

# AURORASAURUS

Reporting Auroras From the Ground Up

Launched Oct. 2014  
NSF INSPIRE project



## Opportunities in the first solar maximum with social media

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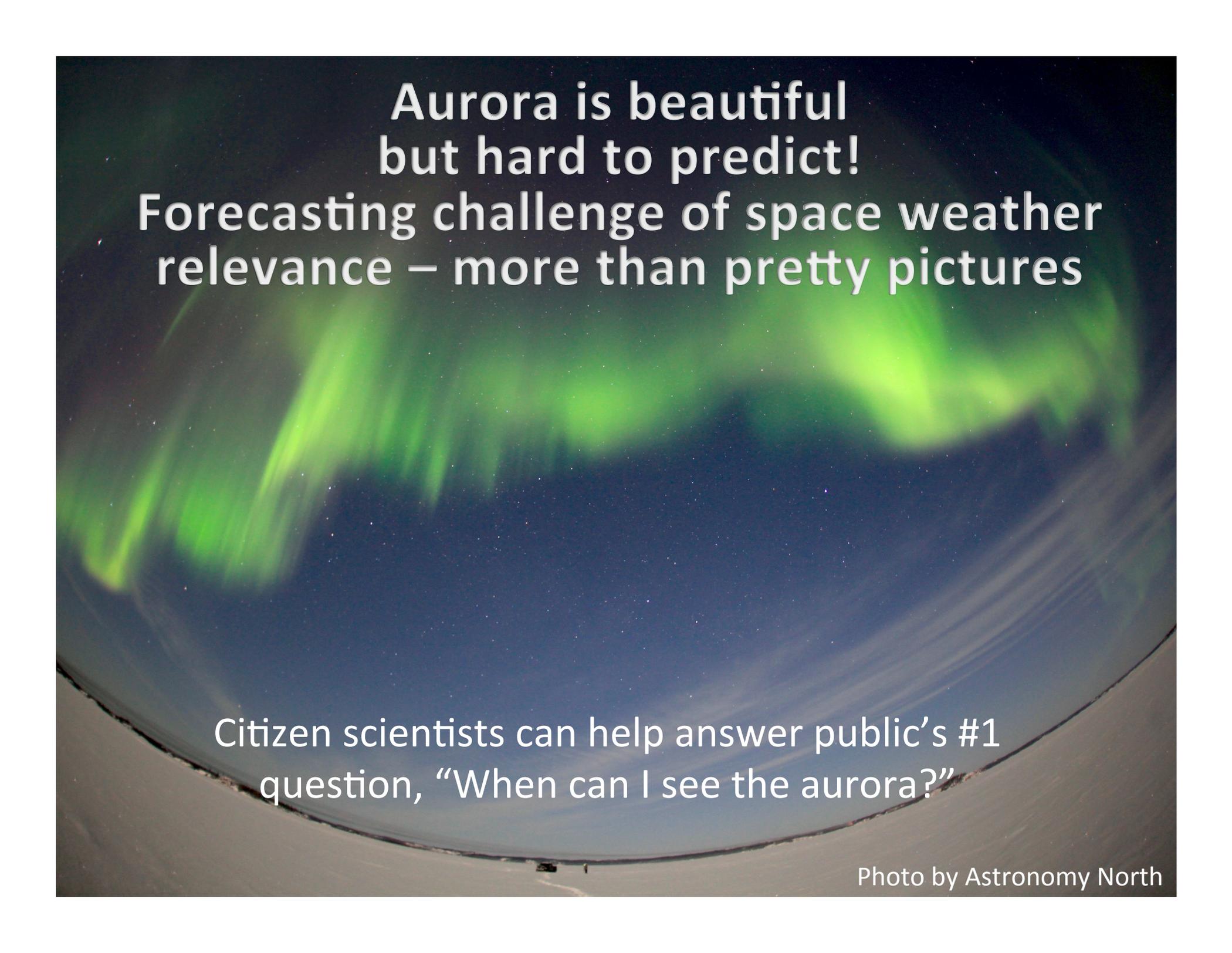
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Primary Support: NSF INSPIRE program



Aurorasaurus.org, Apple iOS, and Android apps



**Aurora is beautiful  
but hard to predict!**  
Forecasting challenge of space weather  
relevance – more than pretty pictures

Citizen scientists can help answer public's #1  
question, "When can I see the aurora?"

Photo by Astronomy North

# New global, real-time data sources from citizen scientists and tweets.



- Public very interested in aurora.
- Hybrid approach, twitter not required. Location required, privacy protected.
- Sign up to get a free, custom aurora alert for your location.

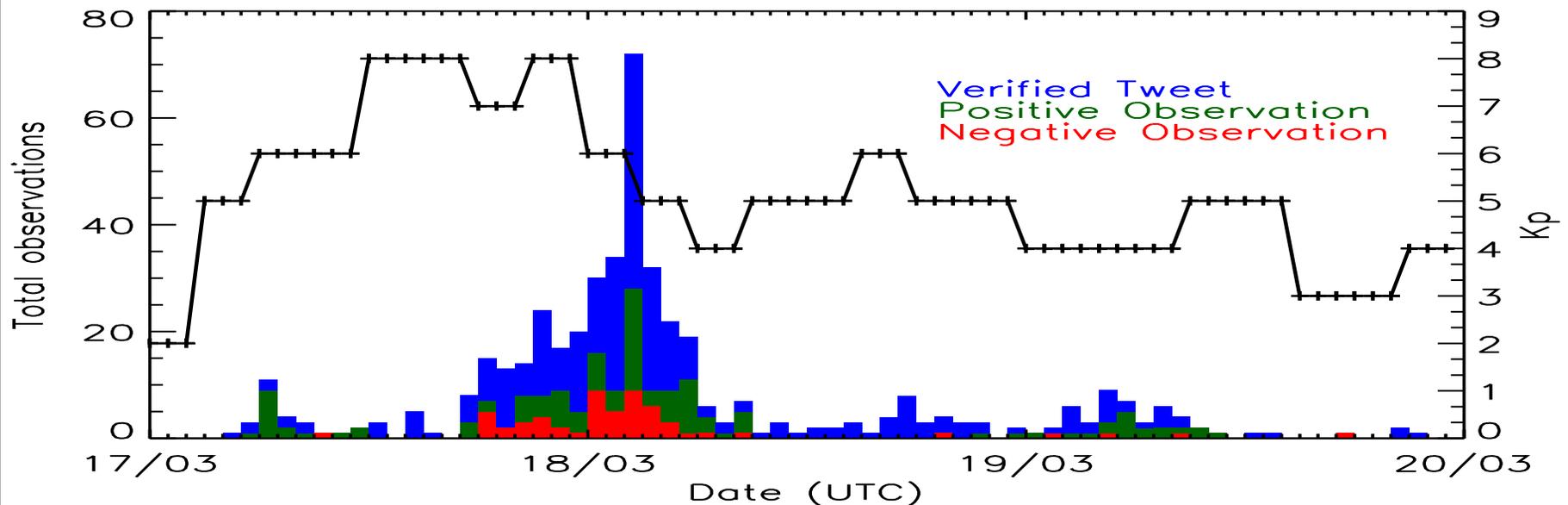


Did you see the aurora?

→ Simple form, time, date, location, activity, color, photo

# St. Patrick's Day storm of the decade

- Aurorasaurus shows 70 reports per hour max
  - Geographic, population bias
- 30,000 tweets total about the Northern Lights
  - Geolocated and “verified” ~2 %
- Put these reports on a Google map in real-time



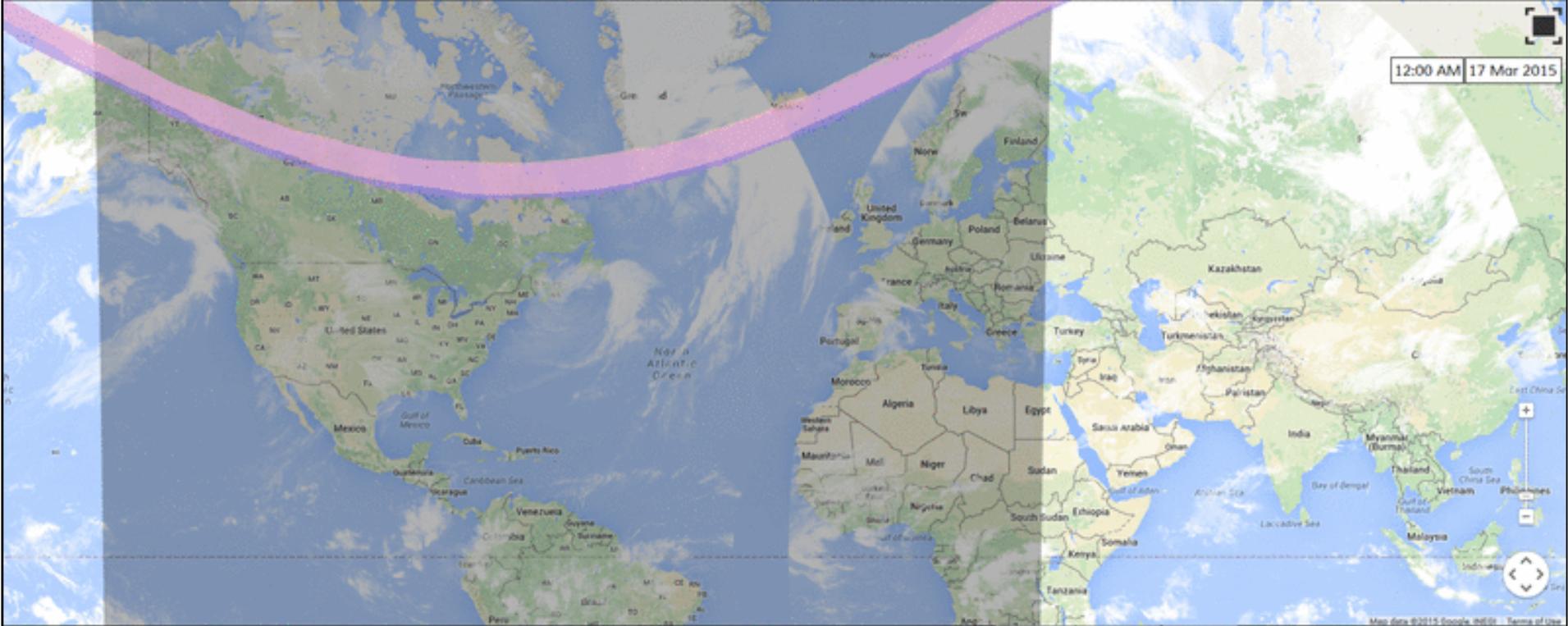
Preliminary numbers for 3/17/15:  
134 observations, 234 verified tweets (out of 30,000+),  
~800 new users (100% increase), 312 location based alerts  
<http://bit.ly/StPaddysDayStorm>

The strong St. Patrick's Day storm is subsiding but we have 30,000 tweets to sift through. Can you help? Thanks!



Register Login

Did you see the aurora?  Yes  No



12:00 AM 17 Mar 2015

Layers: Auroras Weather Legend

Visit us on:   

Map Verify Tweets Space Data Learn News About Us Help

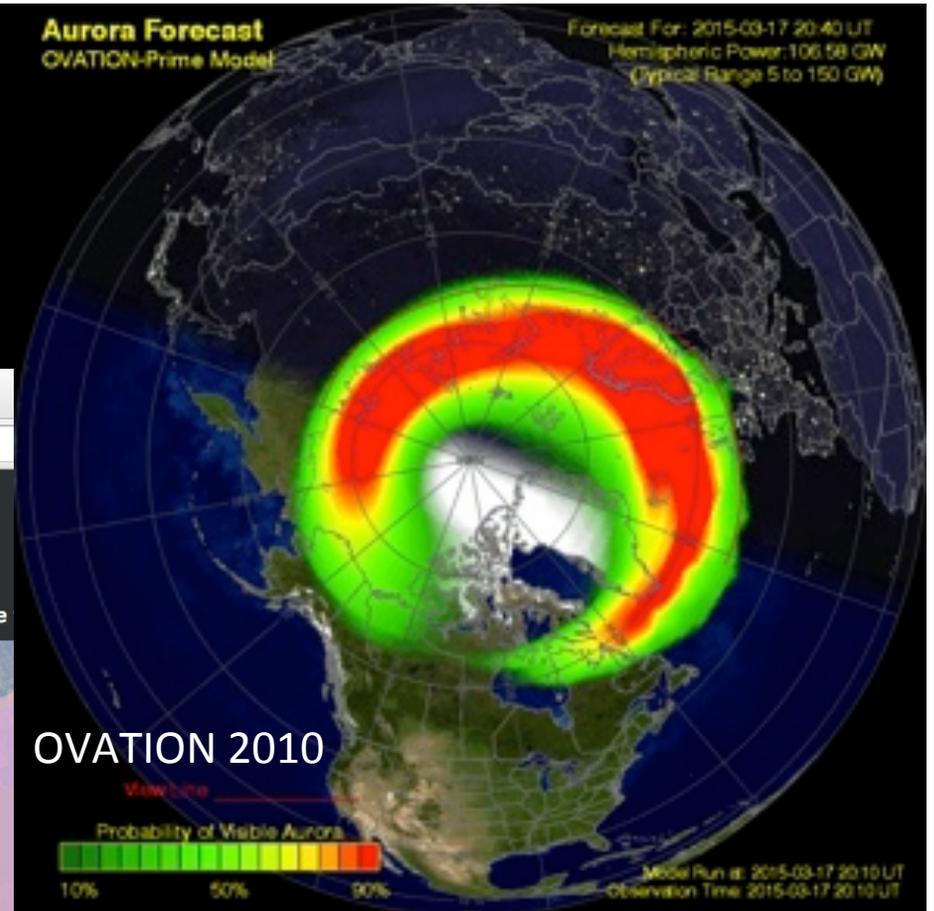
# Why should you care?



1. Global, real-time, interdisciplinary citizen science project focused on observing aurora
  - Benefits for participants and scientists
    - Validate auroral oval models
    - Find better conjunctions with orbiting spacecraft, rare things like breakups, pulsating aurora, SAR arcs, etc. (even subvisual aurora with DSLR's)
2. Chance to communicate our science to the public and collaborate on cooperative work

# Auroral ovals do not match at high Kp (known unknowns observed 3/17/15)

A screenshot of the Aurorasaurus website. The browser address bar shows 'aurorasaurus.org'. The website header features a red dinosaur logo and the text 'AURORASAURUS Reporting Auroras From the Ground Up'. A 'Sighting Details' pop-up window is open, displaying a photo of an aurora and the text: 'Inkeri Lantta @ilantta 3/17/15 at 12:44 pm Astonishing all-over-the-sky #aurora outskirts of #Tampere'. Below the photo, it says 'Sighting Verification Tweet confirmed to be a positive sighting'. The background of the website shows a map of Europe with several blue location pins and a purple auroral oval overlay.



UAF oval, Ridley and Roble, 1987

Based on a cluster of verified sightings, plan to combine with ACE-driven oval and produce a dynamic aurora “view line”

# Space science is core to our mission

- Improving research, connections to CCMC and space weather
- Connection to missions, education, and outreach



**AURORASAURUS**  
Reporting Auroras From the Ground Up



My Aurorasaurus

Logout

Did you see the aurora?

Yes

No

Verify Tweets

News

Learn

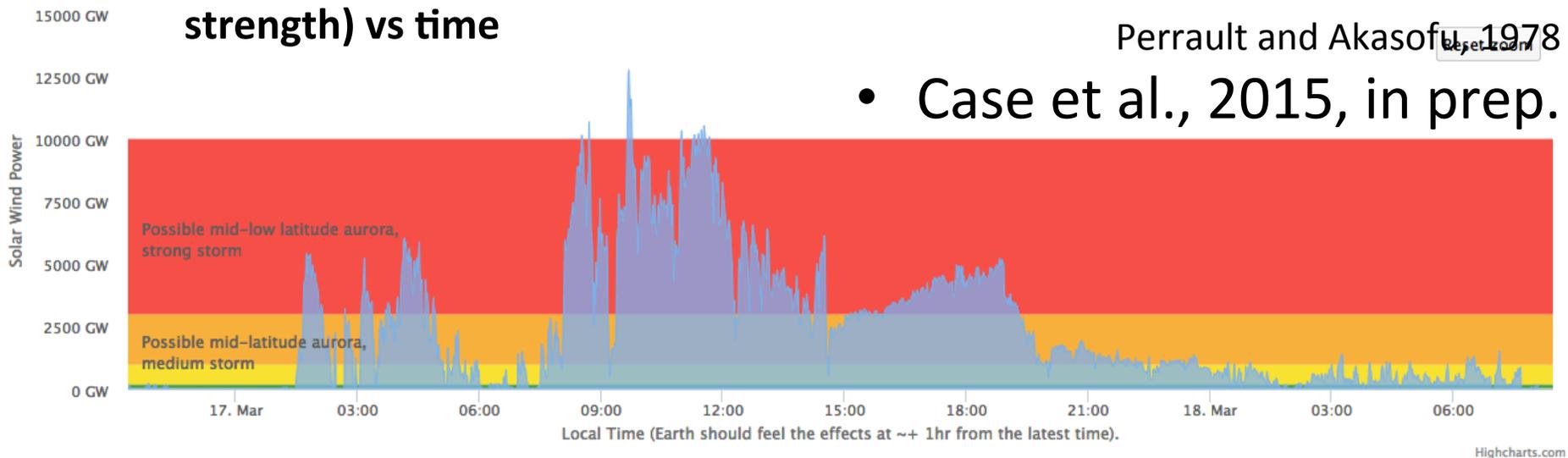
Help

## Solar wind power (related to auroral strength) vs time

$$\varepsilon = \frac{4\pi}{\mu_0} v B^2 \sin^4 \left( \frac{\theta}{2} \right) l_0^2$$

Perrault and Akasofu, 1978

- Case et al., 2015, in prep.



This graph shows the strength of solar wind power, a real-time indicator of how strong aurora will be in about one hour. The solar wind power corresponds to the energy released by the sun over time. The more energy released, the higher the power and the stronger the aurora will be.

# Informal science education is core to our mission

- Get answers to common aurora questions in plain but engaging language.
- Quizzes, points, scientist network, blogging, and more

← → × aurorasaurus.org/learn ☆ 📌 📱 ☰

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Did you see the aurora?

## Learn

What Causes the Auroras?

Where and When Do Auroras Occur?

What Gives Auroras Different Colors?

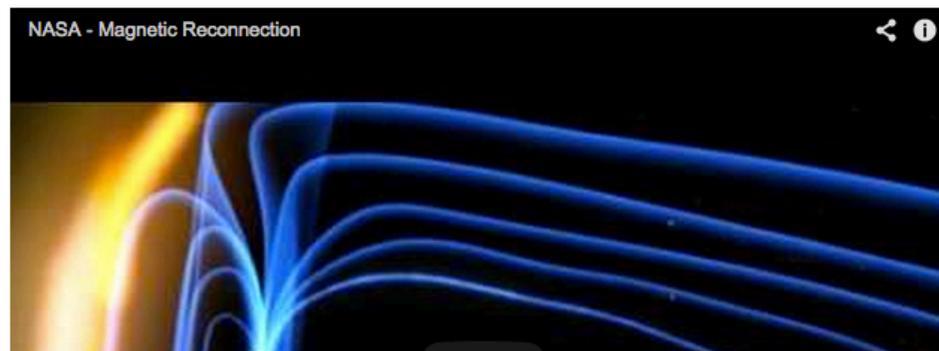
What Are the Common Shapes of Auroras?

Why Are Auroras Important to Everyday Life?

How Can You Photograph the Beautiful Aurora?

## What Causes the Auroras?

The making of an aurora is an intricate dance of particles and magnetism between the Sun and Earth. The Sun continuously produces a solar wind, made of charged particles (plasma) carrying the Sun's magnetic field. As the solar wind nears Earth, it causes the magnetic field of the Earth to be drawn into a giant teardrop shape, squashed on the side closest to the sun and drawn out into a long tail on the side farthest from the sun. This giant magnetic bubble is called the magnetosphere. Watch this video a few times to help you understand the description below!



# Information sciences is core to our mission

- Connection to Early Warning Systems
- Crowdsourcing tweets & evaluating alert responses

The screenshot displays the Aurorasaurus website interface. At the top, the browser address bar shows 'aurorasaurus.org'. The website header features the Aurorasaurus logo (a red dinosaur) and the tagline 'Reporting Auroras From the Ground Up'. Navigation links include 'My Aurorasaurus', 'Logout', and a 'Did you see the aurora?' section with 'Yes' and 'No' buttons. A secondary navigation bar contains 'Verify Tweets', 'News', 'Learn', and 'Help'. The main content area is split into a left sidebar and a central map. The sidebar shows a tweet from @stroppadel: '3/17/15 at 2:34 pm @Asrunn there was aurora borealis over Hungary tonight' with a link to a photo. The central map shows Europe with various colored markers (green, red, blue) indicating aurora sightings. A legend on the right side of the map lists categories: Scientist, Positive Sighting (10+), Negative Sighting (10+), Unverified Tweet (10+), Verified Tweet (10+), 1 Hour Forecast, and Current Oval Estimate. The bottom of the page includes social media links (Twitter, Facebook, Google+) and a footer with 'Visit us on:' and 'Map Verify Tweets Space Data'.

# Join our community at [Aurorasaurus.org](http://Aurorasaurus.org)!

[@tweetaurora](https://twitter.com/tweetaurora), [aurorasaurus.info@gmail.com](mailto:aurorasaurus.info@gmail.com),  
[fb.com/aurorasaurus.org](https://fb.com/aurorasaurus.org)

## Partner and collaborate with us!

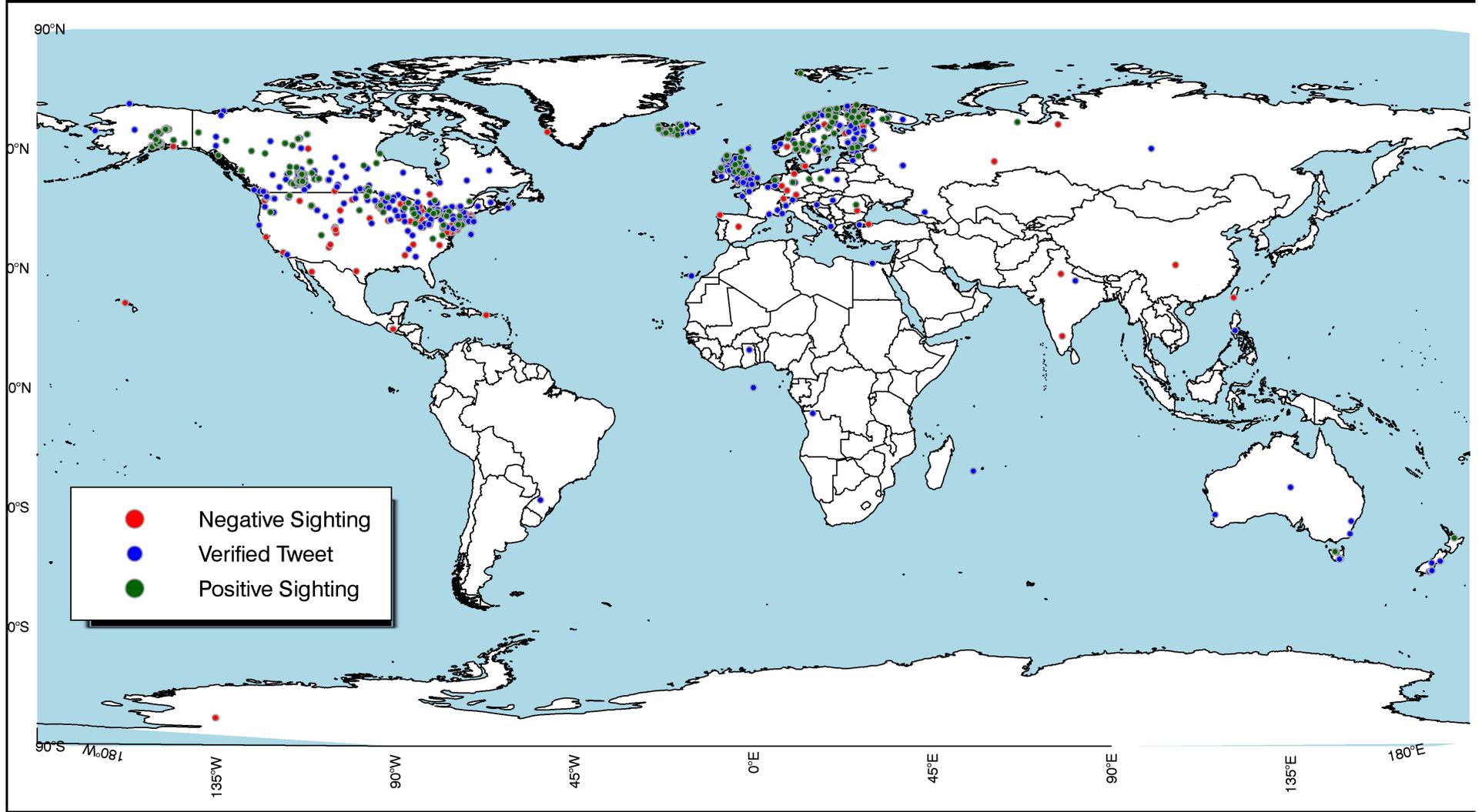
### Thanks to our Scientist Network Partners

- Allison Jaynes, Mike Liemohn, Ian Cohen, Joe Shaw, Meghan Mella, Jason Ahrns, Don Hampton, Gareth Dorian, Emma Spanswick, Pat Reiff, Laura Peticolas
  - Looking for more across US and internationally
- In March, White House launched new citizen science initiatives.
  - Looking for more university, international partners
  - Looking for students and postdocs

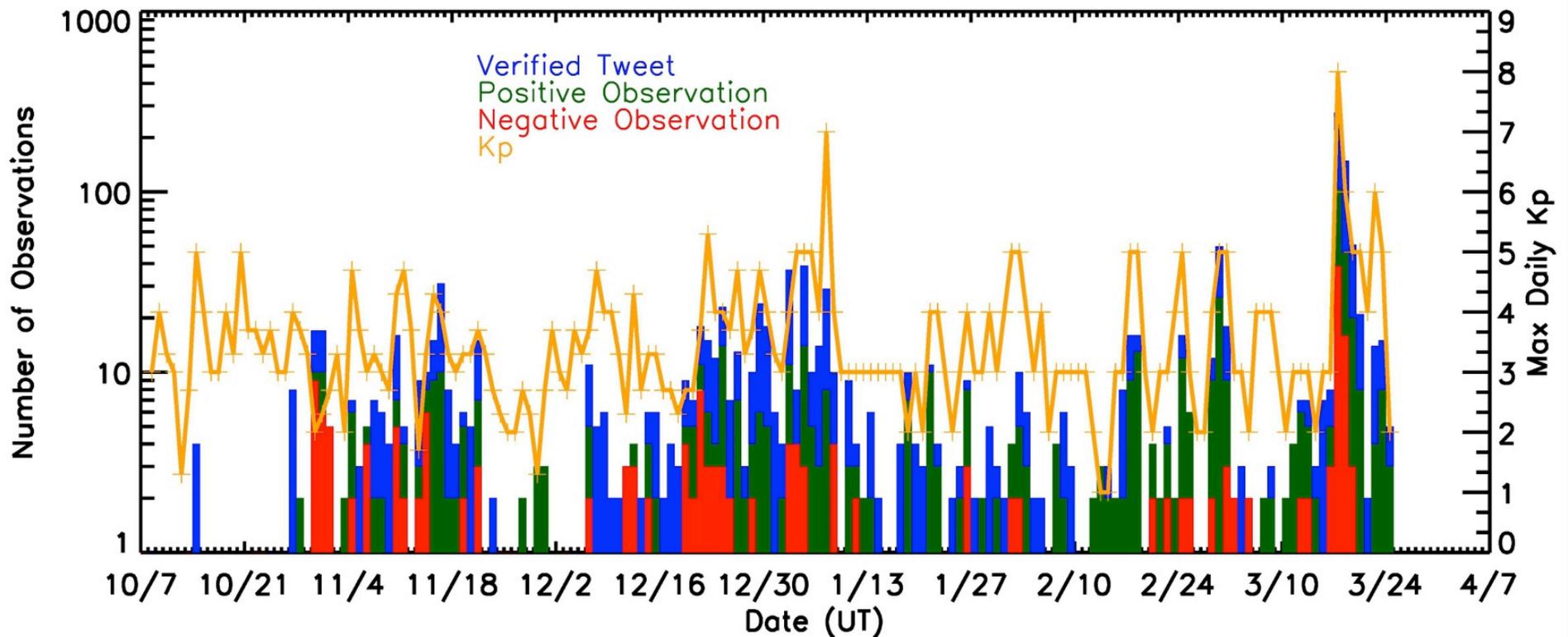
First 6 months: >1600 citizen scientists have given  
>500 real observations and looked at >45,000  
tweets with >800 real observations found



# Backup



# Tweets and observations correlate with geomagnetic activity



- Case et al., GRL, 2015

# We ask citizen scientists low jargon questions

Carrier 1:55 PM 100%

**AURORASAURUS**  
Reporting Auroras From the Ground Up

## Make a Report

Location:

When did your observation start?

When did your observation end?

Ongoing?

What colors did you see?  
 Red  Green  White  
 Pink

Other:

What type of aurora did you see?  
 Discrete Arcs  Diffuse Glow  Patches (pulsating) [?](#)

Other:

Where in the sky was the aurora?

Other:

How active was the aurora?

