

Aurorasaurus Database Of Real-Time, Crowd-Sourced Aurora Data For Space Weather Research



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Aurorasaurus (aurorasaurus.org) is an innovative citizen science project focused on two fundamental objectives: (1) collect real-time, ground-based aurora data from citizen scientists whose personal devices act as a form of soft-sensor and (2) incorporate this new type of data into scientific investigations related to aurora.

What is the science question?

What kind of new auroral phenomena can be discovered using real-time crowd-sourced aurora data and can the data improve real-time auroral models?

Why does it matter?

- Accurate real-time auroral oval location is crucial for auroral and space weather research.
- Real-time auroral oval predictions, which are based on space based data, have large uncertainties.
- This robust data set, particularly abundant during strong geomagnetic storms when auroral oval models have the highest uncertainty, can potentially help reduce uncertainties.

What were your findings?

- We have documented the details of Aurorasaurus citizen science data for the period spanning 2015-2016 as well as its routine data filtering protocols.
- Approximately ~50% of the observations are reported from latitudes that are further equatorward of the view line estimated by the NOAA SWPC, which is based upon the OVATION Prime model.
- Even though image sequences captured by the citizen scientists are rare, they are particularly useful in visualizing temporal and spatial dynamics of auroral arcs during geomagnetic storms.

What was the impact?

These data are offered to the scientific community for use through an **open-access database** in its raw and scientific formats, each of which is described in detail in the technical report. By demonstrating its scientific utility, we aim to encourage its integration into auroral research. A collaborative research opportunity between the Aurorasaurus citizen science network and auroral researchers has recently led to the **discovery** of an optical signature of a new subauroral phenomena STEVE (Strong Thermal Emission Velocity Enhancement)!

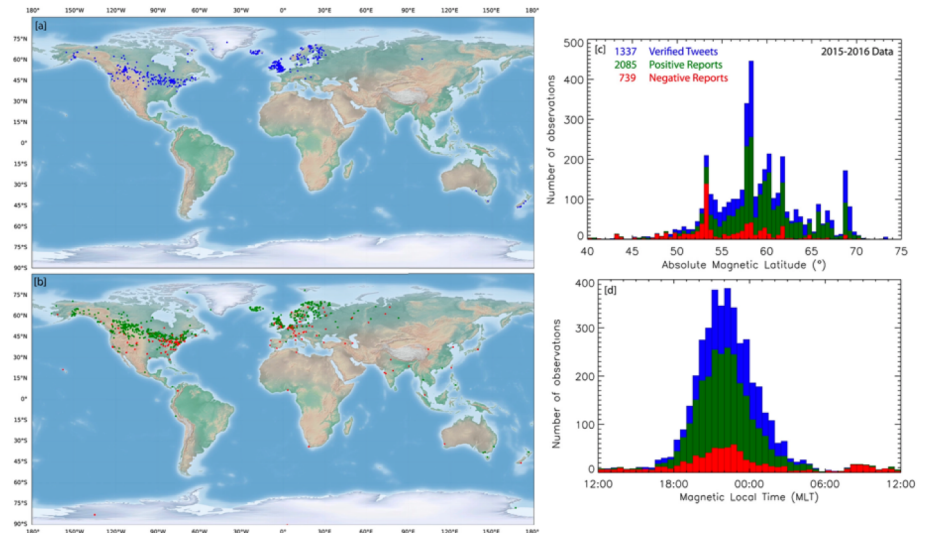


Figure 1: Distribution of validated (a) positive verified tweets and (b) web reports over the globe and the distribution of validated and filtered data as a function of (c) absolute magnetic latitude and (d) magnetic local time. Green and red filled circles correspond to positive and negative web reports, and blue filled circles correspond to positively verified tweets.



Figure 2: Image of STEVE and its accompanying green picket fence features forming south of the traditional auroral oval. STEVE = Strong Thermal Emission Velocity Enhancement