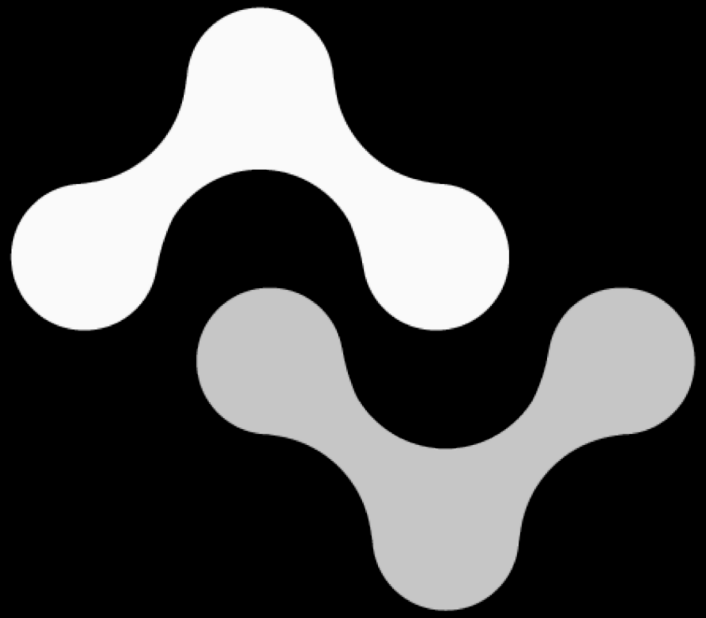


citizen science lab

Frans Snik, Liselotte Rambonnet, Anne Land, Margaret Gold, Matthijs Begheyn, Pedro Russo

Universiteit Leiden

What is Citizen Science?

Citizen science is the term that is used to describe a wide range of activities, in which people from all walks of life participate in a scientific project in a meaningful way (beyond being subjects in a medical experiment, or participants in a study in the social sciences)

Muki Haklay

The term *citizen science* was needed many years later for similar reasons. To paraphrase Whewell, we might say that *citizens* are those with rights and responsibilities to participate in some larger collective (such as governance), and *citizen scientists* are thus people exercising their rights and responsibilities to participate in collective scientific endeavors. Participation in the process of governance involves adding one's values, opinions, and perspectives to decision making; participation in the process of science involves adding one's observations and amateur expertise to making new knowledge. In the former, one casts ballots; in the latter, one submits data.

Caren Cooper

3. The boundaries of what can rightly be termed citizen science are debatable, but there is broad consensus that projects should involve voluntary and active public engagement with research. Projects that cull public data from social media, exploit data gathered from medical cohorts, or incentivise participation without clearly stating the scientific purpose of the activity, are not normally considered to be citizen science, although they may have the potential to become it.

LERU

In Citizen Science, a broad network of people collaborate. Participants provide experimental data and facilities for researchers, raise new questions and co-create a new scientific culture. While they add value, volunteers acquire new learning and skills and gain a deeper understanding of the scientific work in appealing ways. As a result of this open, networked and transdisciplinary scenario, science-society-policy interactions are improved, leading in turn to a more democratic research based on evidence and informed decision-making.

Socientize

This collaboration between scientists and people from all walks of life has received growing recognition by the general media and by researchers. It is now commonly referred to as "citizen science." The term entered the Oxford English Dictionary in June 2014 as "*scientific work undertaken by members of the general public, often in collaboration with or under the direction of professional scientists and scientific institutions.*"[4]

Commons Lab

Alternative definitions [edit]

Other definitions for citizen science have also been proposed. For example, Bruce Lewenstein of Cornell University's Communication and S&TS departments describes 3 possible definitions:[22]

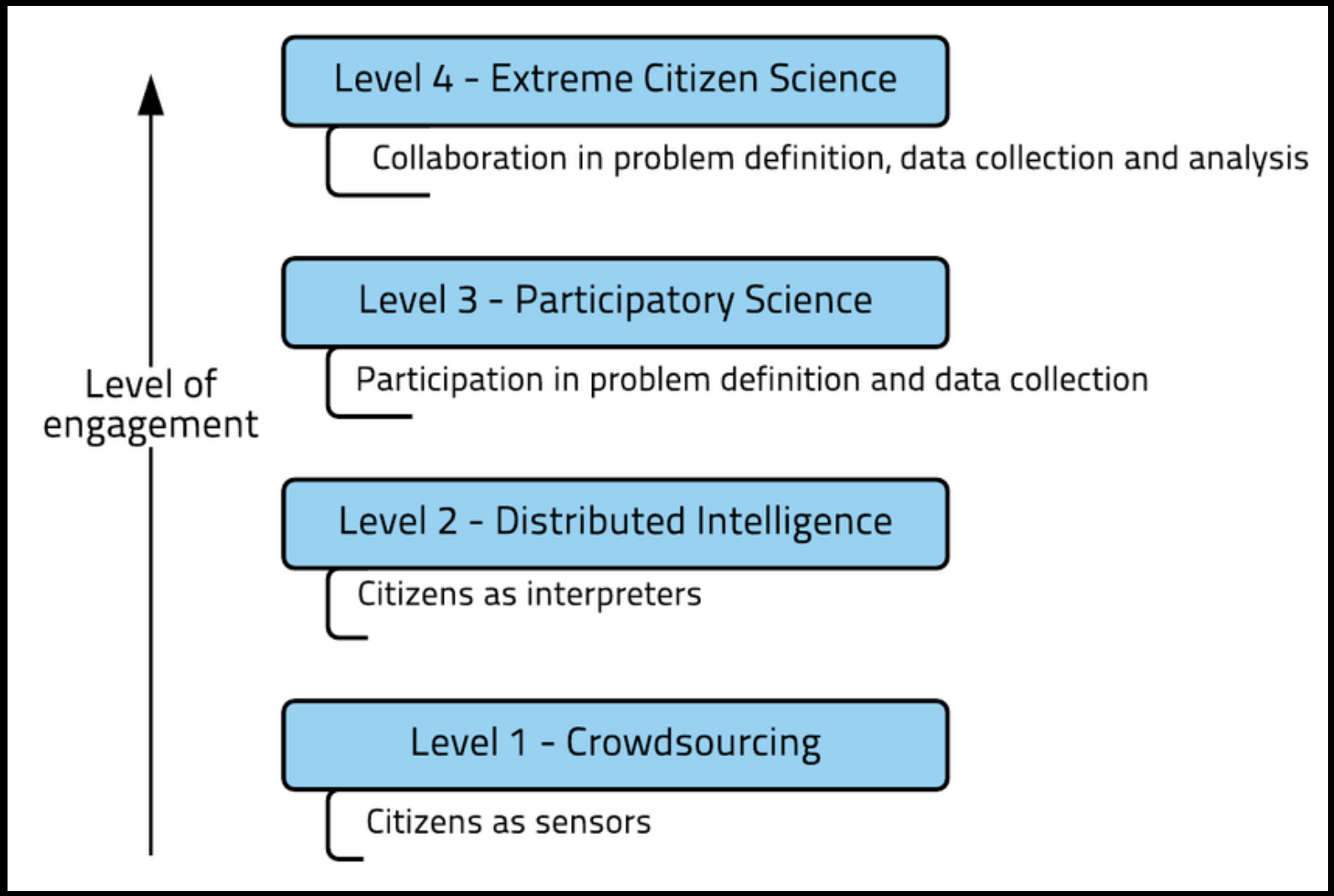
- The participation of nonscientists in the process of gathering data according to specific scientific protocols and in the process of using and interpreting that data.[22]
- The engagement of nonscientists in true decision-making about policy issues that have technical or scientific components.[22]
- The engagement of research scientists in the democratic and policy process.[22]

Wikipedia

Whenever possible, **citizen science** should be encouraged, where citizens become providers and users of data. This will reinforce and give new meaning to the policy of open access to publications and data; this openness should enable citizens and citizen groups to participate in evidence-based policy and decision-making. This could give rise to new types of partnerships, such a "P4P"s or "P4.0s" where "people" are working together with the public and private sector. This could be systemically implemented on European, national and regional levels.

EC Lamy report

categories of Citizen Science



Haklay (2013)

What could be properties of successful Citizen Science projects?

10 principles of Citizen Science

1. Citizen science projects actively involve citizens in scientific endeavour that generates new knowledge or understanding
2. Citizen science projects have a genuine science outcome.
3. Both the professional scientists and the citizen scientists benefit from taking part.
4. Citizen scientists may, if they wish, participate in multiple stages of the scientific process
5. Citizen scientists receive feedback from the project.
6. Citizen science is considered a research approach like any other, with limitations and biases that should be considered and controlled for.
7. Citizen science project data and meta-data are made publicly available and where possible, results are published in an open access format.
8. Citizen scientists are acknowledged in project results and publications.
9. Citizen science programmes are evaluated for their scientific output, data quality, participant experience and wider societal or policy impact.
10. The leaders of citizen science projects take into consideration legal and ethical issues surrounding copyright, intellectual property, data sharing agreements, confidentiality, attribution, and the environmental impact of any activities.

EUROPEAN
CITIZEN SCIENCE
ASSOCIATION

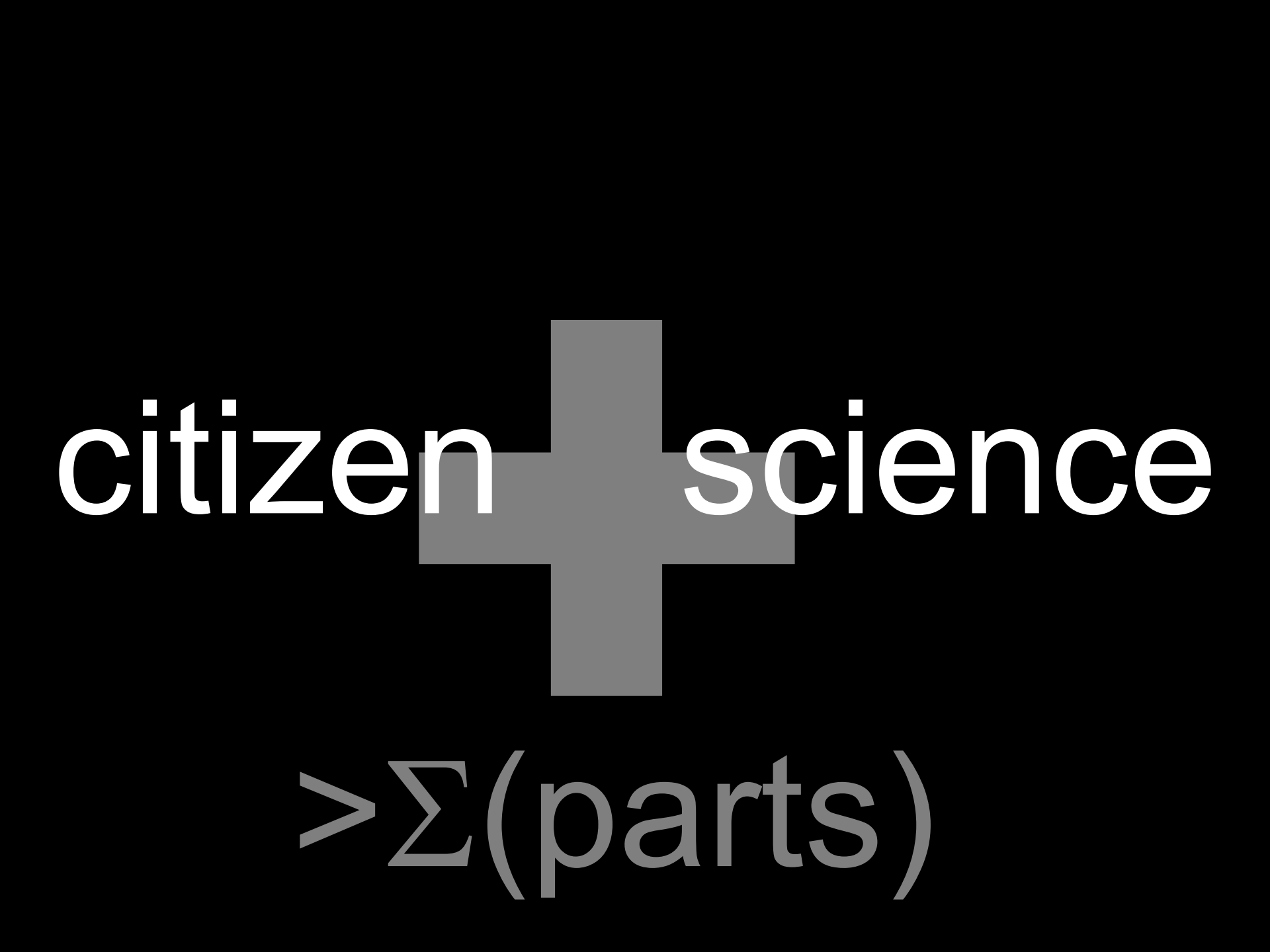
Input and output of Citizen Science

Scientists	Participants
Reasons	
Scientific output	Contribution to goals of project
Outreach	Interest in topics
Environmental Stewardship	Enjoyment
Democratizing	Community
Outcomes	
Data	Knowledge
Peer-reviewed papers	Skills
Discoveries	Interest, attitude
Policy	Empowerment (science for everyone)

courtesy: Anne Land

citizen **science**

citizen science


citizen science
>Σ(parts)

citizen + science
=impact
(scientific and/or societal)

William Herschel

Caroline Herschel

Galaxy Tutorial
Galaxy Analysis
Galaxy Zoo - Thank You
Show My Galaxies

Galaxy Analysis

Welcome to Galaxy Zoo's view of the Universe. If you're here you should already have seen the Tutorial, but feel free to go and remind yourself. There's no need to agonise for too long over any one image, just make your best guess in each case.

Show Grid Overlay on the next Image

Galaxy Ref:
587729387677679742

Choose the Galaxy Profile by clicking the buttons below

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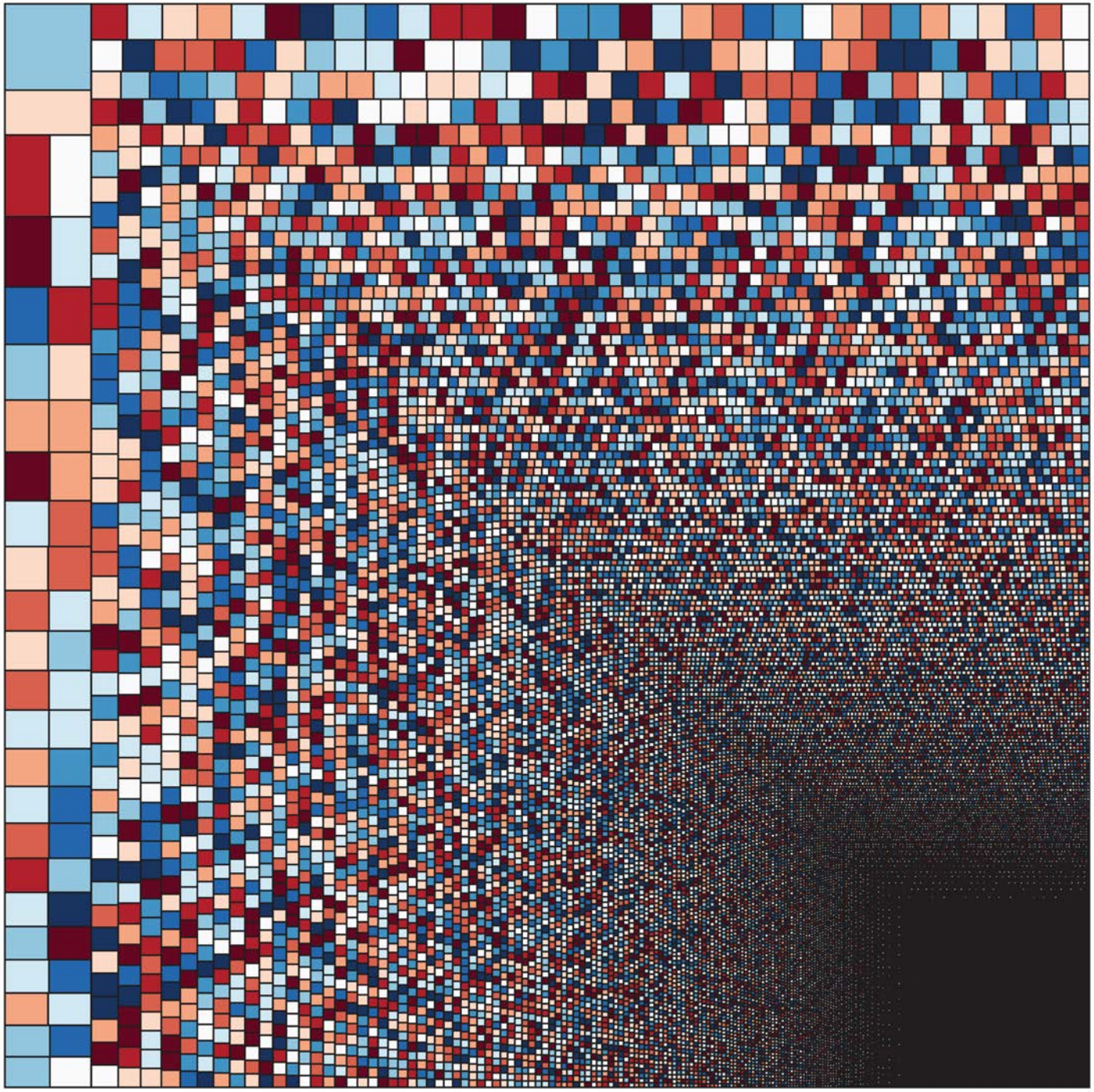
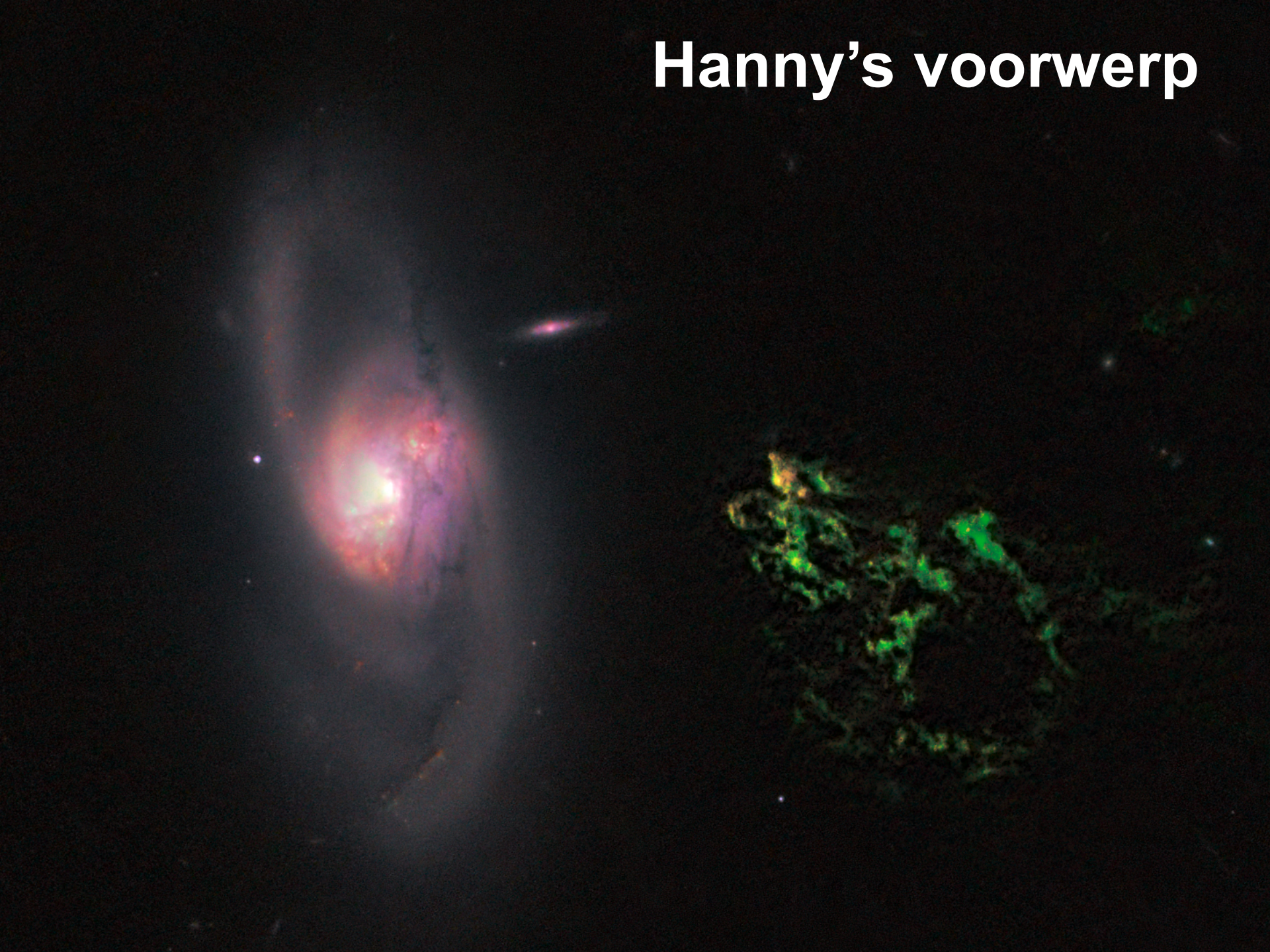
Galaxy Zoo contributers



Marshall et al. (2015)

Hanny's voorwerp



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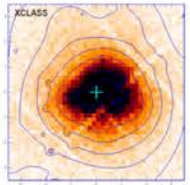
THE AMERICAN SOLDIER



THE HUNT FOR GALAXY CLUSTERS

MANATEE CHAT

SNAPSHOT DEBSHAN

SNAPSHOT ENONKISHU

SNAPSHOT MADIKWE

MAPPING CHANGE

SOUTHERN WEATHER DISCOVERY

WORLDS OF WONDER

SNAPSHOT APNR

WEATHER RESCUE

SNAPSHOT KRUGER

ASTRONOMY REWIND

CAMERA CATALOGUE

CEDAR CREEK: EYES ON THE WILD

SNAPSHOT SERENGETI

PLANET HUNTERS TESS

WILDCAM GORONGOSA

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https://www.zooniverse.org/about/publications

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All Publications

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Galaxy Zoo (58)

Coordinating Advanced Crowd Work: Extending Citizen Science, Crowston+ 2018.
View publication.

Galaxy Zoo: secular evolution of barred galaxies from structural decomposition of multiband images, Kruk+ 2018.
View publication.

Galaxy Zoo: finding offset discs and bars in SDSS galaxies, Kruk+ 2017.
View publication.

Galaxy Zoo: star-formation versus spiral arm number, Hart+ 2017.
View publication.

Galaxy Zoo: The interplay of quenching mechanisms in the group environment, Smethurst+ 2017.
View publication.

Galaxy Zoo: Quantitative Visual Morphological Classifications for 48,000 galaxies from CANDELS, Simmons+ 2016.
View publication.

Galaxy Zoo: Morphological Classification for 120,000 Galaxies in HST Legacy Imaging, Willett+ 2016.
View publication.

Galaxy Zoo: Mergers - Dynamical Models of Interacting Galaxies, Holincheck+ 2016.
View publication.

Galaxy Zoo: Comparing the demographics of spiral arm number and a new method for correcting redshift bias, Hart+ 2016.
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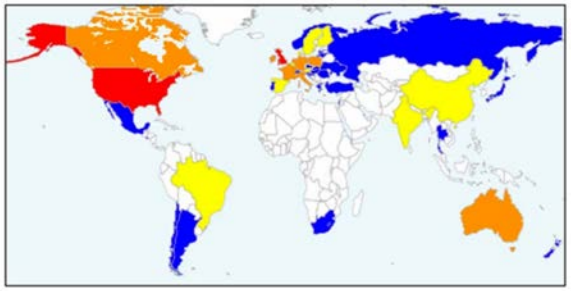
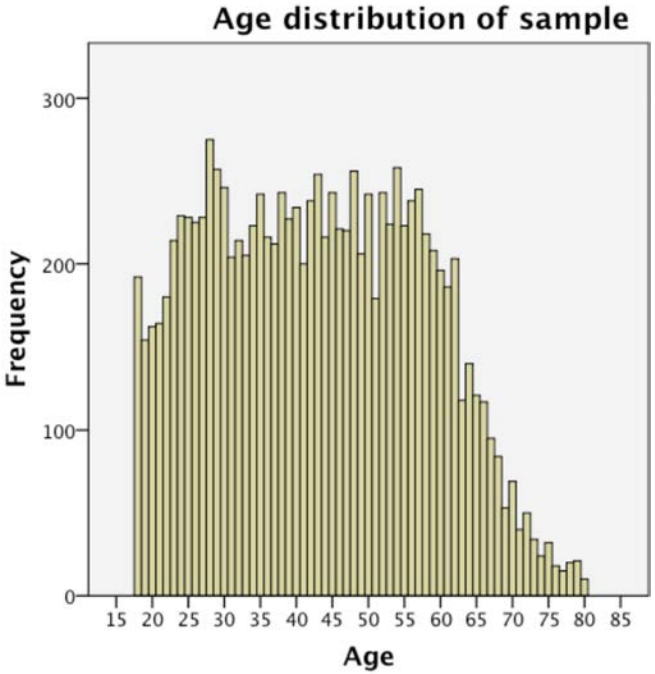
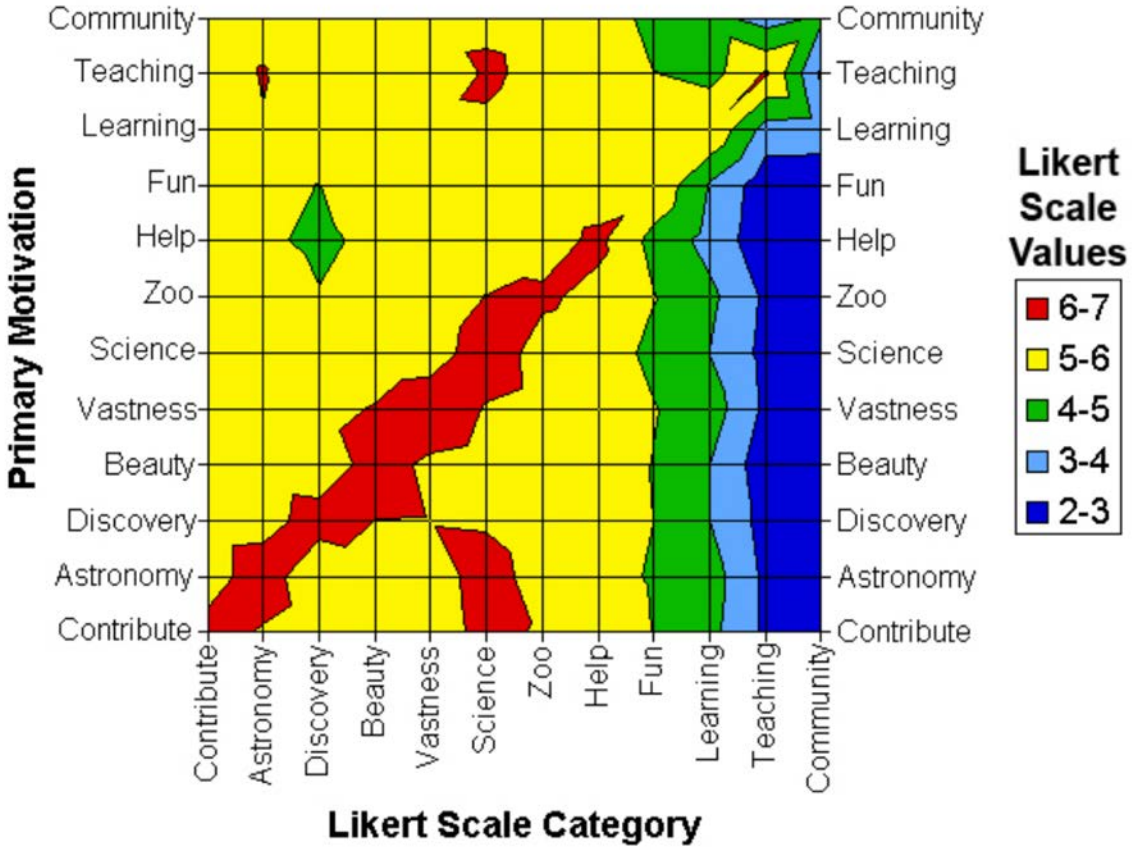
Galaxy Zoo: Evidence for rapid, recent quenching within a population of AGN host

Galaxy Zoo participant motivations

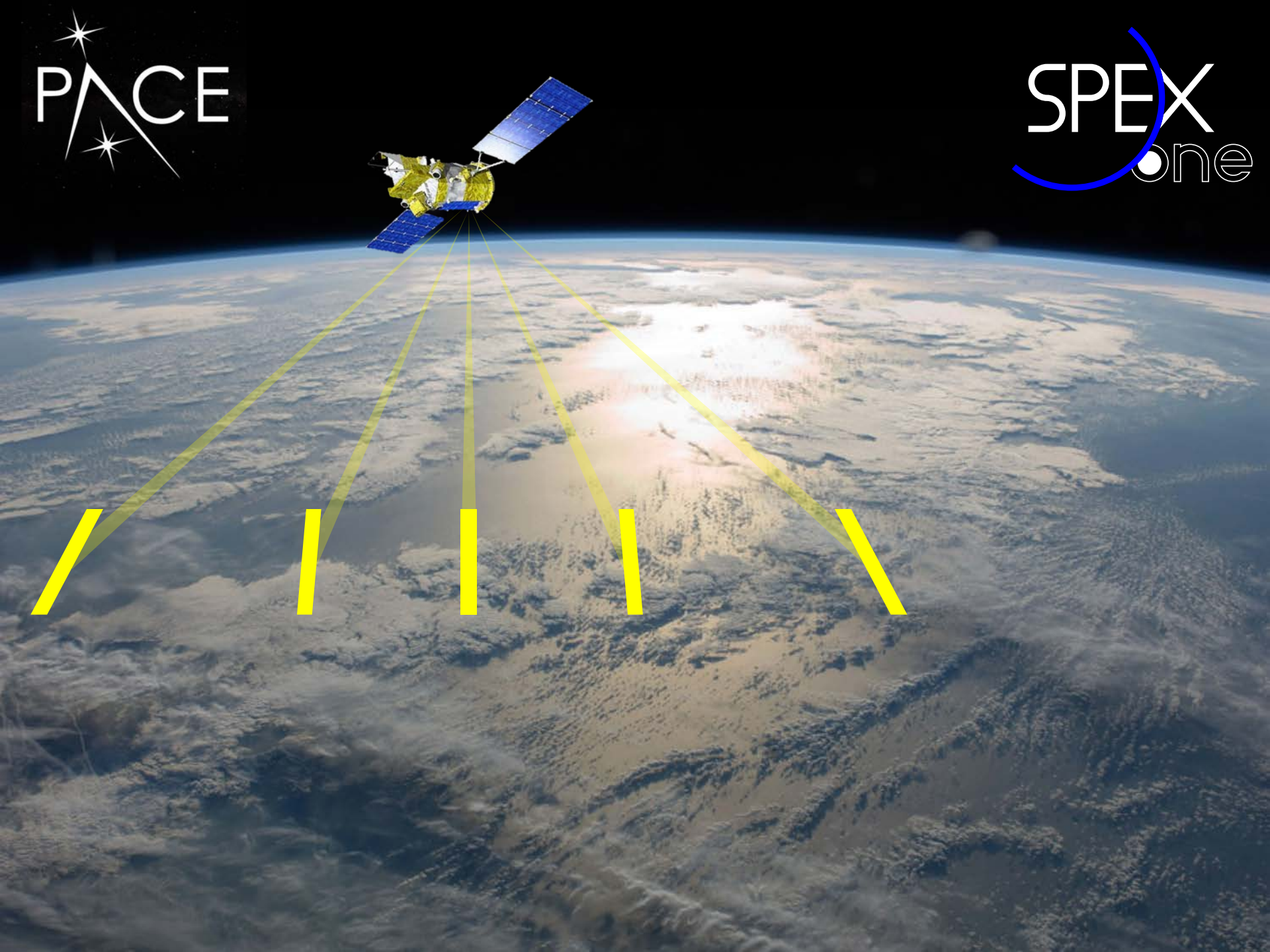






Raddick et al. (2009)

SPEX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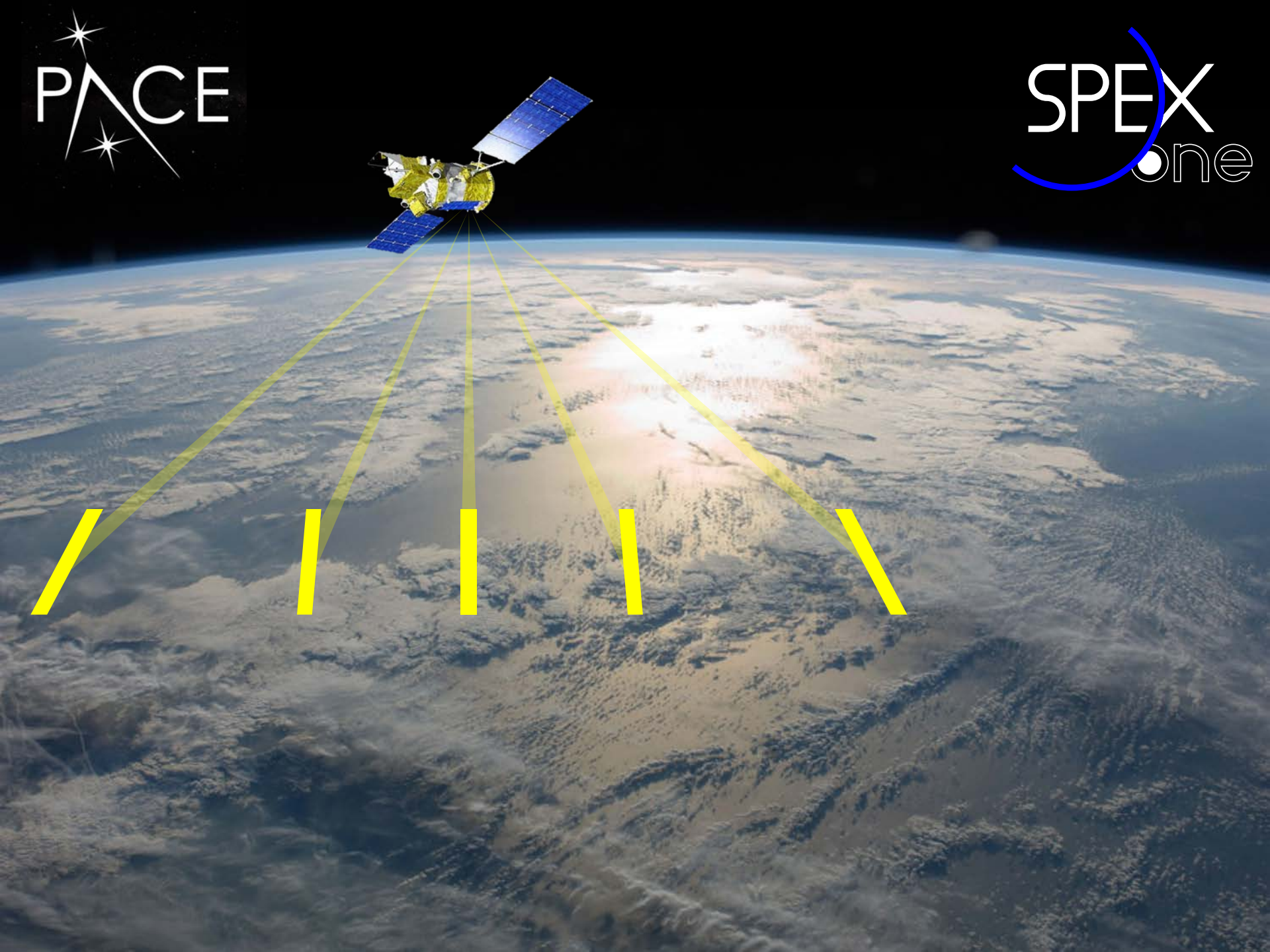
SPEX one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SPEX one

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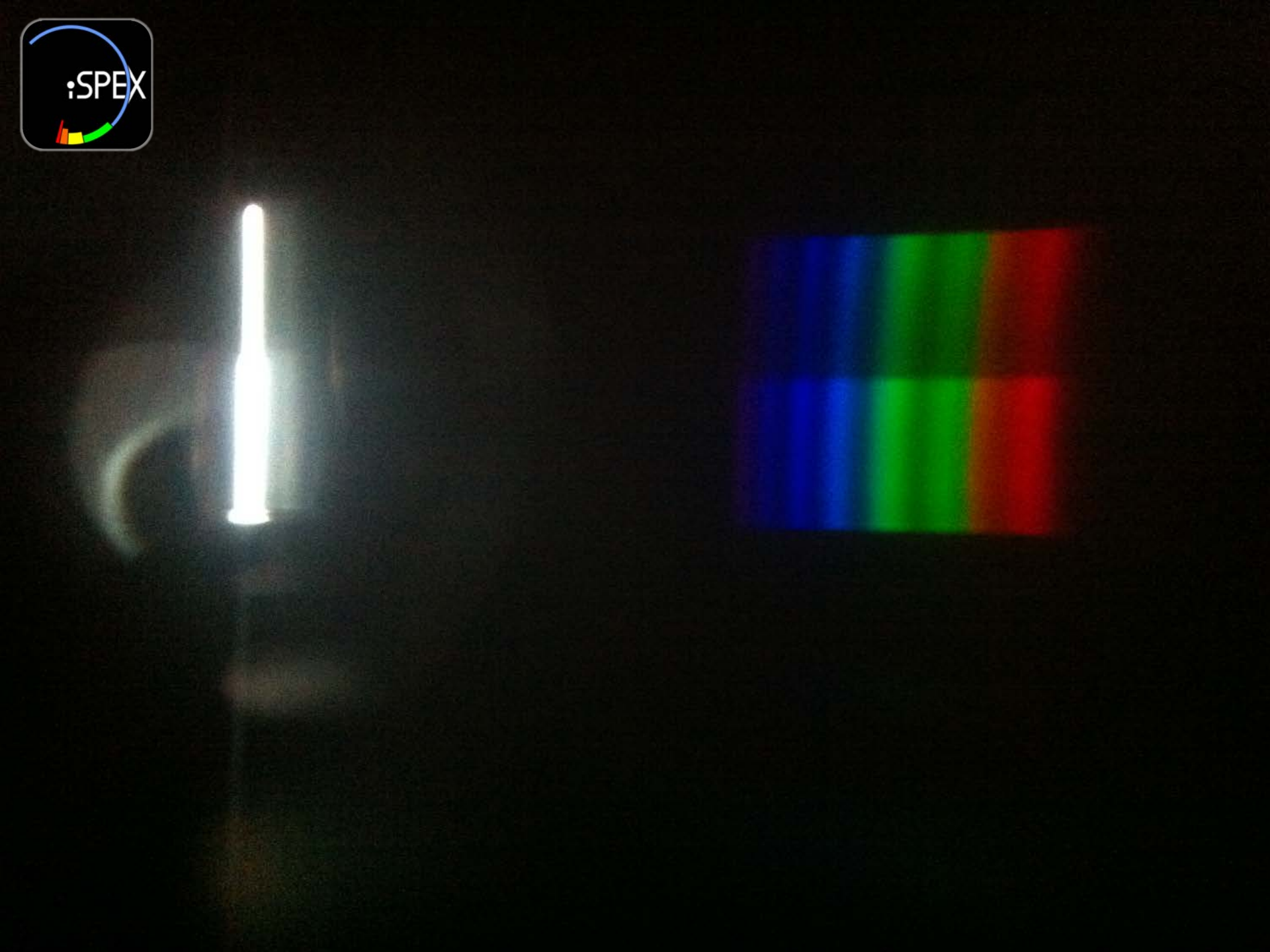
:SPEX

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€ 100.000

production

longfonds.nl/buitenlucht
CNGNet
Schoon rijden en goedkoop tanken
CNG NET TANKTEGOED
€ 100,-
iSPEX
Meet fijnstof met je smartphone
www.ispex.nl

1.Positie fijnstofmeting
2. iSPEX montage
3. Meetprocedure
4. Delen
Zelf aan de slag
Je kunt zelf deels vermijden dat je klachten krijgt door luchtvervuiling. Blijf weg van druk verkeer en de spits, zeker als je je buiten gaat inspannen. Plan bij zomersmog activiteiten buiten liefst in de ochtend of de avond. Ventileer je huis, maar doe dat niet aan de straatkant. En laat de auto zoveel mogelijk staan. Informatie over luchtvervuiling vind je op onze website en via project iSPEX.
Meer weten? Kijk op longfonds.nl/buitenlucht
Gezonde aanpak
Het Longfonds wil gezonde buitenlucht, zodat gezonde longen niet ziek worden en mensen met longziekten niet nog zieker. Bij ons staan mensen en hun gezondheid voorop. We willen dus geen nieuwe scholen pal naast een drukke verkeersweg. We pleiten voor een beter smogalarm in Nederland en een gezond beleid voor luchtkwaliteit.
Project iSPEX kan daar enorm bij helpen!
Bijdragen aan schone lucht en goedkoper rijden?
CNG Net gaat voor schonere mobiliteit in Nederland. U kunt bij onze ruim 50 CNG-tankstations in Nederland CNG tanken. Een brandstof die niet alleen erg schoon is, maar ook nog eens erg goedkoop.
Wist u dat?
U voor € 30,- van Amsterdam naar Parijs rijdt op CNG en nagenoeg geen fijnstof uitstoot!
Op onze site www.cngnet.nl/ispex vindt u meer informatie over de brandstof CNG en waarom CNG Net hoofdpartner is van iSPEX. CNG Net geeft ook nog eens €100,- tankegoed weg als u al in een CNG-voertuig rijdt of gaat rijden voor 1 juli 2014. Zie achterzijde voor meer informatie.
Het tankegoed van € 100,- CNG kunt u tot 1 juli 2014 verzilveren bij CNG Net. CNG kunt u alleen tanken met een aardgasauto en tanken op ongeveer 100 CNG-tankstations in Nederland.
Stuur een mail naar info@cngnet.nl met uw unieke code:
CNG8502
U ontvangt dan een link om uw prepaid tankpas aan te vragen.

app

TOP FREE APPS >

1. **iSpex**
   Education
2. **iTunes U**
   Education
3. **Meta 11-12**
   Education
4. **Pocket Dictionary 25in1**
   Education
5. **WrtsMobile**
   Education
6. **FlashCards++**
   Education
7. **Radboud Lustrum**
   Education
8. **Rijksmuseum**
   Education
9. **Starlight - Mobile Planetarium**
   Education
10. **CBR theorie examens oefenen**
    Education

national measurement day

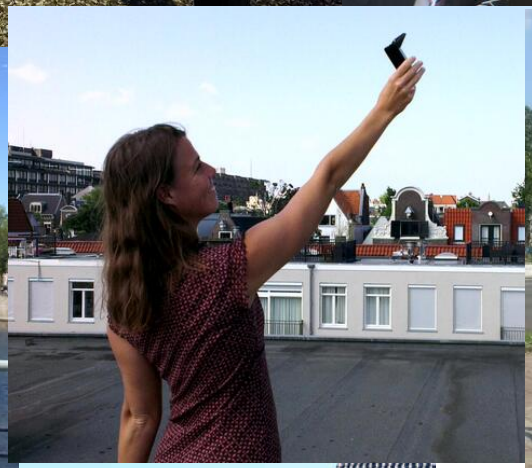
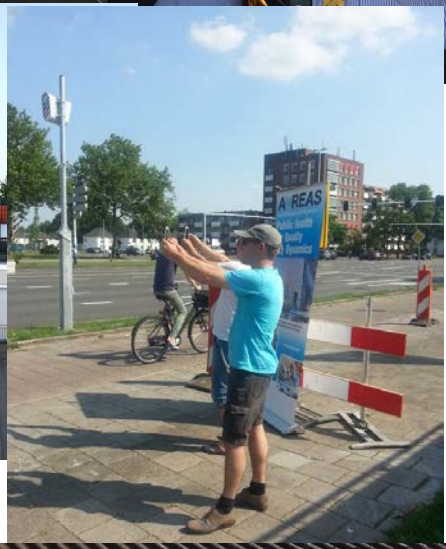
iSPEX project @iSPEXnl 5 Jul
De meetdag vindt plaats op maandag 8 juli! Meer informatie op de website ispex.nl

Helga van Leur @helgavanleur 5 Jul
Eindelijk! Maandag 8 juli 1e landelijke iSPEX-meetdag: de luchtkwaliteit meten met jouw smartphone!!! @iSPEXnl zie ispex.nl

André Kuipers @astro_andre 8 Jul
Meet mee #ispex live experiment for all
Retweeted by iSPEX project

Willem-Alexander @Koning_NL 8 Jul
Let u een beetje op wat u voor #ispex fotografeert met uw mobieltje, Landgenoten? Mijnheer #Obama en de #NSA kijken ook mee. #prism

:SPEX

BN DESTEM DINSDAG 9 JULI 2013

VANDAAG 3

gaan de lucht in

50 De overheid heeft de maximaal toelaatbare hoeveelheid fijnstof per kubieke meter in de atmosfeer vastgesteld. De dagelijkse norm is 50 microgram en die mag hooguit 35 dagen per jaar worden overschreden.

René Martens had verwacht een hogere concentratie fijnstof te meten. foto Ron Magielse/het fotoburo

'Minder fijnstof in Breda dan verwacht'

door **Maartje Huijben**

BREDA – Nee, eerlijk gezegd had hij meer fijnstof verwacht dan dat hij tot dusver heeft gemeten. „Ik woon relatief dicht bij de snelweg en de spoorlijn. Ik ging ervan uit dat er daarom meer fijnstof in de lucht zou zitten. De hoeveelheid die ik tot nu heb gem…

fijnstof van weinig tot veel. In de rest van West-Brabant is het vergelijkbaar, zij het dat op sommige plekken ook schone lucht wordt gemeten.

„Ik ben geïnteresseerd in de wetenschap", verklaart Martens…

Sterrenkundige Stephanie Heikamp van de Univ…

Massaal…

Reportage Fijnstofonderzoek

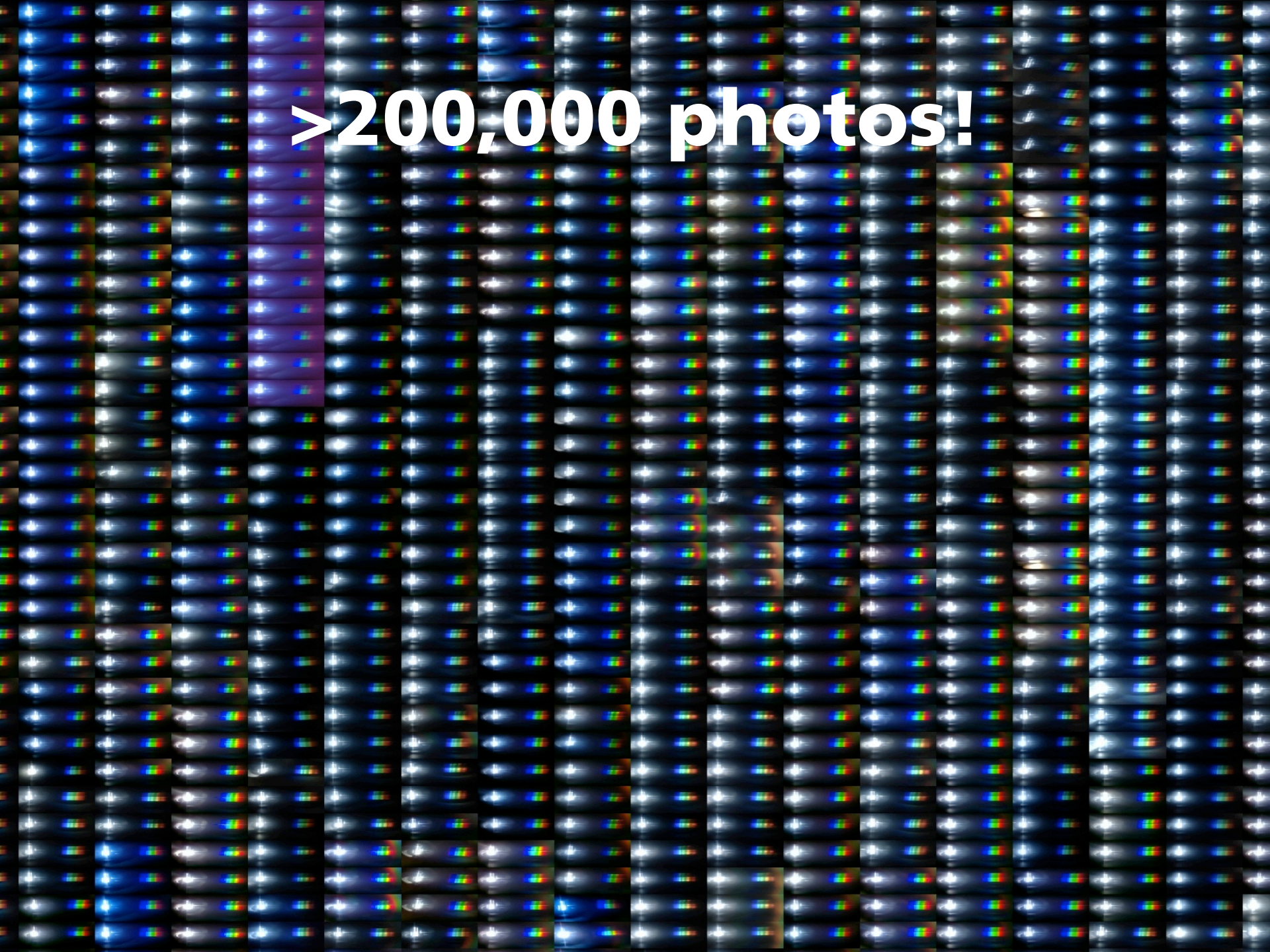
Het was lang wachten… een zo strakblauwe l… dat fijnstof meten… duizenden smart… tegelijk zin zou… Maandag was…

Van onze versl… Bard van de…

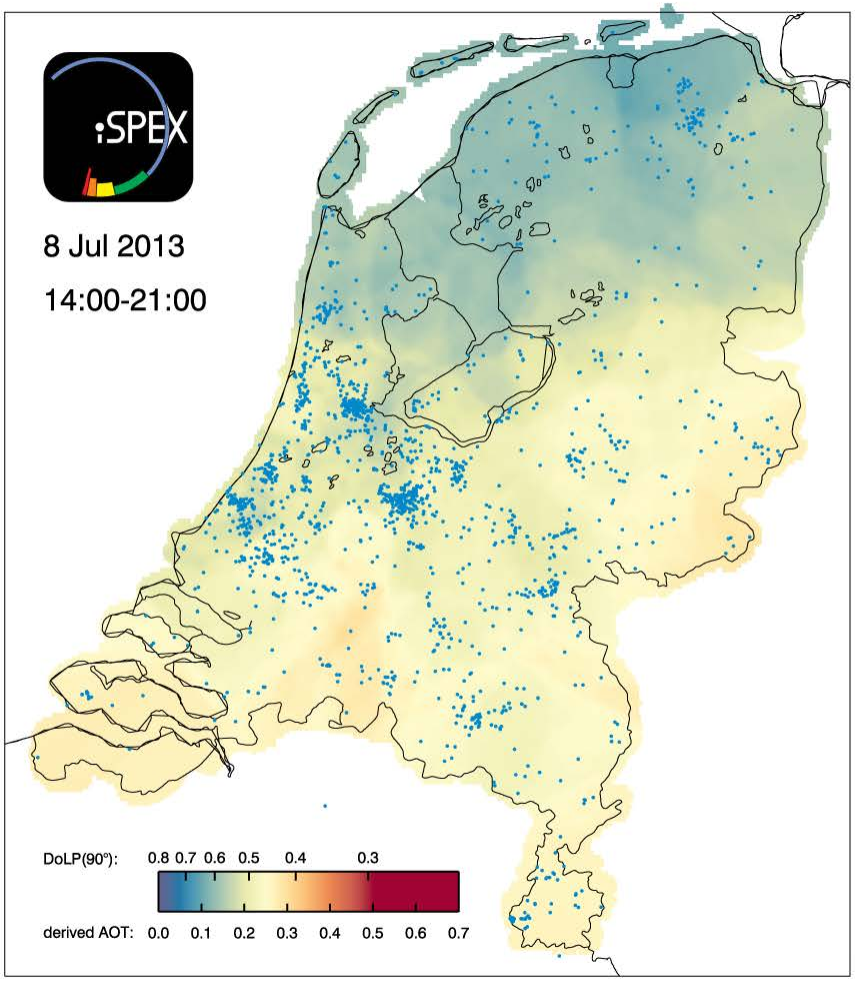
…Putting / de Volkskrant

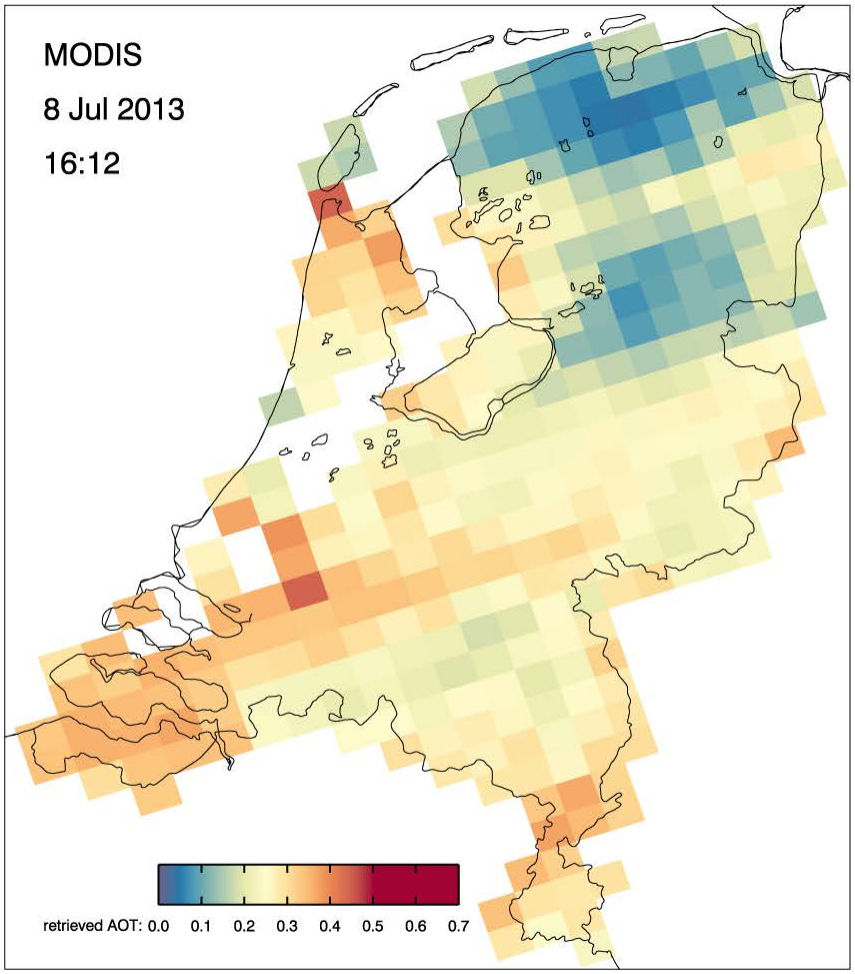
…ag voor …ex

…en Haarlem …server traag


>200,000 photos!

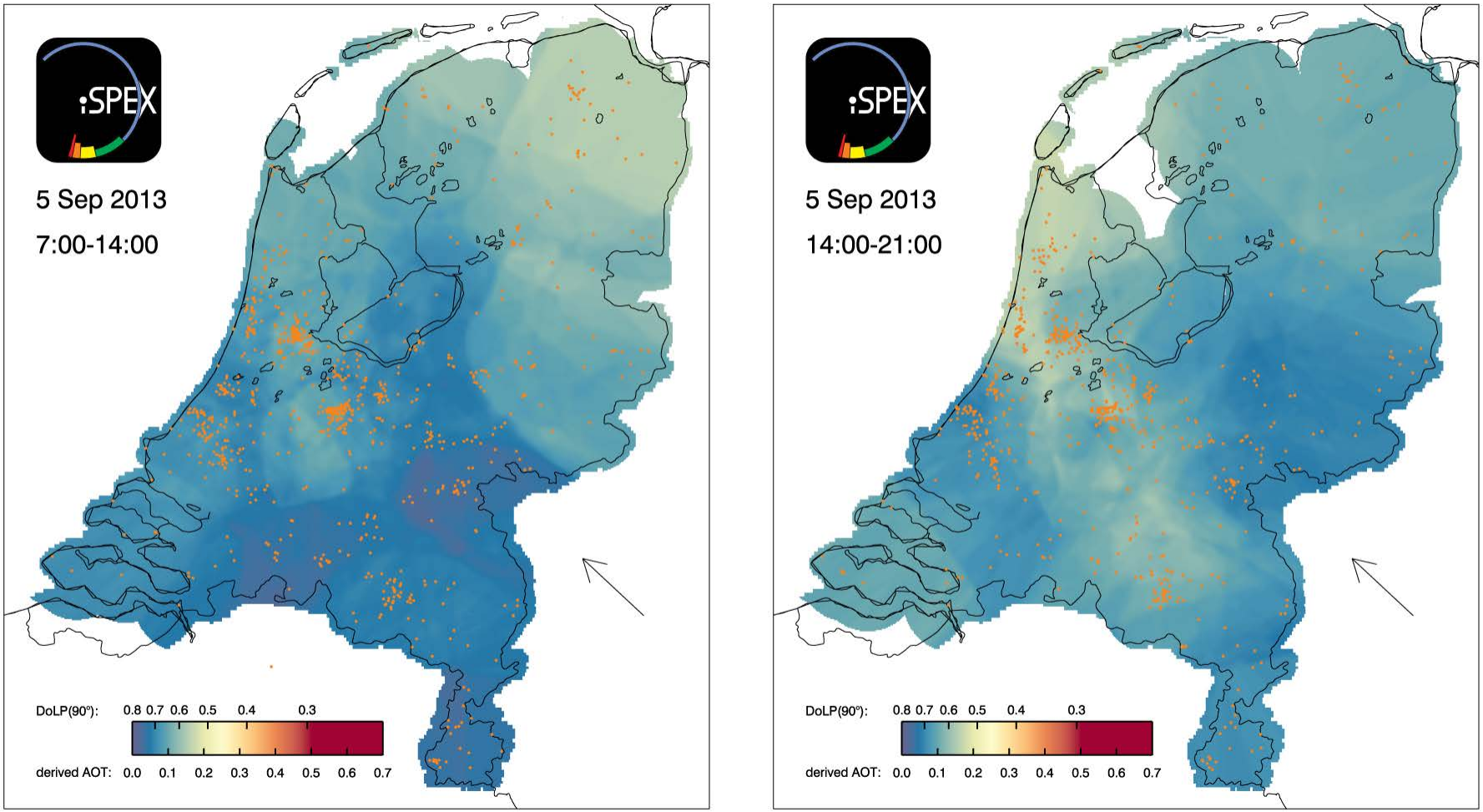
Snik et al. (2014)





Snik et al. (2014)

Snik et al. (2014)

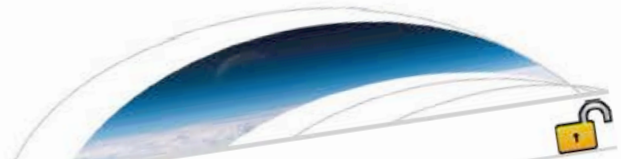


Snik et al. (2014)

AGU PUBLICATIONS

Geophysical Research Letters

RESEARCH LETTER
10.1002/2014GL061462



Mapping atmospheric aerosols with a citizen science network of smartphone spectropolarimeters

Frans Snik[1], Jeroen H. H. Rietjens[2], Arnoud Apituley[3], Hester Volten[4], Bas Mijling[3], Antonio Di Noia[2], Stephanie Heikamp[1], Ritse C. Heinsbroek[1], Otto P. Hasekamp[2], J. Martijn Smit[2], Jan Vonk[4], Daphne M. Stam[5], Gerard van Harten[1], Jozua de Boer[1], Christoph U. Keller[1], and 3187 iSPEX citizen scientists[6]

[1]Leiden Observatory, Leiden University, Leiden, Netherlands, [2]SRON Netherlands Institute for Space Research, Utrecht, Netherlands, [3]KNMI Royal Netherlands Meteorological Institute, De Bilt, Netherlands, [4]National Institute for Public Health and the Environment, Bilthoven, Netherlands, [5]Faculty of Aerospace Engineering, Delft University of Technology, Delft, Netherlands, [6]www.ispex.nl/participants

Key Points:
- The iSPEX add-on turns smartphones into aerosol measurement devices
- Thousands of iSPEX measurements across the Netherlands form AOT maps
- The iSPEX AOT data match MODIS and AERONET data and have 2 km resolution

Supporting Information:
- Readme
- Supporting Text and Figures S1–S6

Correspondence to:
F. Snik,
snik@strw.leidenuniv.nl

Citation:
Snik, F., et al. (2014), Mapping atmospheric aerosols with a citizen science network of smartphone spectropolarimeters, *Geophys. Res. Lett.*, *41*, doi:10.1002/2014GL061462.

Received 7 AUG 2014
Accepted 8 OCT 2014

Abstract To assess the impact of atmospheric aerosols on health, climate, and air traffic, aerosol properties must be measured with fine spatial and temporal sampling. This can be achieved by actively involving citizens and the technology they own to form an atmospheric measurement network. We establish this new measurement strategy by developing and deploying iSPEX, a low-cost, mass-producible optical add-on for smartphones with a corresponding app. The aerosol optical thickness (AOT) maps derived from iSPEX spectropolarimetric measurements of the daytime cloud-free sky by thousands of citizen scientists throughout the Netherlands are in good agreement with the spatial AOT structure derived from satellite imagery and temporal AOT variations derived from ground-based precision photometry. These maps show structures at scales of kilometers that are typical for urban air pollution, indicating the potential of iSPEX to provide information about aerosol properties at locations and at times that are not covered by current monitoring efforts.

1. Introduction

lives in many ways. They reduce our life expectancy by causing and
2014; *Krall et al.*, 2013; *Chen et al.*, 2013;
Climate Change, 2013; *Rosenfeld*
traffic in the

ISPEX PROJECT

Researchers measure atmospheric aerosols with iSPEX optical devices and smartphones.

TECHNOLOGY

Smartphone science

Researchers are learning how to convert devices into global laboratories.

BY JON CARTWRIGHT

A decade ago, Dutch astronomer Frans Snik invented a simple optical device to measure the density of dust, soot and other particles, or aerosols, in the atmosphere that affect human health and the climate. He hoped to launch it into orbit around Earth aboard a satellite. But one afternoon in 2011, Snik held up a demonstration version of his device to an iPhone camera. The smartphone's screen displayed a rainbow of colours: Snik's optical device was converting incoming light into a spectrum that contained polarization information and channelling it into the camera. Snik realized that he could pair smartphones with the optical device and make the same kind of measurements that he and his colleagues planned to record from space.

An idea was born. "We thought, why not make use of a technology that millions of people carry around in their pockets anyway?"

By 2013, Snik and his colleagues at Leiden University in the Netherlands had given or sold a version of the optical device — called iSPEX — to more than 8,000 willing iPhone users across the country. The users followed instructions provided by an associated app to attach the optical devices to their iPhone cameras and photographed the sky in their local areas. Within a day, reams of crowdsourced spectra had stacked up in an online database, ready for analysis. It resulted in a Netherlands-wide map of atmospheric particles with unprecedented resolution (F. Snik *et al. Geophys. Res. Lett.* **41**, 7351–7358; 2014) — several years before the proposed satellite launch and for a fraction of the original estimated cost. The team has since received funding from the European Union to repeat the project in 11 European cities.

CITIZEN SCIENCE

Many researchers are finding ways to exploit smartphones. Snik's project, and those of some geophysicists, astronomers and other scientists who need huge data sets, go one step further. They recruit citizen scientists who use their own smartphones to collect data that would be difficult — if not impossible — to obtain in conventional ways. The various internal sensors that smartphones carry, such as cameras, ▶

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evaluation

Table 3. Correlations between motivation versus age, attitude and expectations.

	Motivation scale				
	Contribution	Interest	Health concern	Fun	School
Age	.23***	.13***	.15***	.15***	.02
Attitude scale					
Activities	.10**	.40***	.01	.25***	.19***
Optimism	.17***	.28***	.06	.14***	−.01
Trust	.03	.10**	.02	.05	−.03
Expectations					
Good representation	.21**	.18**	.19**	.12**	.02
Not overly positive	.16*	.12**	.07*	.02	.11**
Impact on environmental policy	.26**	.10**	.21**	.11**	.00
Impact on health policy	.29**	.10**	.29**	.08**	.04

$N = 1123$; Grey = effect size $r > .25$.
*$p < .05$; **$p < .01$; ***$p < .001$.

Land-Zandstra et al. (2015)

Handelingen
Tweede Kamer der Staten-Generaal

Vergaderjaar 2013-2014
Vergaderingnummer 19
Datum vergadering 5 november 2013
Gepubliceerd op 6 februari 2014

Begroting Infrastructuur en Milieu

Aan de orde is de behandeling van:

- **het wetsvoorstel Vaststelling van de begrotingsstaten van het Ministerie van Infrastructuur en Milieu (XII) voor het jaar 2014 (33750-XII).**

Mevrouw **Van Veldhoven** (D66):

In dit debat mag het paradepaardje van de premier, de participatiesamenleving, natuurlijk niet ontbreken. D66 wil graag dat we ons voordeel doen met grassroots-initiatieven, zoals de luchtkwaliteitsmetingen van Milieudefensie en Y-specks, misschien door met hen een goedgekeurde methode te ontwikkelen. Kunnen de bewindslieden zeggen hoe zij dit zouden willen aanpakken?

13
Begroting Infrastructuur en Milieu (XII)

Aan de orde is de voortzetting van de behandeling van:

- **het wetsvoorstel Vaststelling van de begrotingsstaten van het Ministerie van Infrastructuur en Milieu (XII) voor het jaar 2014 (33750-XII).**

Staatssecretaris **Mansveld**:

Ik ben ook blij met een initiatief als iSPEX. Dat is de proef die gehouden is om mensen te laten bijdragen aan het meten van de luchtkwaliteit in de eigen omgeving. Daar hebben dit jaar 8.000 mensen aan meegedaan. Dat draagt enorm bij aan de bewustwording rond het onderwerp. Mevrouw van Veldhoven gaf al aan hoe belangrijk die burgerinitiatieven zijn.

Handelingen
Tweede Kamer der Staten-Generaal

Vergaderjaar 2014-2015
Vergaderingnummer 16
Datum vergadering 28 oktober 2014
Gepubliceerd op 12 november 2014 12:32

13
Begroting Economische Zaken (onderdeel Landbouw en Natuur)

Aan de orde is de behandeling van:

- **het wetsvoorstel Vaststelling van de begrotingsstaten van het Ministerie van Economische Zaken (XIII) en het Diergezondheidsfonds (F) voor het jaar 2015 (34000-XIII).**

De heer **Leenders** (PvdA):

Ziet de staatssecretaris mogelijkheden om deze burgers meer te betrekken bij de handhaving? Het raakt burgers immers direct in hun gezondheid, maar bijvoorbeeld ook in hun recreatiegenot, om maar niet te spreken van ondernemers, onder meer restauranthouders, op het platteland gevestigd, die erdoor worden geraakt in hun portemonnee. Wellicht dat iSPEX hierin iets kan betekenen, een instrument waarmee burgers fijnstof kunnen meten met hun iPhone. Gisteren hebben we daarover kunnen lezen in de Volkskrant.

Wanted! An army of citizen scientists to tackle air pollution

A Europe-wide project asks iPhone users to help monitor levels of pollution in major cities

is

ust 2015 07.00 BST

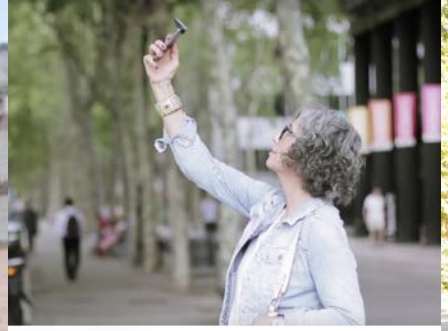
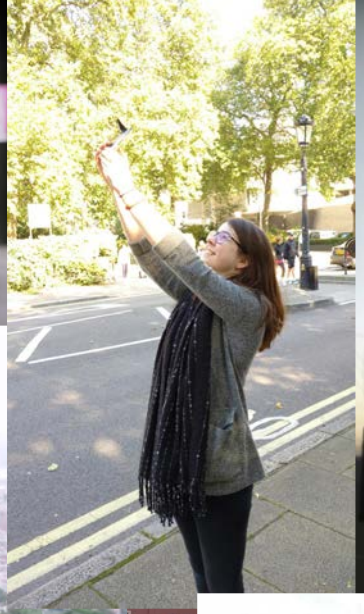
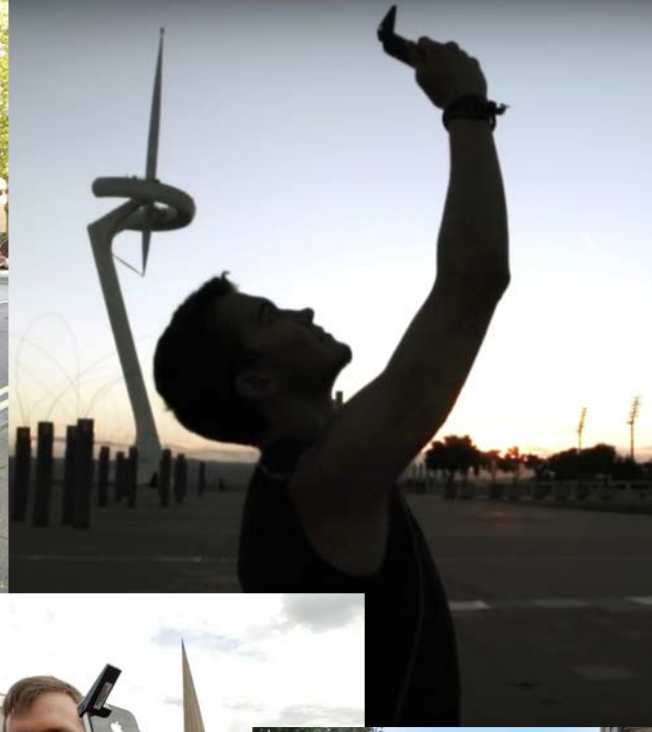
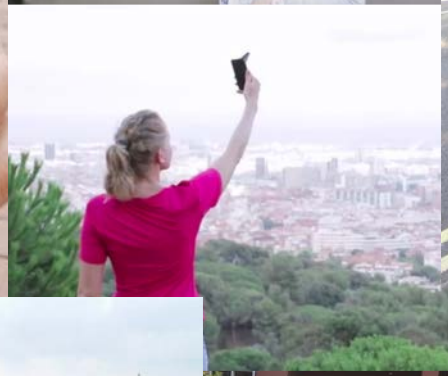
Comments
3

r later

A man jogs on Parliament Hill on Hampstead Heath, London, as smog can be seen in the distance Photograph: Matt Dunham/AP

Advertisement

Turn off Tinder and exit Instagram – scientists want you to turn your iPhones to research. Launching on Tuesday, the iSpex-EU project aims to recruit people from major cities across Europe, including Manchester and

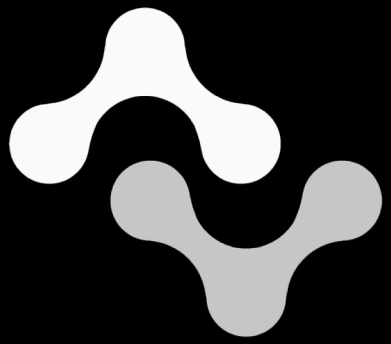





DEVONSHIRE
STREET W1
CITY OF WESTMINSTER

MONOCLE

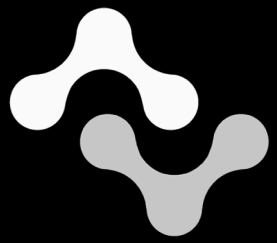
- iSPEX 2.0 generic add-on & app for most modern smartphones
- general camera calibration procedures
- extended air pollution measurement principle
- water colour measurements
- water transmission spectroscopy

H2020 776480



citizen science lab

- Connects scientists (“top-down”) and other citizens (“bottom-up”) through co-creation.
- Links all the sciences (SSH + natural/medical; α+β+γ+m).
- Germinates and incubates new citizen science projects that
  - address an urgent scientific and potentially societal issue,
  - through active contributions by thousands of participants.
- Supports with expertise and funding to first pilot/prototyping stage, with goal to become a sustainable project delivering new scientific/societal results.



citizen science lab

2018

Lorentz center

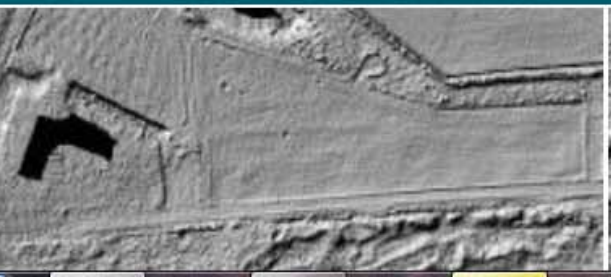
- Air pollution (with Waag)
- Evolution of language
- Archaeology

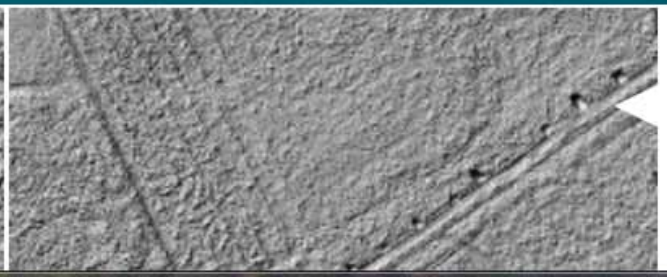
Meer weten over het project? Luister woensdag 11 september naar EenVandaag op NPO1 en donderdag op televisie (18:15 NPO1) Kijk hier/ 11 and 12 September

Speur mee en ontdek nieuw archeologisch erfgoed!

Lees meer

Beginnen





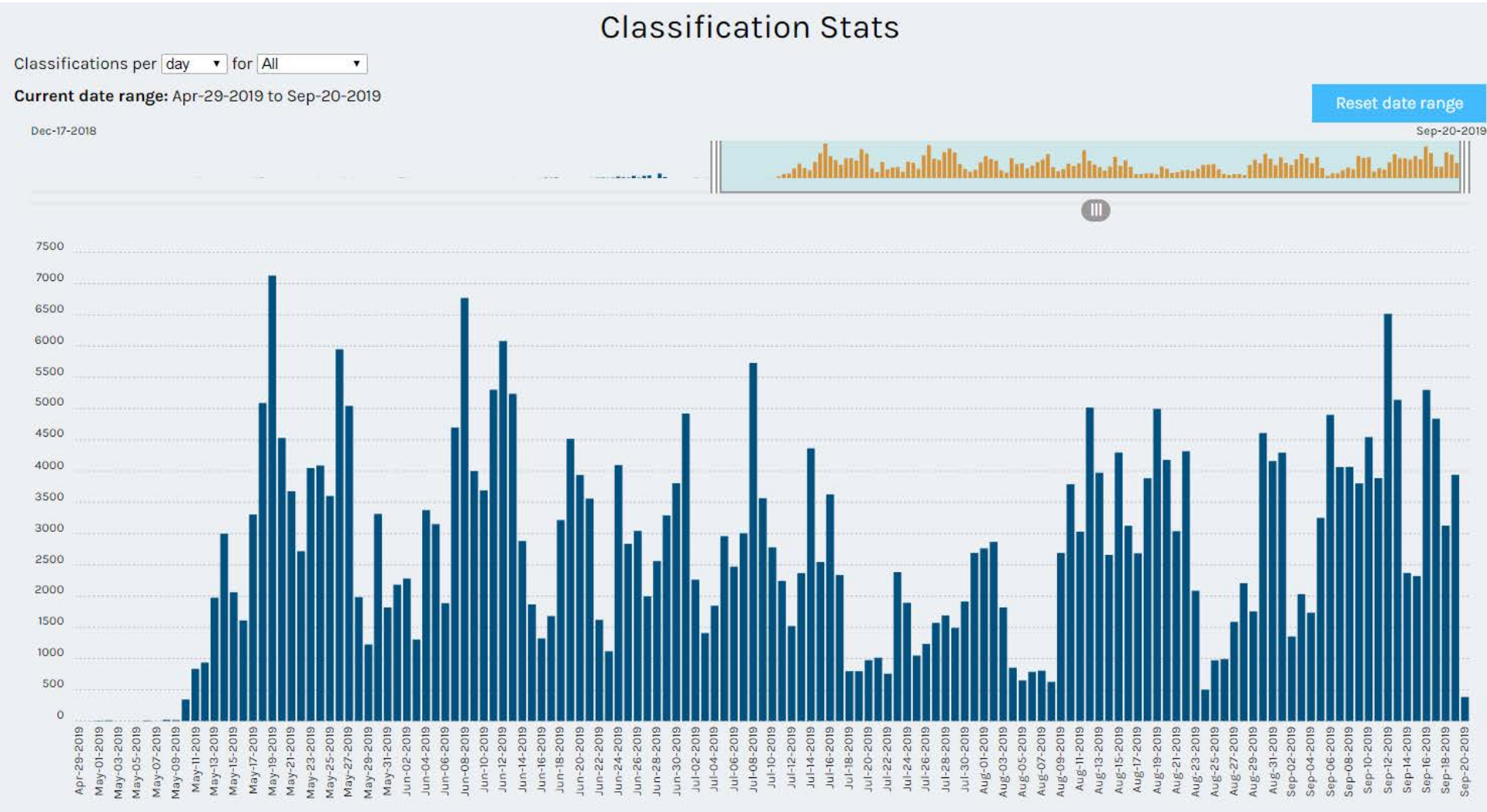
~2000 users (1000 registered)

327’202 classifications

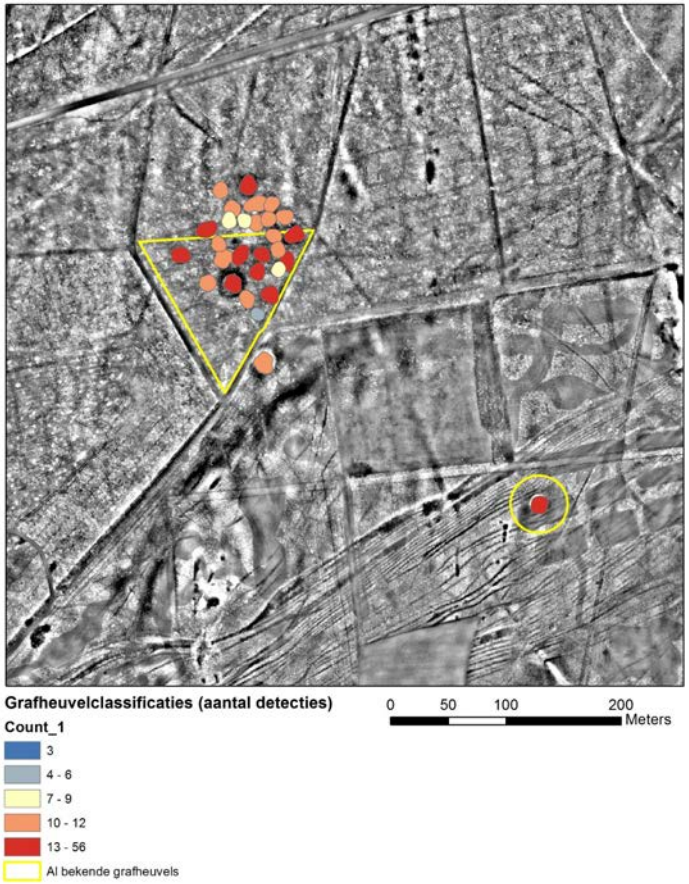
23’489 images studied

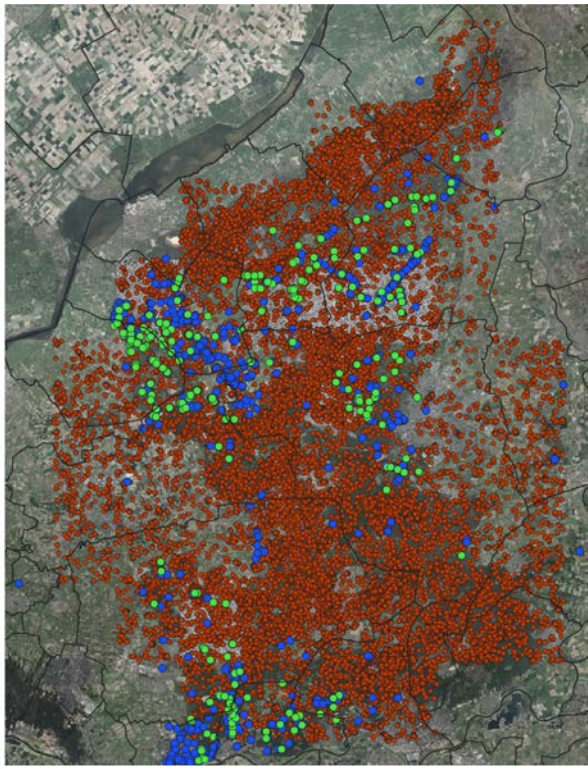
6000+ messages on the forum

2000 km^2 studied in 3 months



1000-2000 new burial site detections!





courtesy: Quentin Bourgeois

citizen science lab

2019

Universiteit Leiden

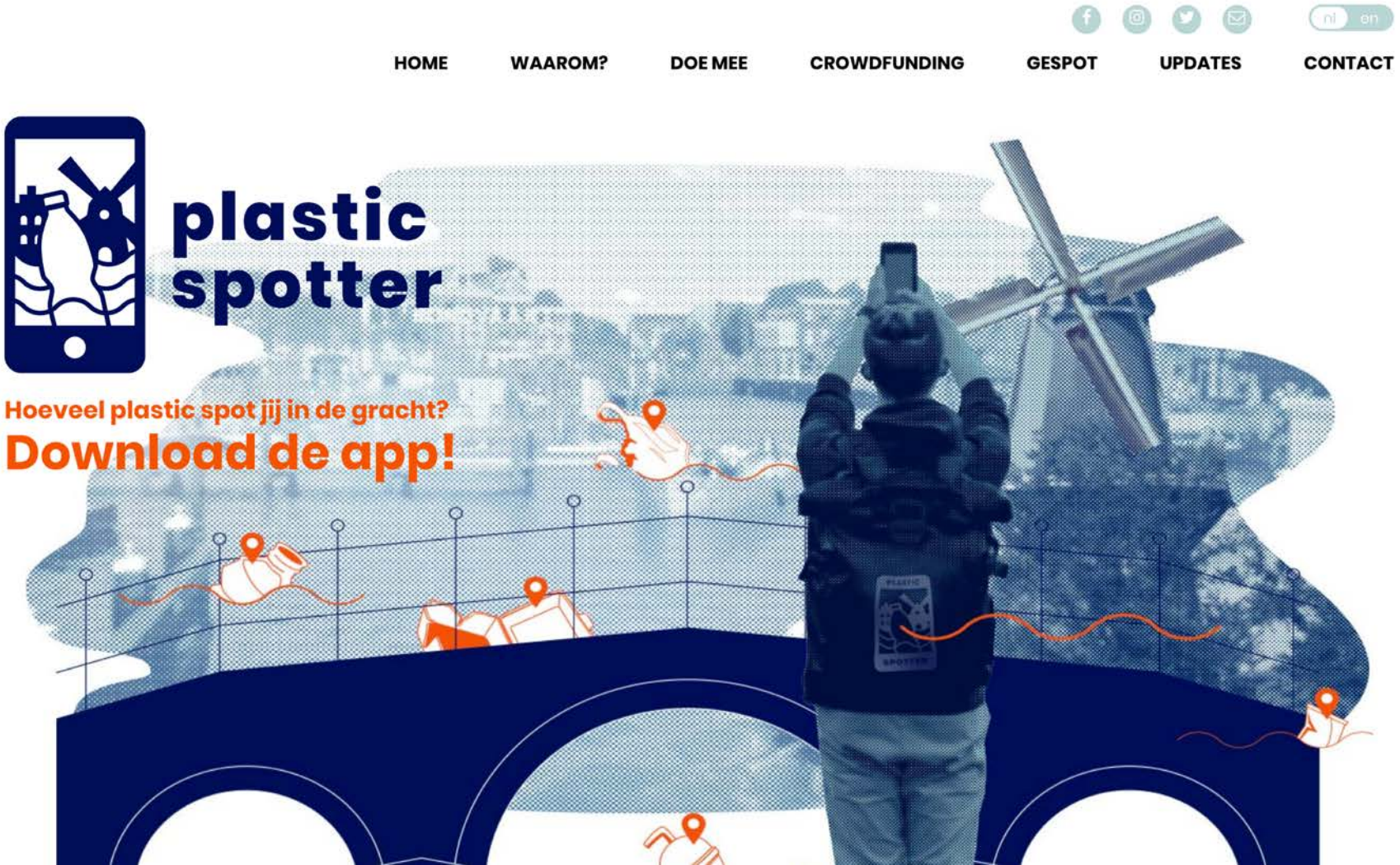
444

LEIDEN stadvanontdekkingen

- Plastic Spotter
- Psychology lab on wheels

444e verjaardag Universiteit Leiden
444
citizen science lab
SCHELTEMA
444
Vier het mee!

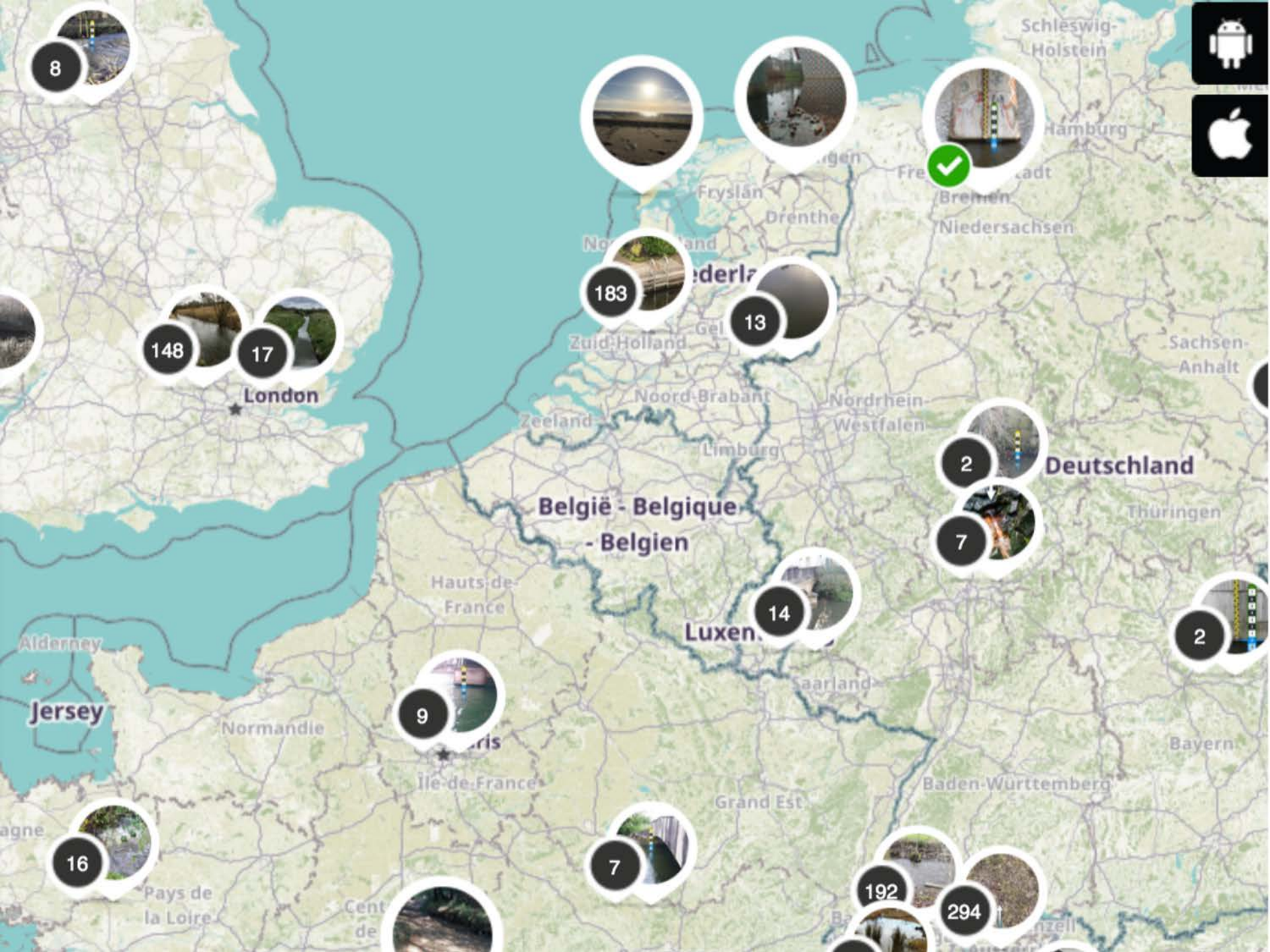
www.plasticspotter.nl



REPORTAGE PLASTIC SOEP

Plastic soep in de Leidse grachten, in kaart gebracht met een app

Plastic afval wordt gelokaliseerd, weggehaald en in de app gezet. Beeld Raymond Rutting


8
183
13
148
17
London
2
Deutschland
België - Belgique
- Belgien
7
14
Luxen.
2
9
Jersey
16
7
192
294

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ambitions

- 2020: 2 local (444) projects
  NL hub for EU-cit.sci, COST CA15212
- 2021: 2 national pilot projects (SDGs + med.)
- 2022 Leiden European City of Science:
  3 large local projects + NL/EU projects
- 2023 fully operational “center” for Leiden, NL, Europe

national developments

(lots of acronyms)

- DORA / recognition & reward systems
- CS in strategy of NWO/ZonMW
- opportunities within NWA
- NPOS (VSNU+KNAW) working group on CS vision for NL
- establishing national network
  - collecting expertise / connections
  - community building
  - quality/impact measurement standards
  - lobbying; PR / marketing
  - innovation / meta research

citizen science lab

some lessons learnt

- CS is not cheap and not easy!
- Fully involve participants / stakeholders as early in the process as possible.
- Community “manager” / champions are essential.
- Find synthesis between scientific questions and questions from participants.
- Technology itself is never the driving force, and can exacerbate non-inclusion.
- Provide rapid / meaningful feedback and “rewards” (no gamification!)
- The largest challenge is continuity (motivation / funding).
- The other largest challenge is inclusivity.
- Lots of room / necessity for experimentation and innovation.