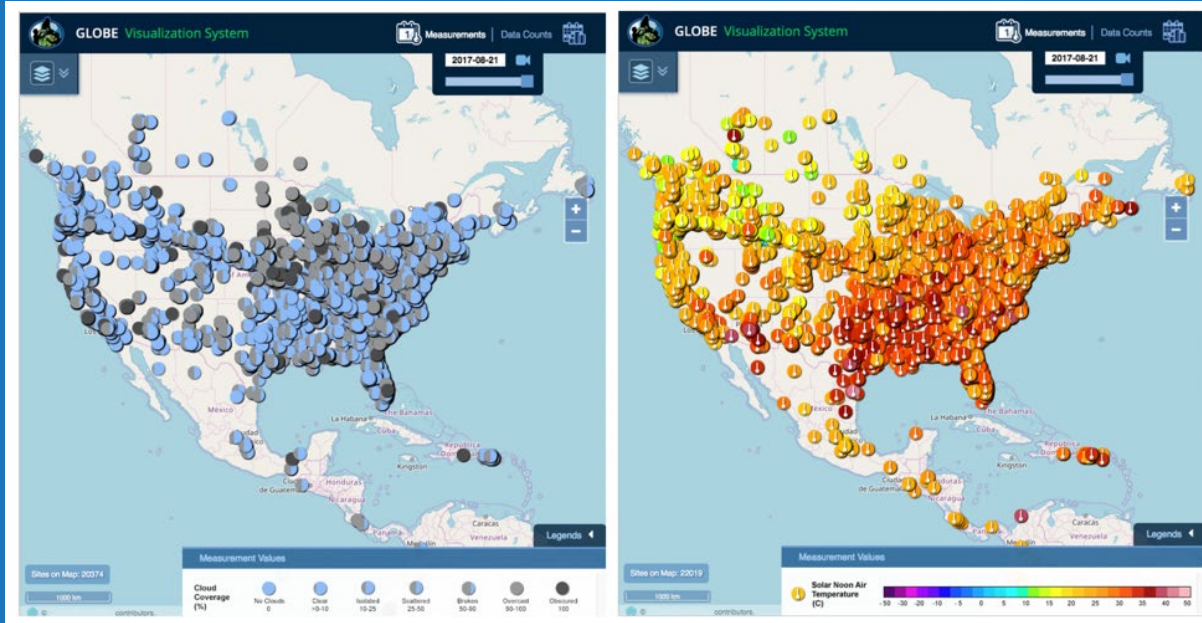


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Total Solar Eclipse 2017

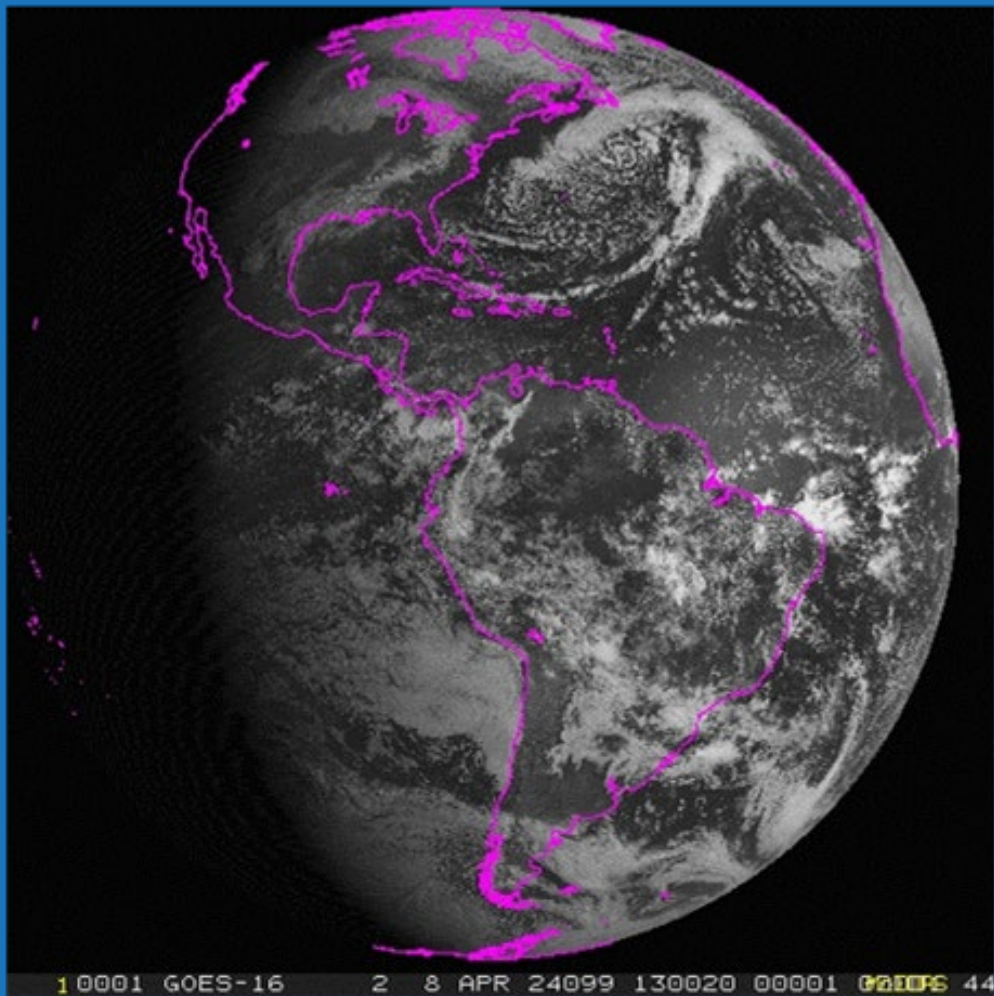


Dodson et al., 2019 found correlation between the total cloud cover and its impact on the coolness reported.

Dodson, J. B., M. C. Robles, J. E. Taylor, C. C. DeFontes, and K. L. Weaver, 2019: Eclipse across America: Citizen Science Observations of the 21 August 2017 Total Solar Eclipse. / *Appl. Meteor. Climatol.*, 58, 2363-2385, <https://doi.org/10.1175/JAMC-D-18-0297.1>.

GOES-16 Imagery

GOES-16 cloud coverage over the continental U.S. during the eclipse, from 1300 UTC to 2100 UTC, band 2. Note the visible shadow from the eclipse.



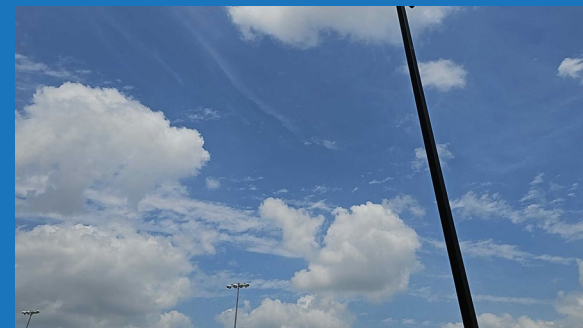
Findings

- Comparing GLOBE data with satellite reports, GEOSCF model (replay) data, weather reports, and sonde data to look at high, mid, and low level clouds
- GLOBE volunteers generally report increases in contrails after the eclipse maximum (especially 1 hour after)
- Many locations also reported increases beforehand
- Contrails are largely affected by upperair (300–200 mb) temp and humidity, so the team is focusing on upperair data

Contrail Imagery Collected by GLOBE Volunteers



Waco, TX; during partial, before local max



Waco, TX; same location, 30 min later, 25 min before max



Toledo, OH; during partial, before local max.
Red circle highlighting a contrail



Toledo, OH; after local max

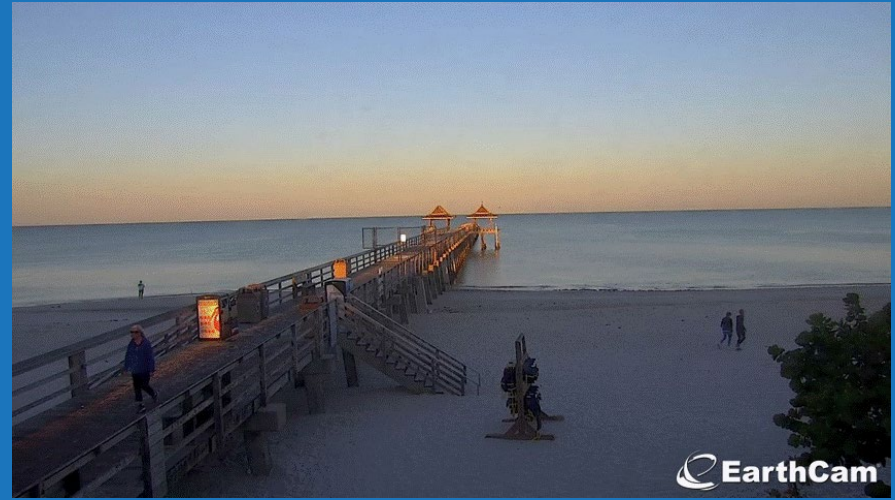


Toledo, OH; after local max, 25 min after previous image & same location

EarthCam Images



EarthCam overlooking Washington, D.C. from the Washington Monument. Exact times are unknown, but relative times can be assumed to be mid-morning, local eclipse time, then sunset.



EarthCam overlooking Naples, FL from the Naples Pier (near Cape Coral, FL). Exact times are unknown, but relative times can be assumed to be mid-morning, local eclipse time, late-afternoon, then sunset.



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Results

Overall:

- Mostly reported high-level clouds in all climate zones
- Before local eclipse max:
 - 10/15 cities reported a decrease or no change in cloud coverage
 - 11/15 cities reported increase in contrails
 - 7/15 cities modeled an increase in 500 mb RH
- After local eclipse max:
 - 11/15 cities reported a decrease or no change in cloud coverage
 - 12/15 cities reported increase in contrails
 - 11/15 cities modeled an increase in 500 mb RH
- 2 cities reported approaching cumulonimbus clouds after max
 - both reported increase in contrails after max

Results

Cold/Humid Continental:

- 3/5 cities reported increase in contrails before max
 - other 2 were the only ones to experience 500 mb temperature increase
- 5/5 cities reported increase in contrail reports after max

Mixed -Dry/Cold Semi-Arid:

- Albuquerque, NM
- Increase in spreading contrails before max
- Increase in cumulonimbus and contrails after max
- Increase in RH

Results

Mixed-Humid/Humid Subtropical:

- More reports of mid-level clouds than the previous climate zone
- 4/6 cities reported increase in contrails before max
 - of the other 2, 1 saw temp increase before max and 1 had no temp change
- 5/6 cities reported overall decrease in contrails after max
 - 6/6 reported decrease in short-lived contrails

Hot-Humid/Humid Subtropical:

- 3/3 cities reported increase in overall contrails before and after max
- Cape Coral, FL reported cumulonimbus clouds after max
 - reported increases in all 3 types of contrails
- 2/3 cities have model data showing general decrease in RH
 - Cape Coral, FL only city with model data showing consistent increase in RH