



# ***How Citizen Science can help us to fight against Light Pollution?***

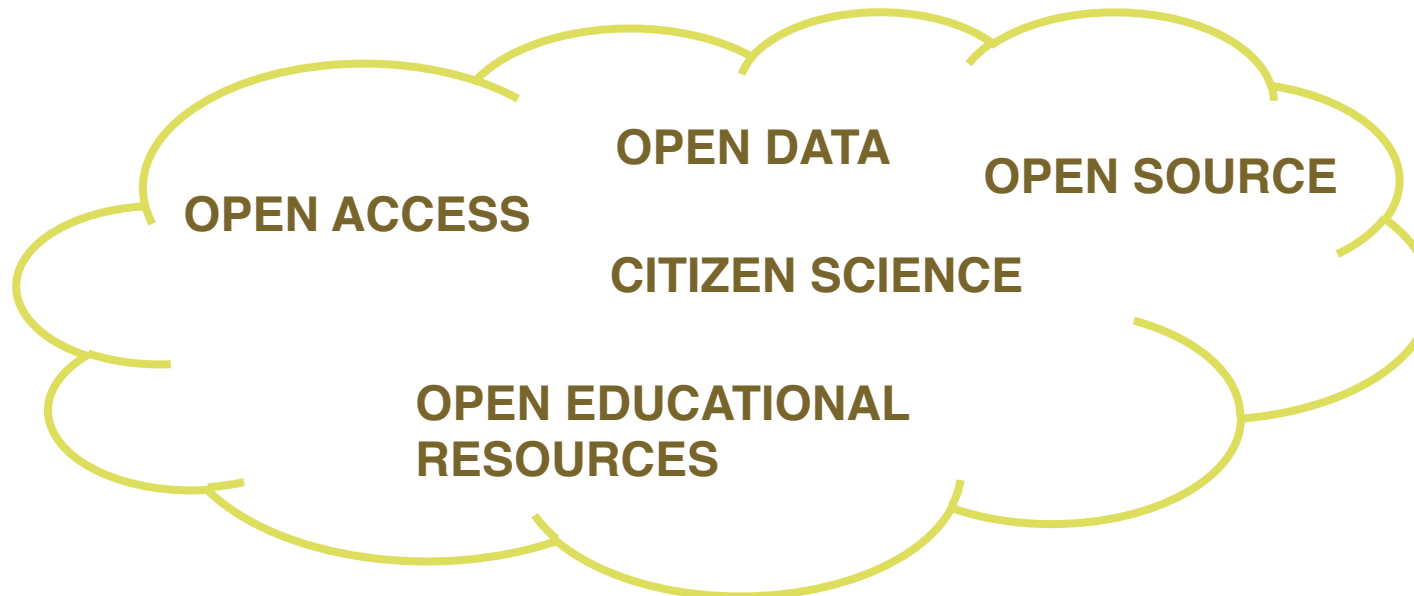
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Ontology Engineering Group - Universidad Politecnica de Madrid

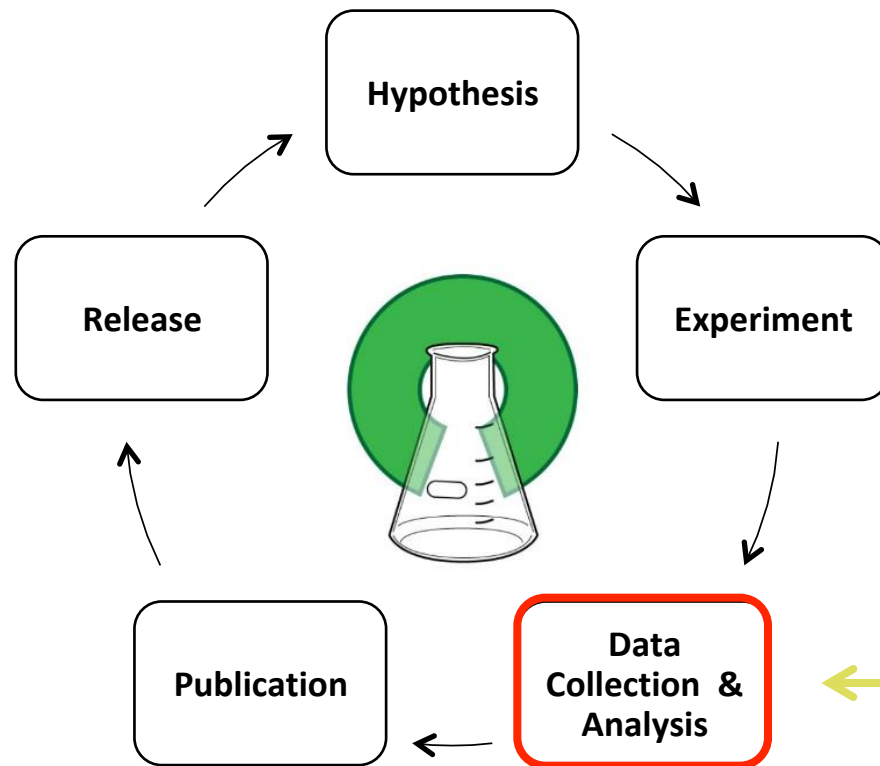
14° European Symposium for Protection of Night Sky – Mulranny, Ireland - November 4th, 2019

# What is Open Science?

**Opening the scientific process to a broader audience, promoting collaboration and participation**



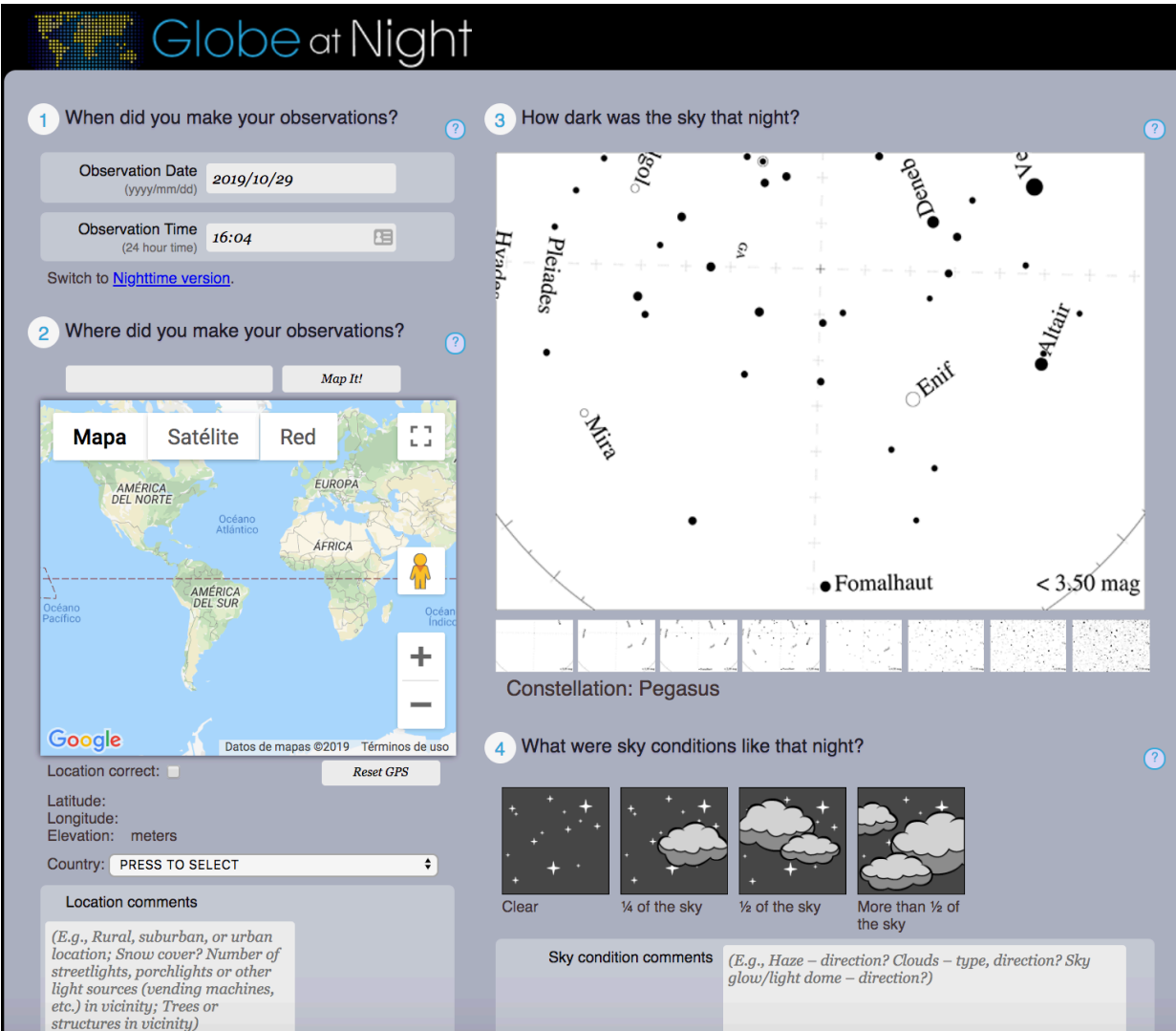
# What is Citizen Science?



**Participation of citizens in the research process**

- It is one of the first citizen science campaigns related with Light Pollution.
- Objective: raise **public awareness** of the impact of light pollution by inviting citizen-scientists to measure their night sky brightness and submit their observations
- Citizens need **an small astronomical knowledges** to identify the stars.
- More than **180,000 measurements** have been contributed from people in 180 countries over the last 12 years
- Open Data & Open Access

<https://www.globeatnight.org/>



**Globe at Night**

- When did you make your observations?
 

Observation Date (yyyy/mm/dd)

Observation Time (24 hour time)

Switch to [Nighttime version](#).
- Where did you make your observations?
 

Mapa | Satélite | Red

AMÉRICA DEL NORTE | Océano Atlántico | EUROPA | Océano Índico | AMÉRICA DEL SUR | Océano Pacífico | África

Location correct: ☐

Latitude:   
Longitude:   
Elevation:  meters

Country:

Location comments  
(E.g., Rural, suburban, or urban location; Snow cover? Number of streetlights, porchlights or other light sources (vending machines, etc.) in vicinity; Trees or structures in vicinity)
- How dark was the sky that night?
 

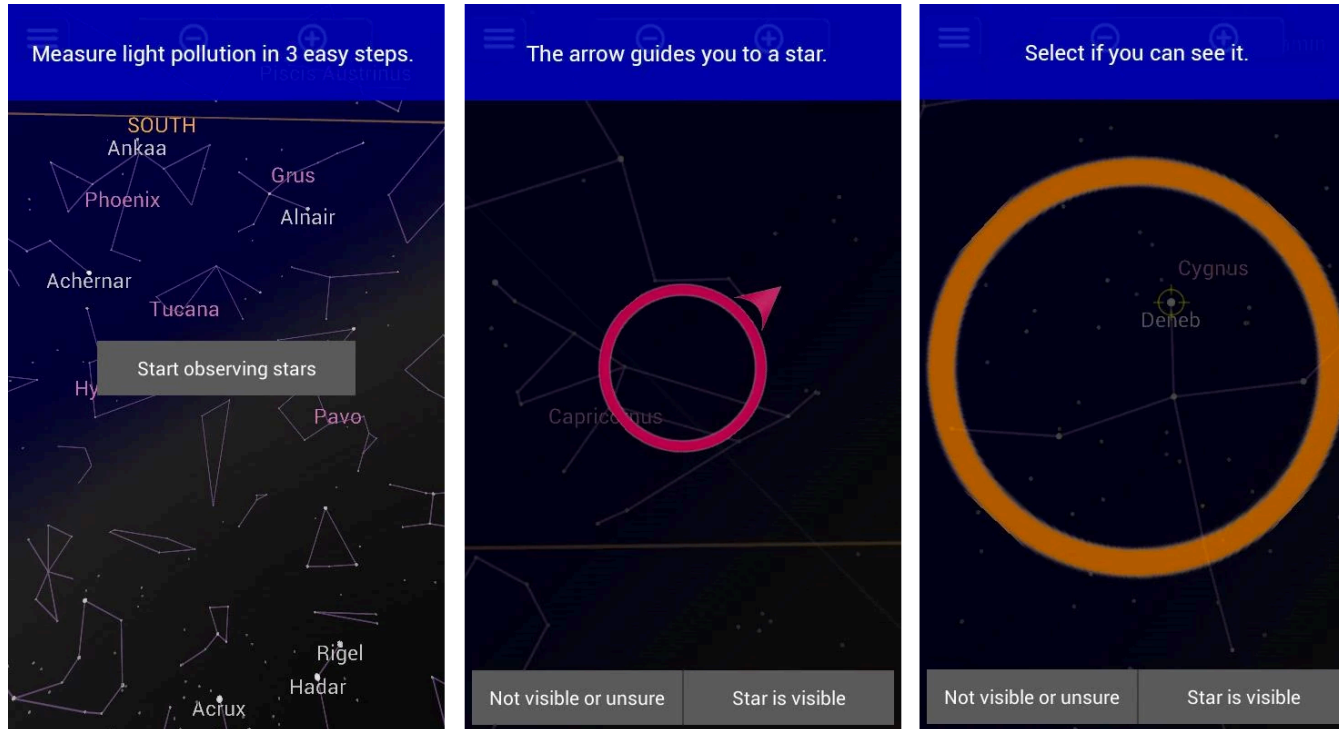
Star chart showing constellations: Pleiades, Hyades, Mira, Enif, Fomalhaut, Altair. Magnitude scale: < 3.50 mag.

Constellation: Pegasus
- What were sky conditions like that night?
 

☐ Clear  
☐ 1/4 of the sky  
☐ 1/2 of the sky  
☐ More than 1/2 of the sky

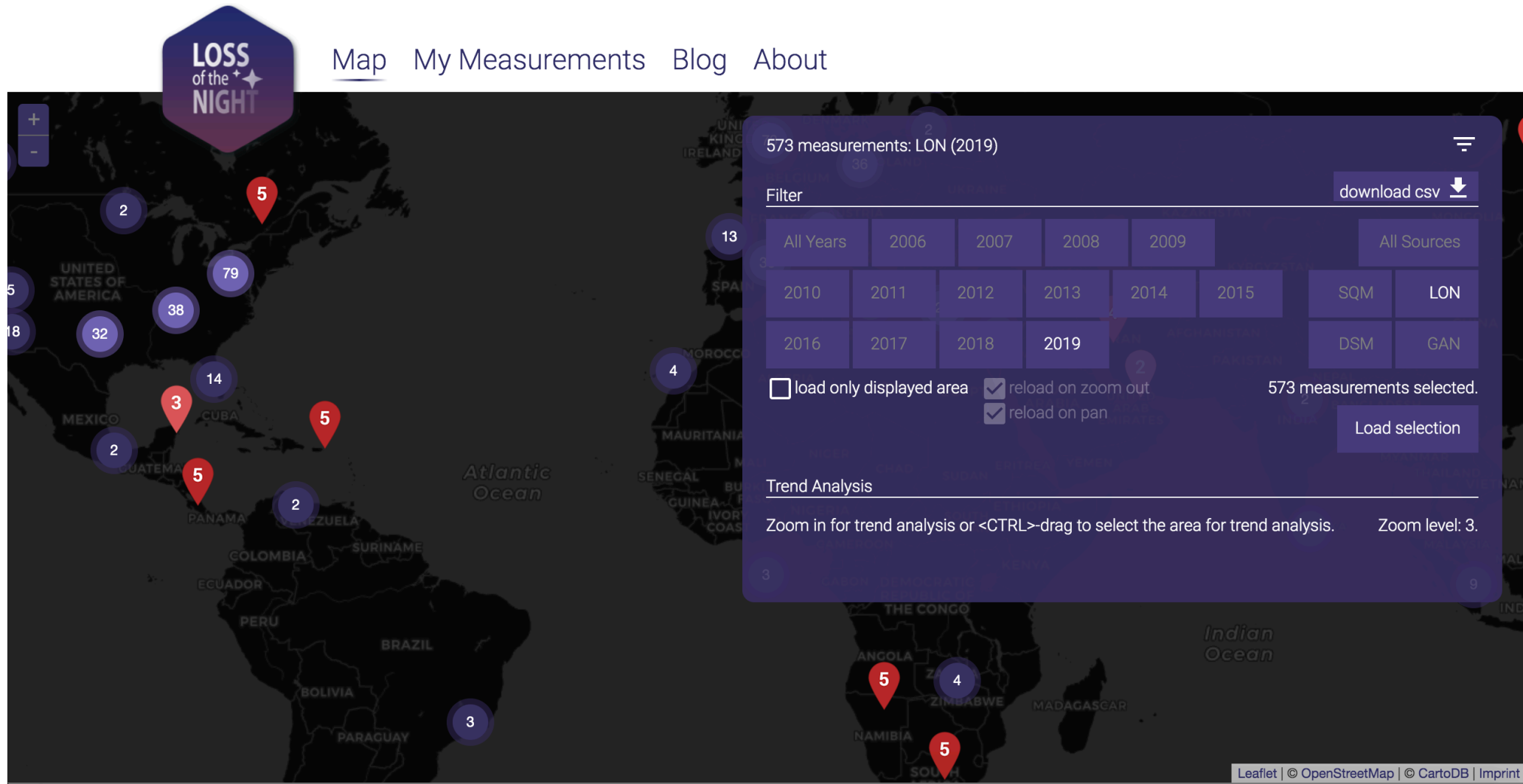
Sky condition comments  
(E.g., Haze - direction? Clouds - type, direction? Sky glow/light dome - direction?)

## Example: Loss of the Night



<http://lossofthenight.blogspot.com/>

- Contact: Dr Christopher Kyba ( [kyba@gfz-potsdam.de](mailto:kyba@gfz-potsdam.de) )
- Partners:
  - GFZ German Research Centre for Geosciences
  - Leibniz Institute for Freshwater Ecology and Inland Fisheries
  - Freie University Berlin - Institute for Space Sciences (until 2013)
- Objective: Building a map to see the effect of skyglow around the world with the help of the citizens.
- Project began in 2013
- Available in 15 languages
- Thousands of contributions from 6 different continents
- Available in Android and IOS
- Online map and skyglow data in My Sky At Night

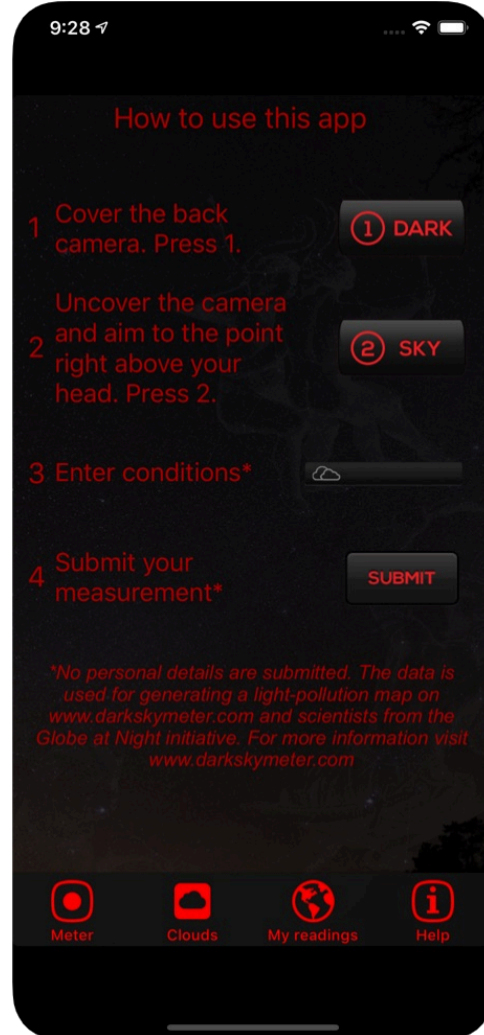
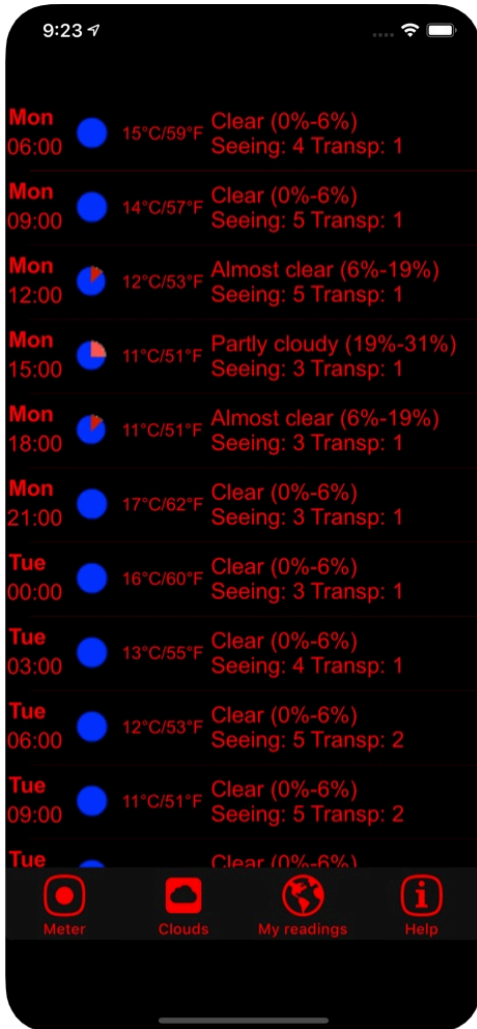


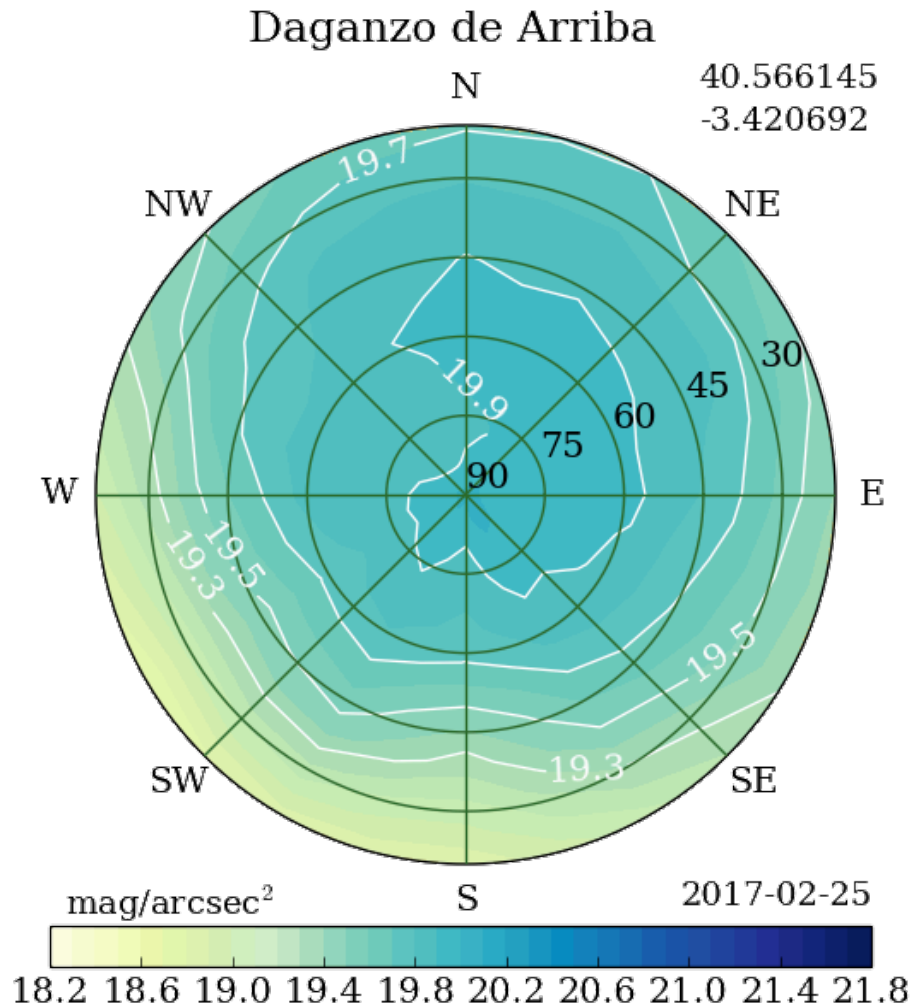
<http://www.myskyatnight.com/#map>

## Example: Dark Sky Meter

- Project led by Norbert Schmidt
- Objective: Contribute to a global map of nighttime light pollution using the iPhone's camera.
- Use an external weather forecast service.
- Open data is available in Globe At Night initiative.
- Paid app

<https://www.darkskymeter.com/>





- Contact: Jaime Zamorano
- Objective: In the origin, create a map with locations where citizens can “see” the stars. Additional information such as parking places or platforms to deploy telescopes are included.
- Now, data can be used to study the impact of cities close to the locations.
- Data reported by citizens is used to generate all sky maps.
- Maps are available in the website

<https://nixnox.stars4all.eu>

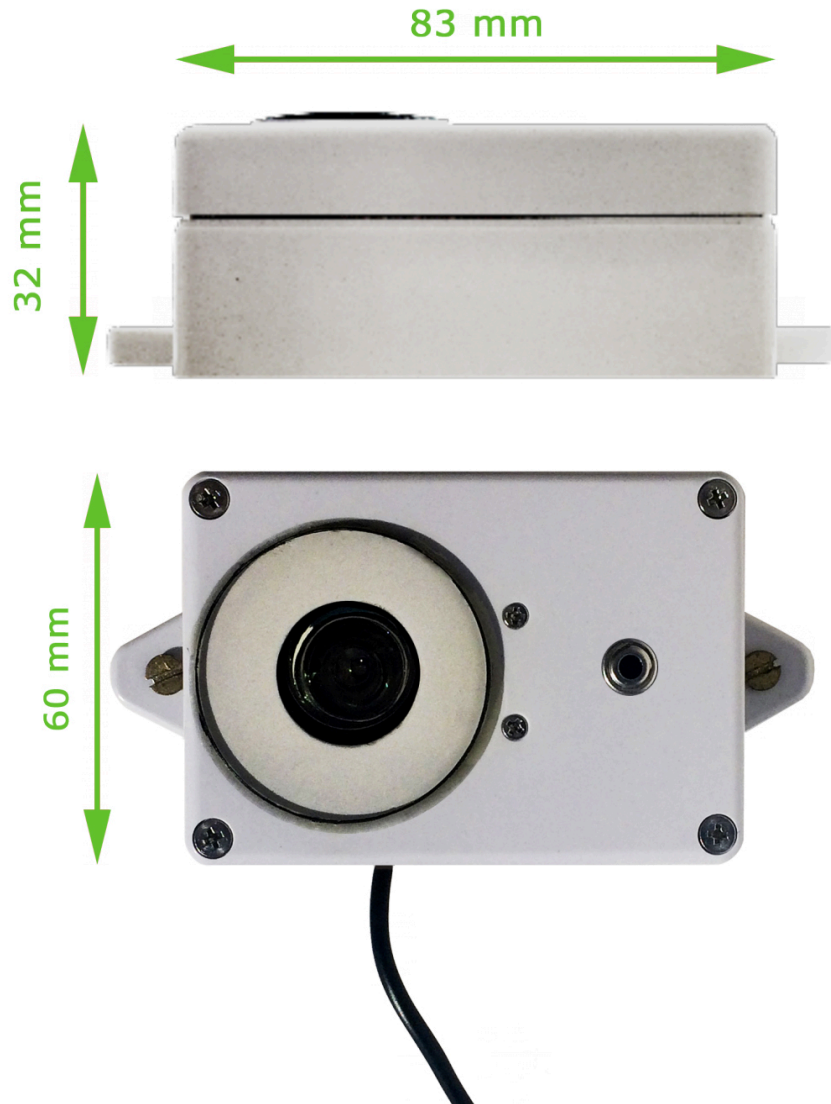


MANUAL Procedure

AUTOMATIC Procedure



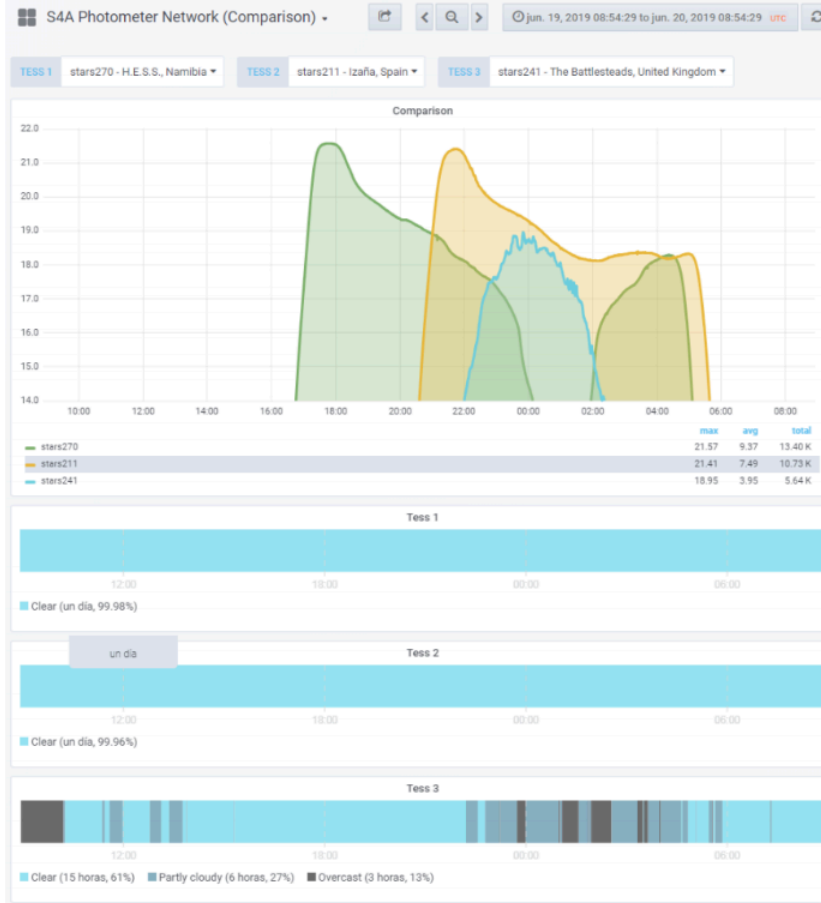
## Example: TESS Photometer Network



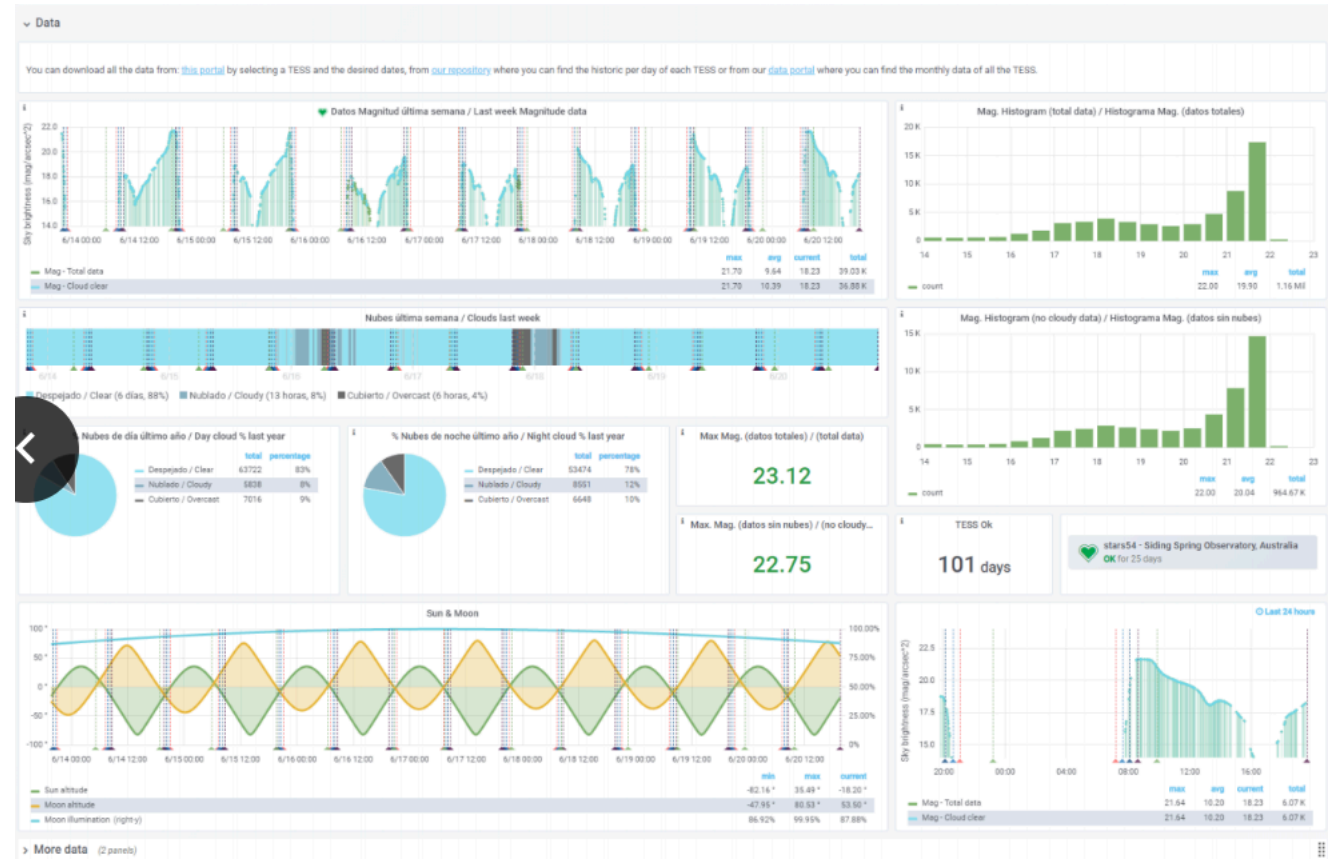
- Project led by Jaime Zamorano from Universidad Complutense de Madrid and Cristobal García Astrohenares (astronomical amateur association)
- Objective: Create a network of photometers to continuously monitor zenith sky brightness.
- You only need energy and WIFI to start working.
- Could coverage estimation included
- Photometer schematics and data are open and available.
- 148 photometers are sending their measurements every minute.

<https://tess.stars4all.eu>

## Comparison



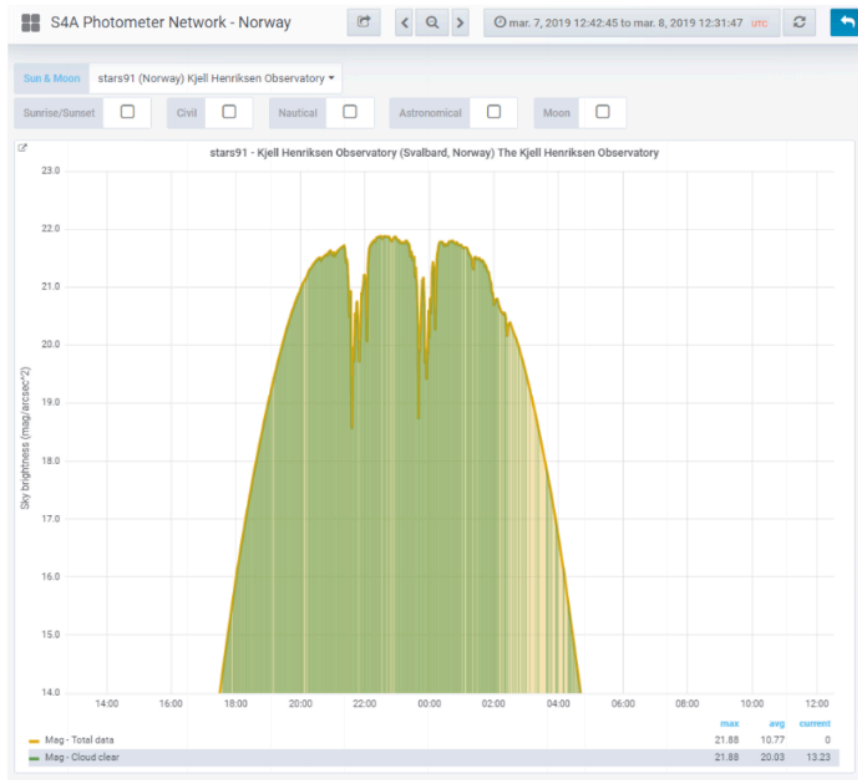
## Dashboard sheet for each photometer



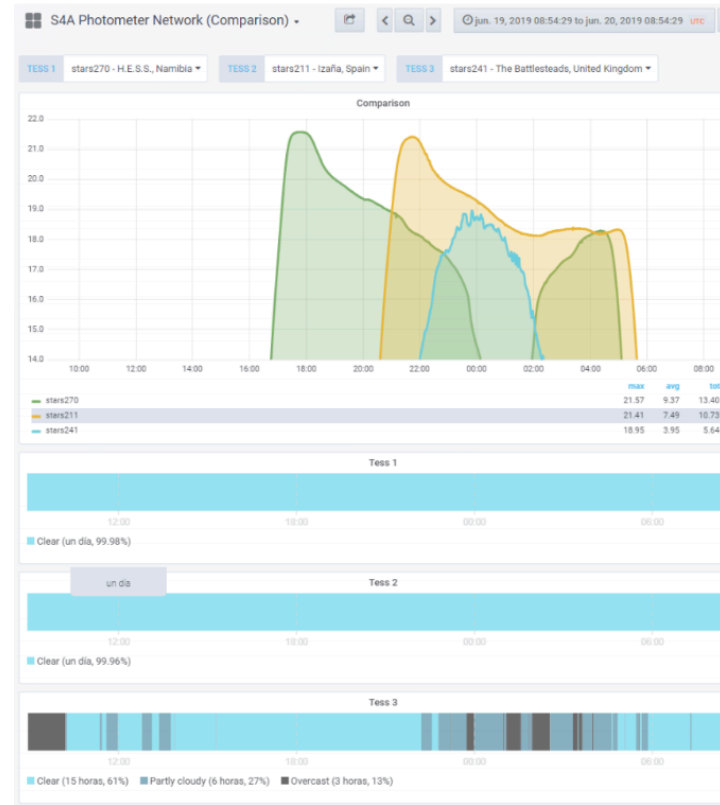
<https://tess.dashboards.stars4all.eu>

# Example: TESS Photometer Network (as Educational Tool)

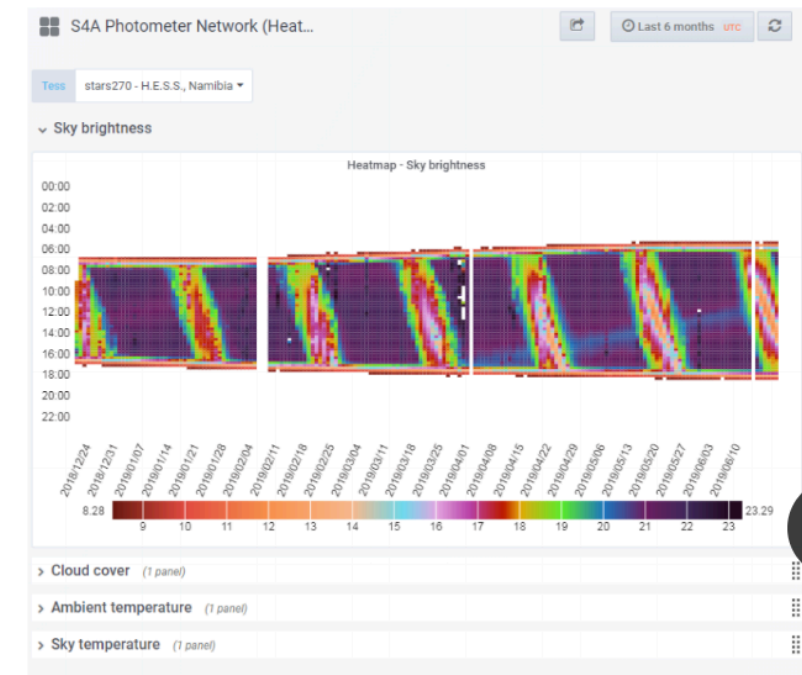
## Aurorae



## Sunrise/Sunset from different locations

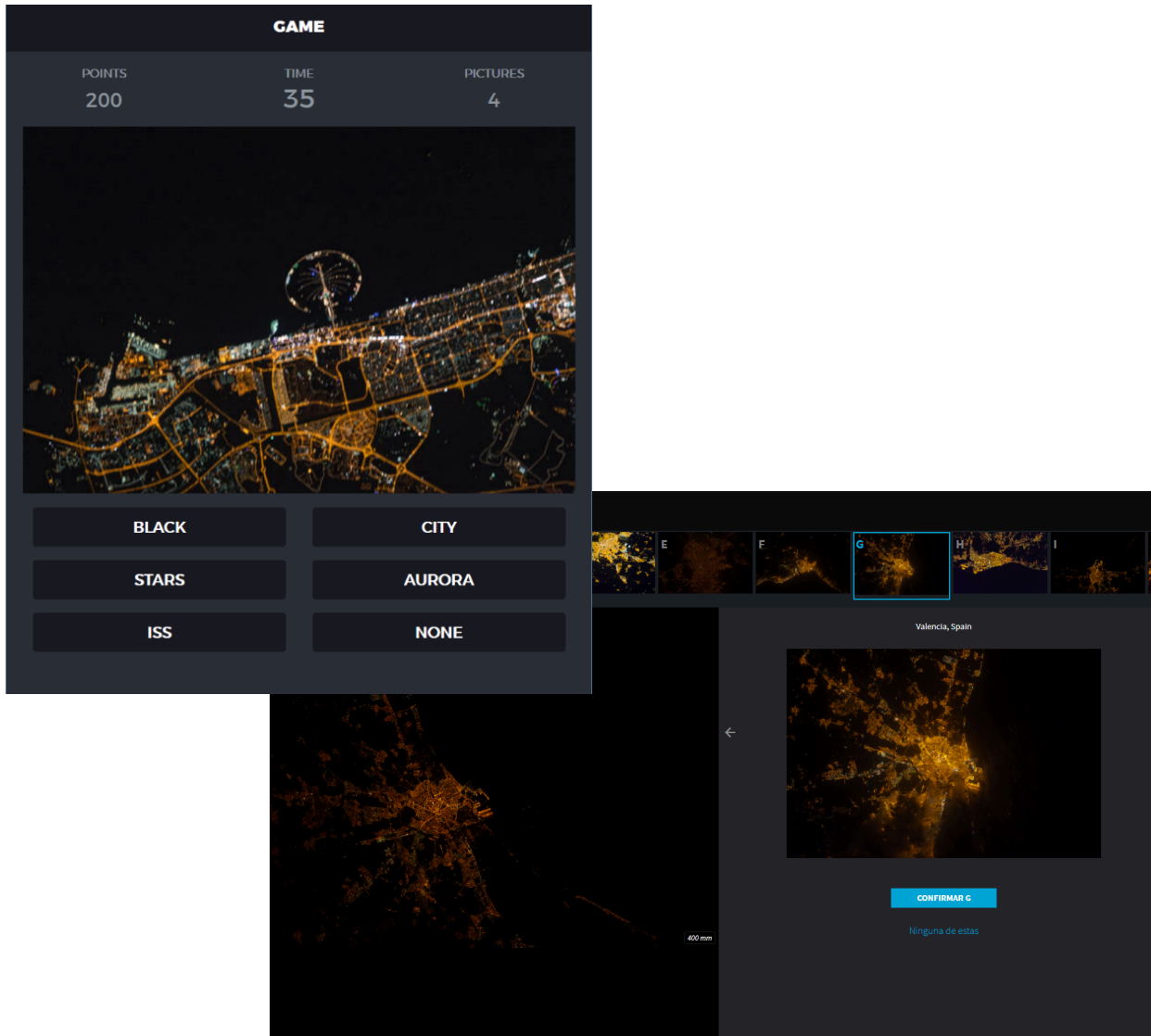


## Evolution of NSB (6 month)



<https://tess.dashboards.stars4all.eu>

## Example: Cities At Night



- Contact: Alejandro Sanchez de Miguel (citiesatnightiss@gmail.com)
- Objective: Create a map of the Earth using night time **colour** images taken by ISS astronauts.
- NASA has a database with almost half a million pictures
- Citizens contribute using two applications:
  - NightKnights to classify images
  - Lost of the Night to localize the images of cities. In one week, 10.000 city night images were processed

<https://citiesatnight.org>

# What is ACTION?

## WHAT

**ACTION transforms citizen science (CS): it makes it even more participatory, inclusive, citizen-led and democratic. ACTION acknowledges the diversity of the CS landscape and the challenges CS teams have to meet by providing ad hoc methodologies, tools and guidelines.**

## HOW?



### ACTION **TOOLKIT**

Co-designed methodologies and socio-technical tools simplifying the everyday life of CS projects and supporting their sustainability.



### ACTION **ACCELERATOR**

A set of services, tailored to the needs of each CS project, including: training, mentoring, infrastructure to host projects and their data; promotion and networking.



### ACTION **MASTERCLASSES**

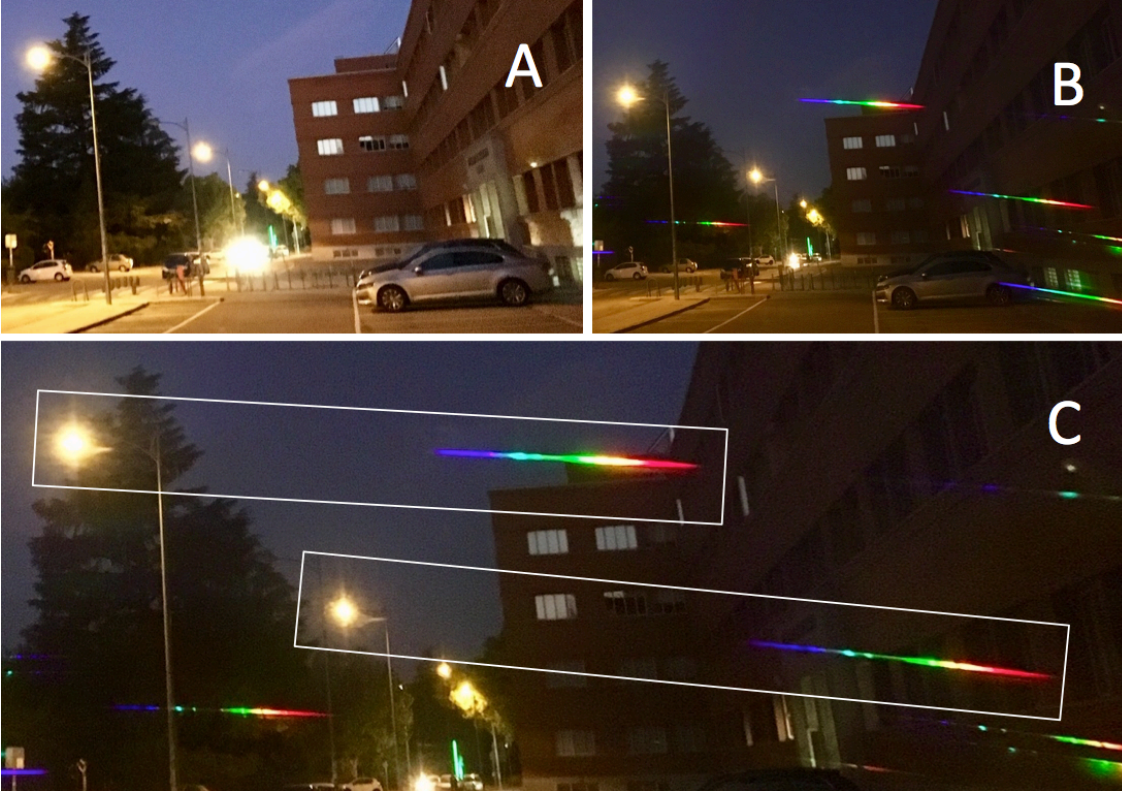
Tailored events for local, national and EU policy makers and civil servants interested in maximizing the potentialities of CS in their territories.



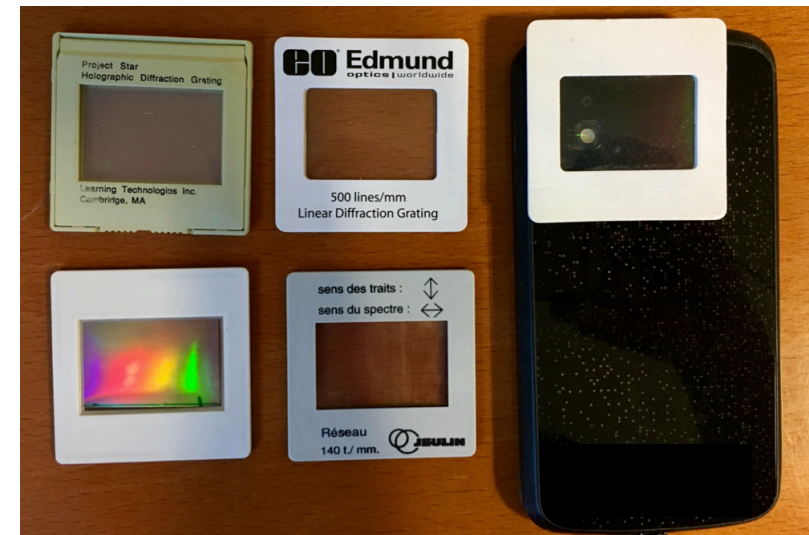
### ACTION **OPEN CALL**

Funds and support for 10 new and ongoing citizen science projects related to any form of pollution in Europe and worldwide.

## Example: Street Spectra



- Project led by Jaime Zamorano from Universidad Complutense de Madrid
- Objective: Characterization of lampposts
- Citizens will contribute reporting the spectra using different datasources
- All data generated will be open



## Example: Tatort Streetlight



<http://tatort-strassenbeleuchtung.de>

- Contact: Dr. Sibylle Schroer ([schroer@igb-berlin.de](mailto:schroer@igb-berlin.de))
- Partners:
  - Leibniz Institute for Freshwater Ecology and Inland Fisheries
  - TU Berlin
  - NABU Regional Association Westhavelland
- Objective: Light pollution has a severe impact on insect populations. How can street lighting can be designed for the wellbeing of flying insects?
- Launching in April 2020
- 4 test sites in Germany
- Collection of long-term data of the effect of streetlight design and location on insect behaviour.
- Engagement with citizen science entomologists for data collection and interpretation
- Local school engagement programme

- ❑ Adopt Open Science principles can foster the light pollution research.
- ❑ Citizen Science can be a powerful tool to create awareness in the society,  
specially in schools
- ❑ Citizens Science projects can be an excellent complement of astrotourism  
activities



**Wayfarer, there is no way.  
Make your way by going farther.**

Antonio Machado (poet)

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## Acknowledgement



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