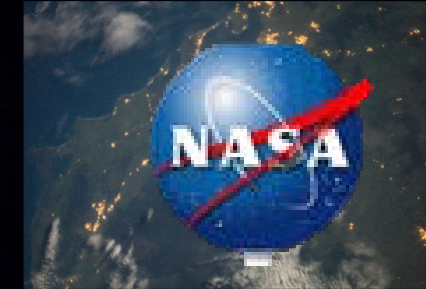




# Cities at Night

A. Sánchez de Miguel, J. Gómez Castaño,  
D. Lombrana, M. Aubé, A. Domínguez, B. Fernández,  
JR. Solera, M. Vela,  
J. Zamorano, J. Gallego, CC.M Kyba  
and ... 18.175 volunteers  
Universidad Complutense de Madrid  
Cepeg Sherbrooke



EOSCIENCE 2015 13 october 2015

There are a ESA mission that maybe you don't know.

Is a mission that has not competition on it's window of observation.

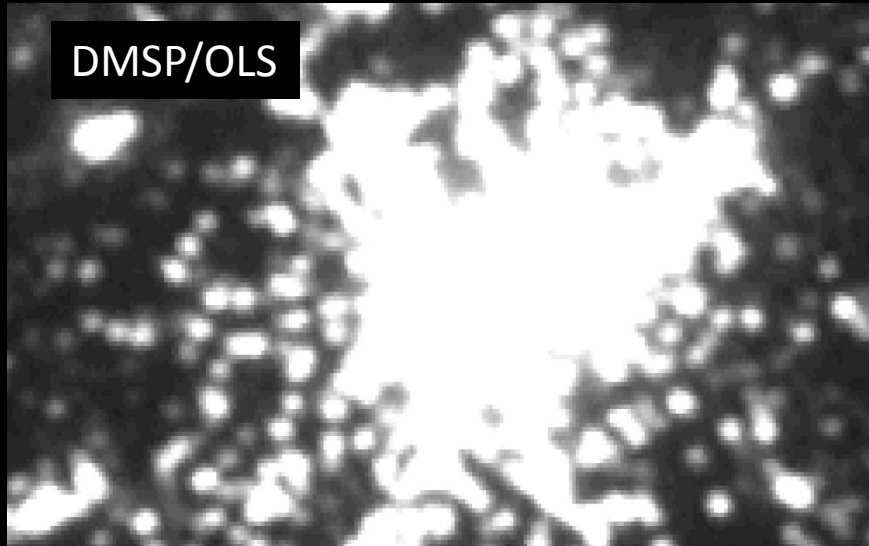
But ... It don't have and Data processing Unit, It don't have a mission plan, and it don't have a budget for scientific exploitation or and open ESA archive...

No Ground segment\*

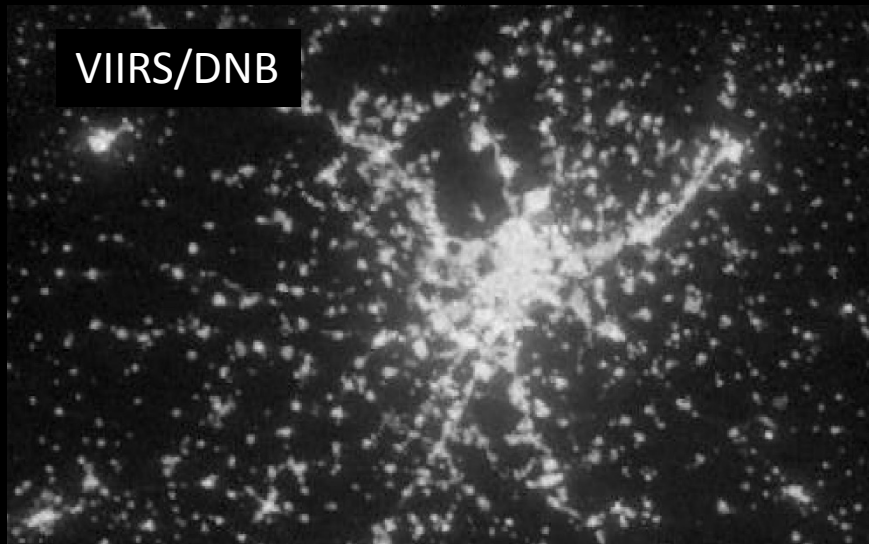
No calibration

No end user interface\*

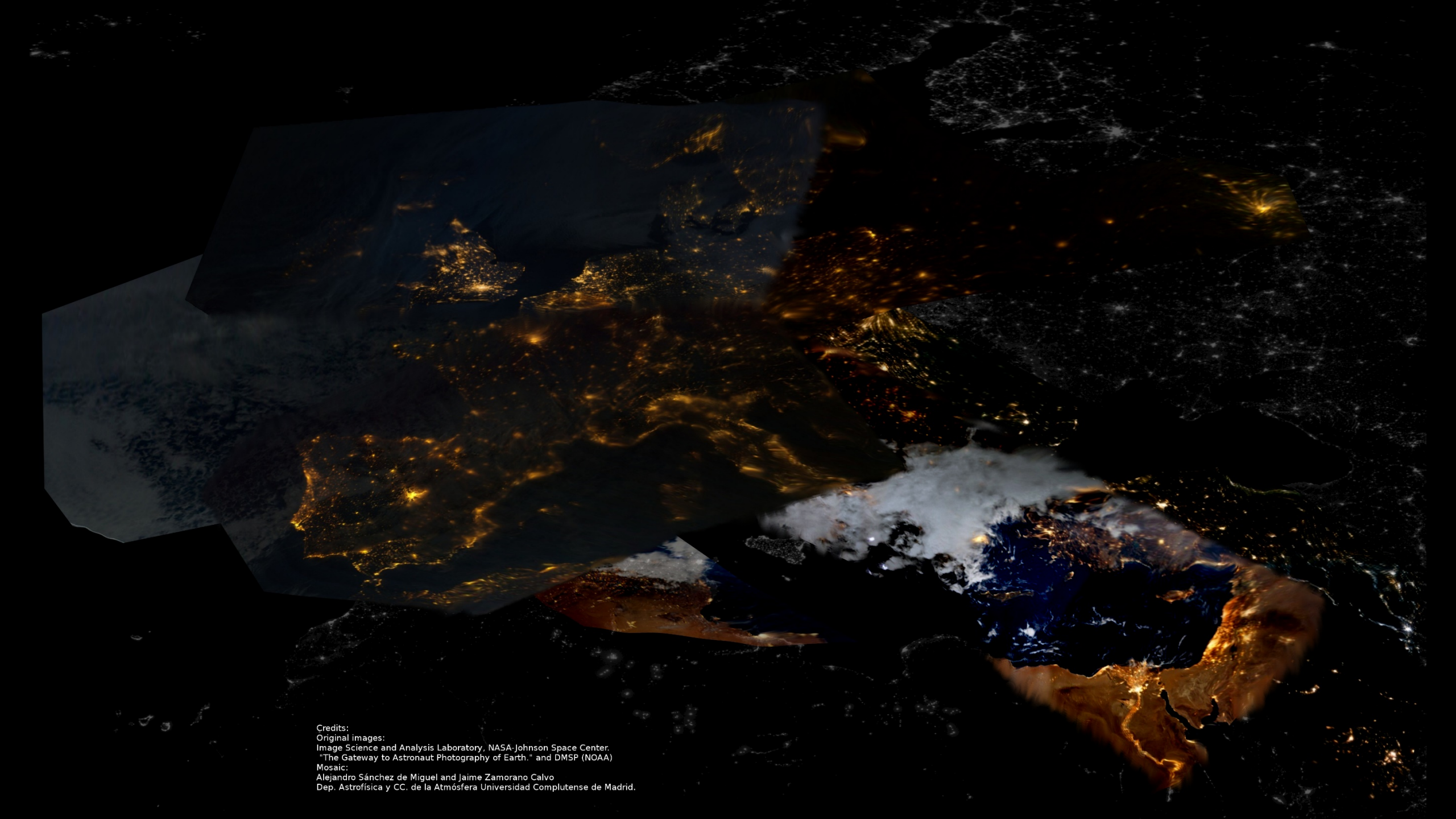
# Night time images



Madrid from the space at Night



Satellite/Camera	DMSP/OLS	VIIRS/DNB	ISS/D3S/RGB
Principal Use	Meteorological	Earth observation	Outreach
Range of data	1992-2012	2012-2014	2003-2015
Calibration	A posteriori	On the Lab	My thesis
Bands	(1) 0.5 -0.9 $\mu\text{m}$	(1) 0.5 -0.9 $\mu\text{m}$	(3) 0.40-0.65 $\mu\text{m}$
Flybys	Sunset	Midnight	Any
Resolution	5 km	742 m	1.5-740 m
Sensibility	$\sim 0.5 \text{ nW/cm}^2/\text{sr}$	$\sim 0.02 \text{ nW/cm}^2/\text{sr}$	$\sim 0.08 \text{ nW/cm}^2/\text{sr}$
Errors	No estimated	Estimated 15%	Estimated > 15%



Credits:  
Original images:  
Image Science and Analysis Laboratory, NASA-Johnson Space Center,  
"The Gateway to Astronaut Photography of Earth." and DMSP (NOAA)  
Mosaic:  
Alejandro Sánchez de Miguel and Jaime Zamorano Calvo  
Dep. Astrofísica y CC. de la Atmósfera Universidad Complutense de Madrid.

Milan 2012

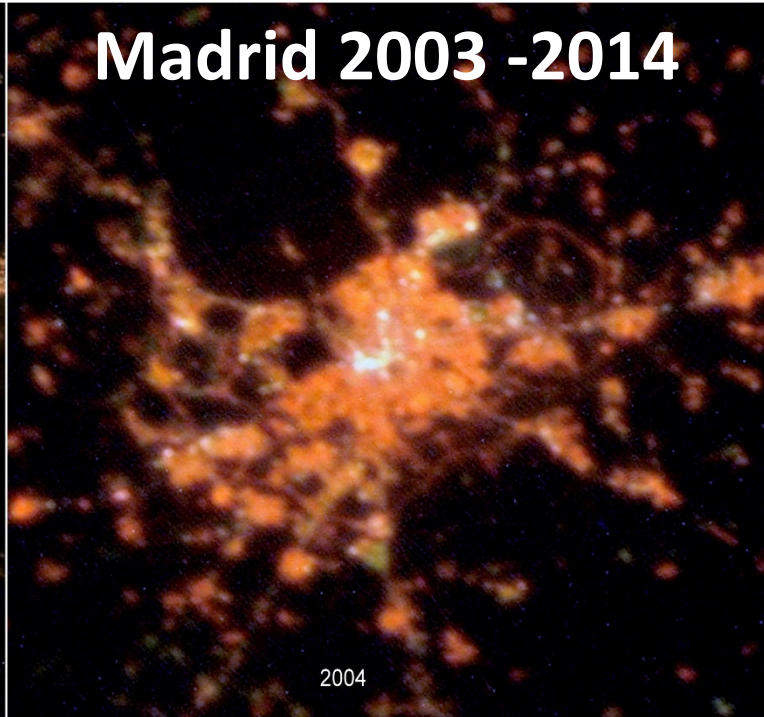


Milan 2015

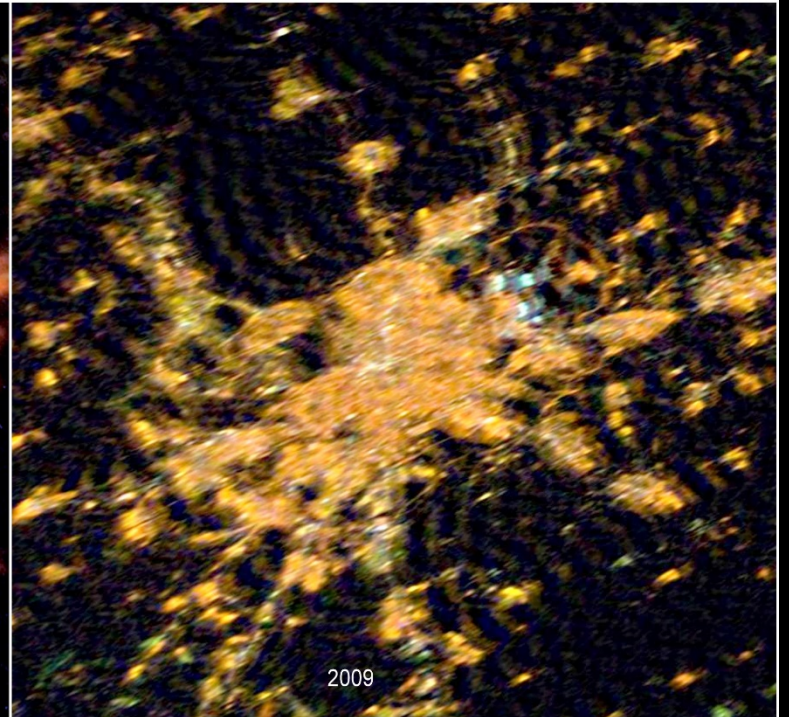
# Madrid 2003 - 2014



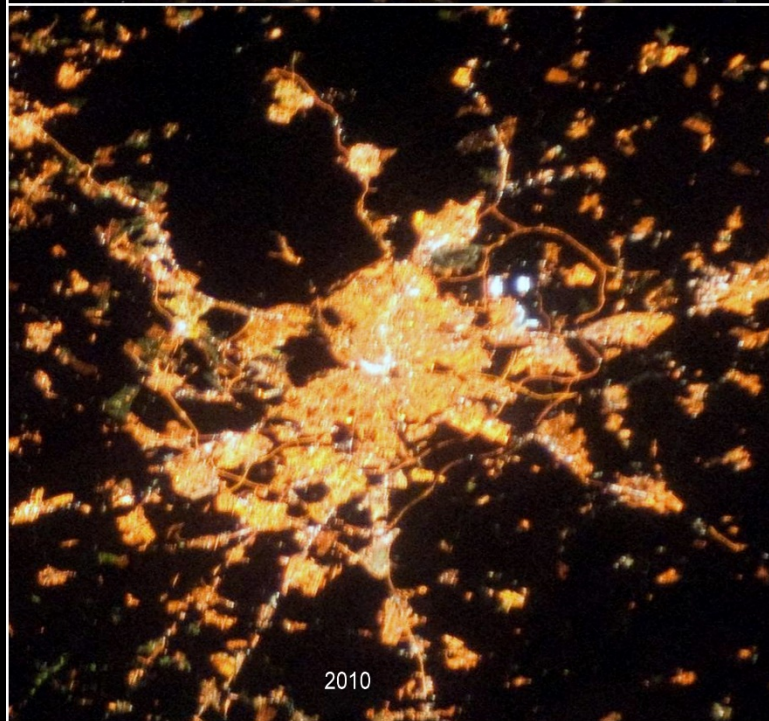
2003



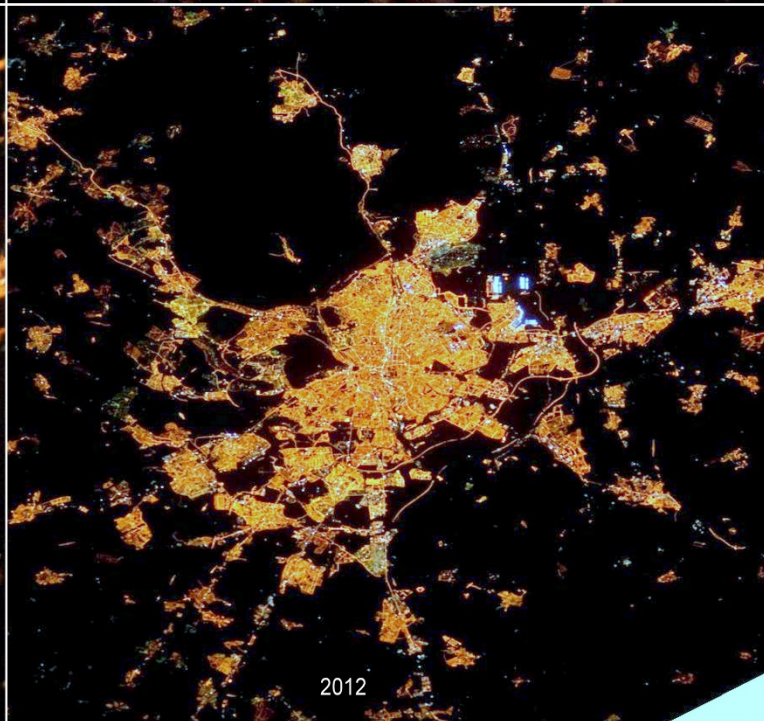
2004



2009



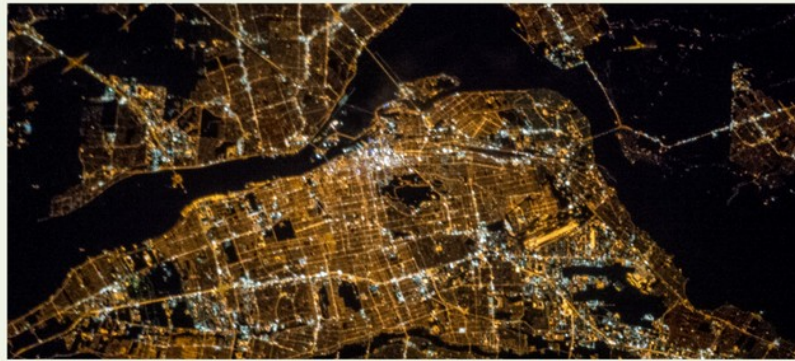
2010



2012

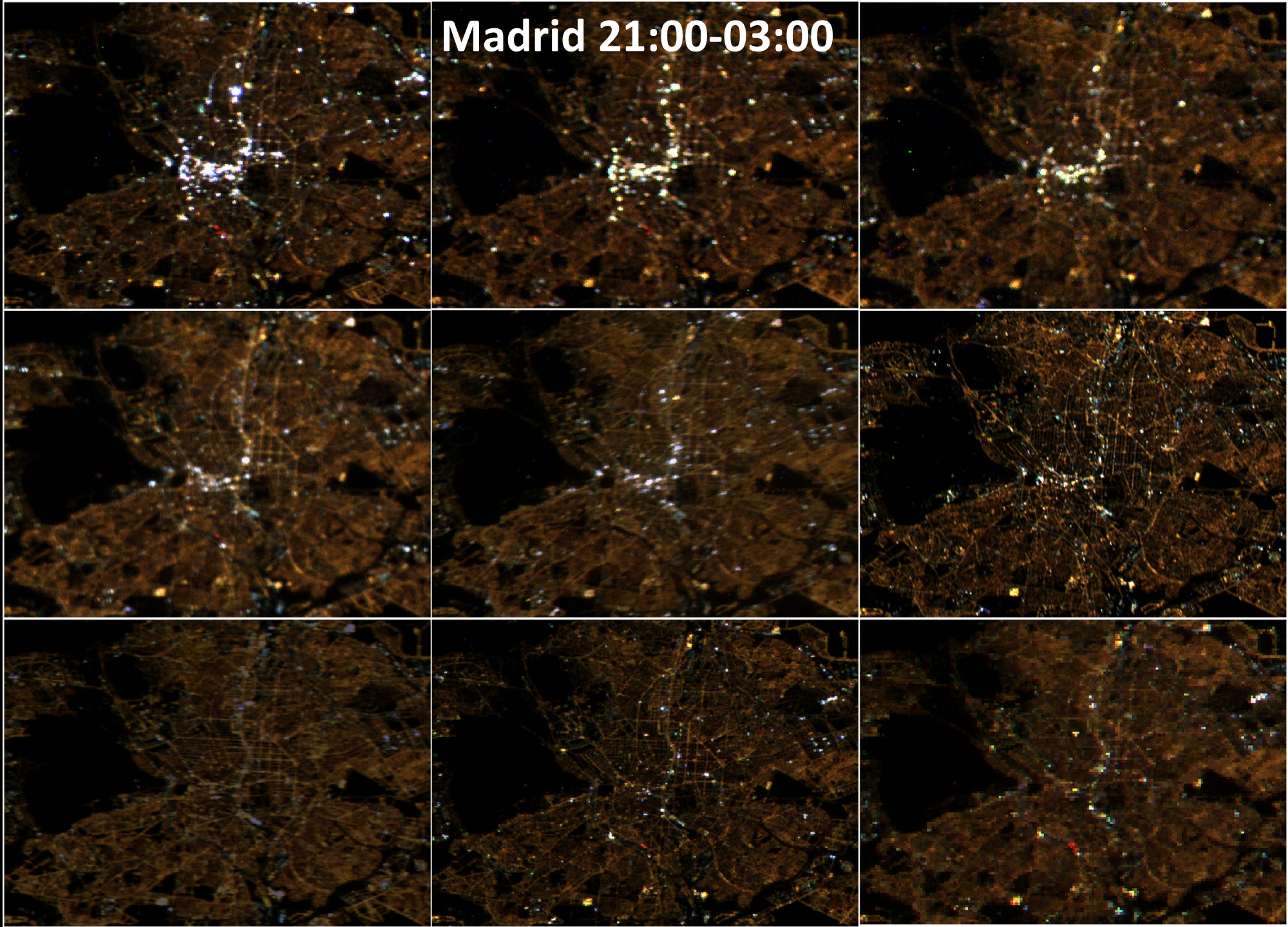


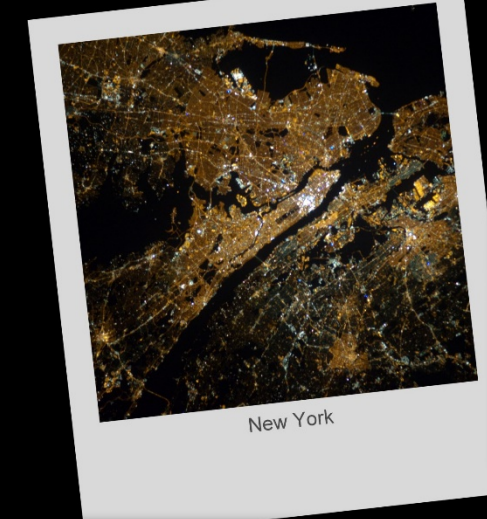
2014



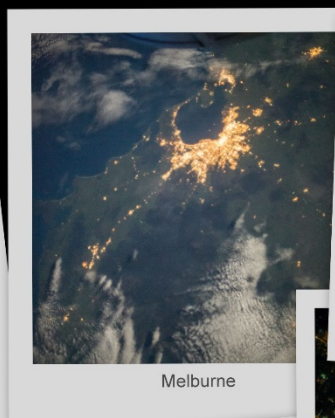


Madrid 21:00-03:00

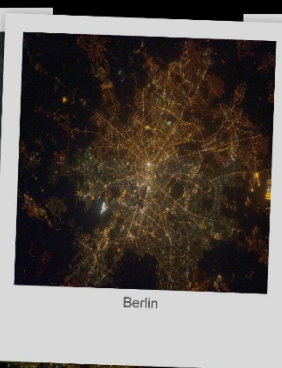




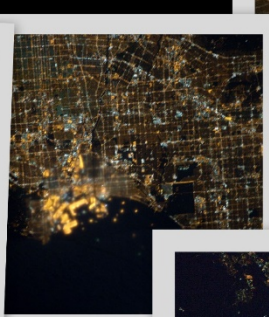
New York



Melburne



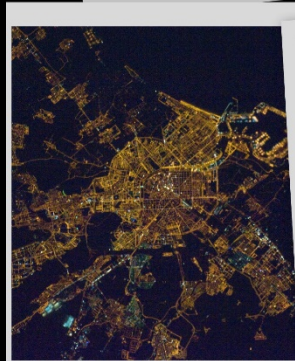
Berlin



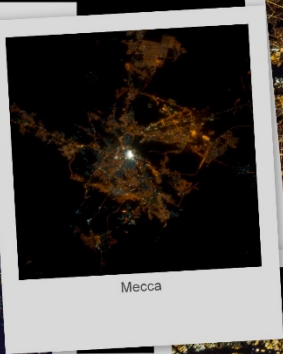
Los Annel



New Delhi



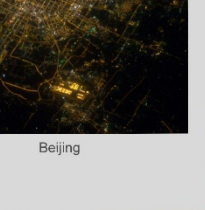
Valencia



Mecca



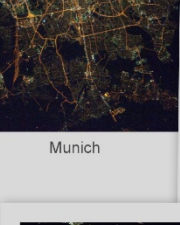
London



Beijing



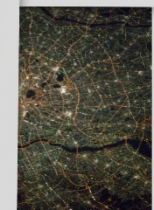
Chica



Munich



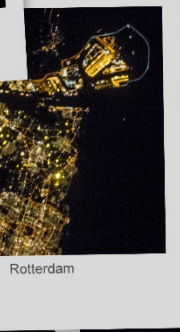
Tokyo



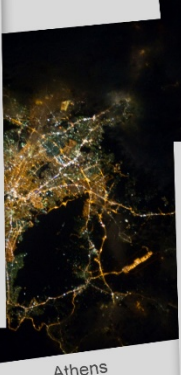
San Francisco



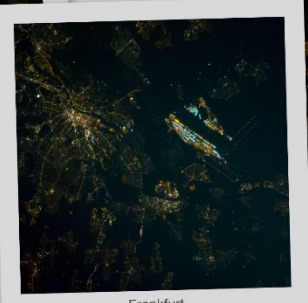
Moscow



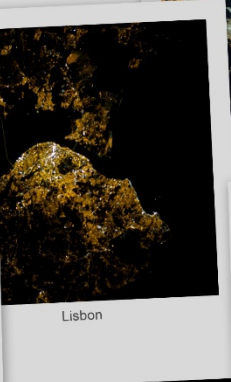
Rotterdam



Athens



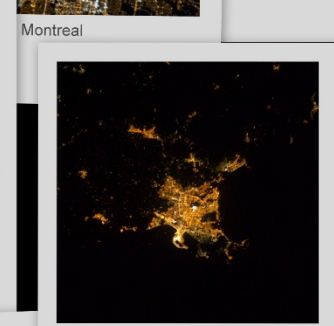
Frankfurt



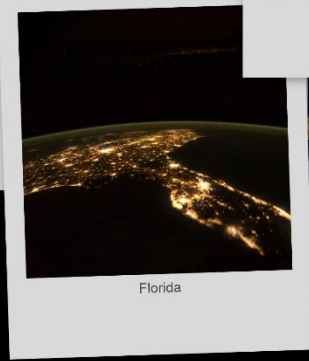
Lisbon



Mexico DF



Cabe Town



Florida



Rio de Janeiro

Berlin



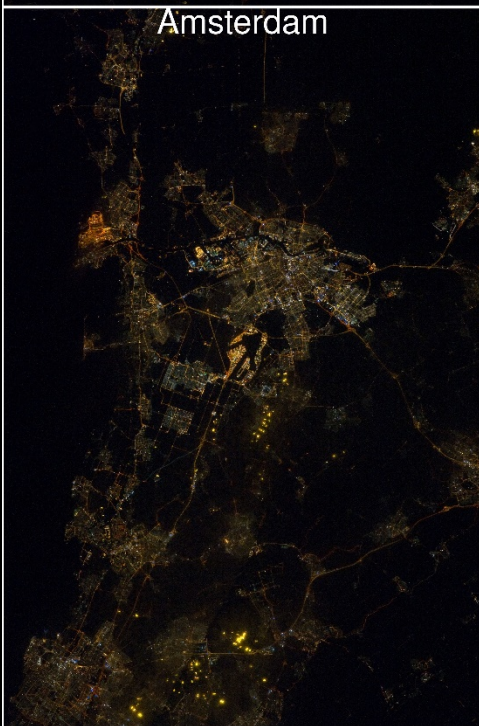
Warsaw



London



Amsterdam



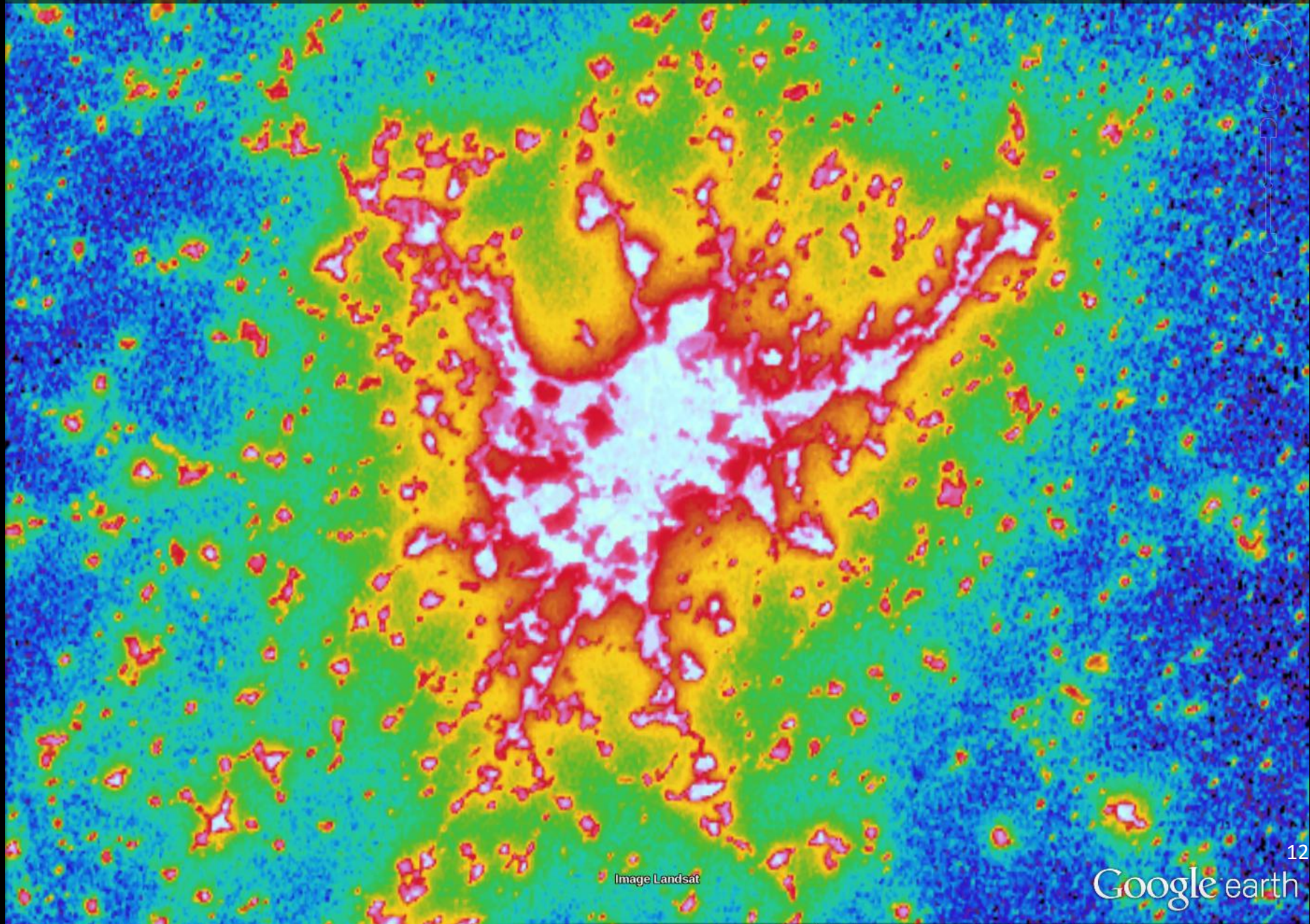
Paris



Madrid



# Sky brightness

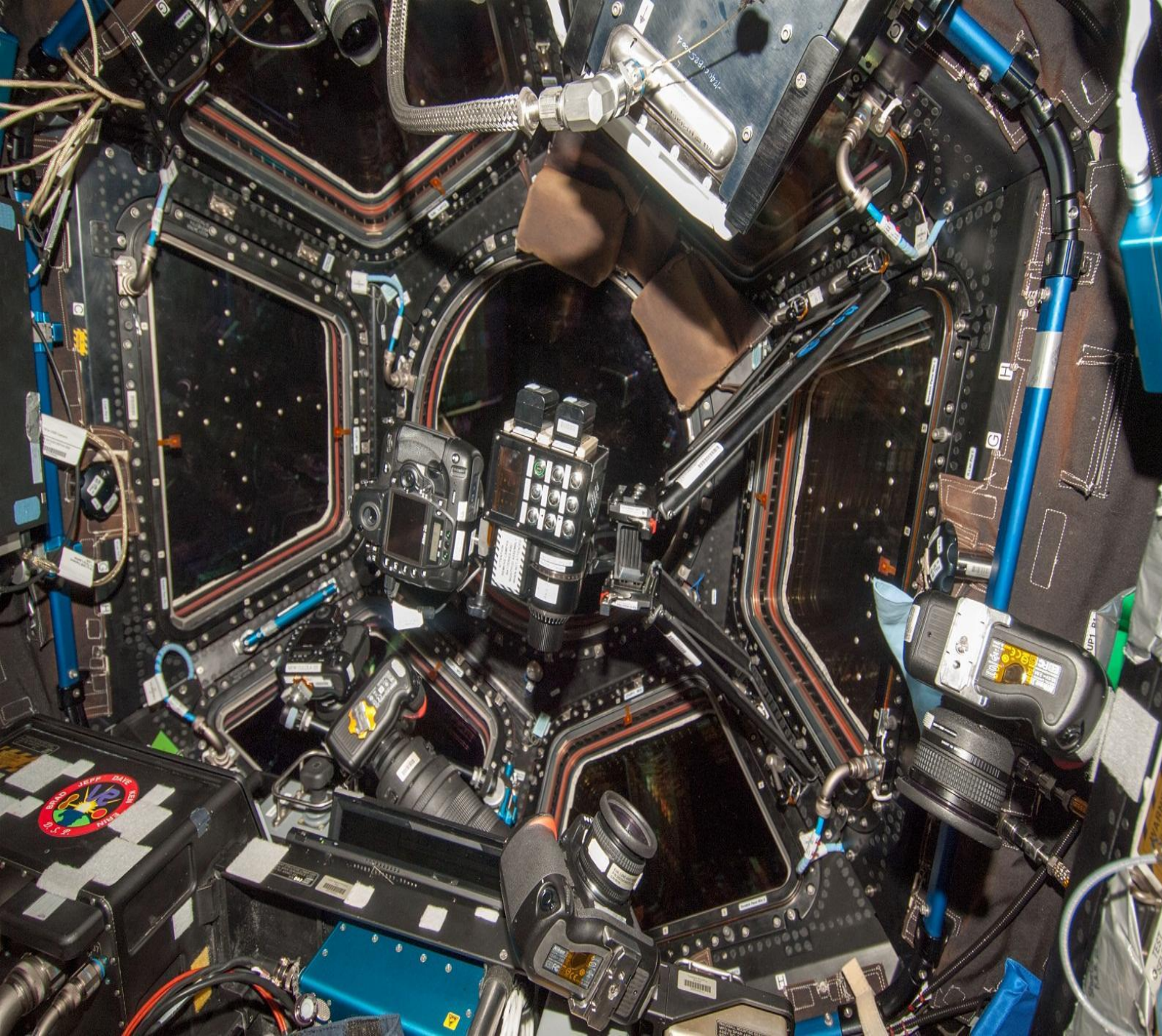




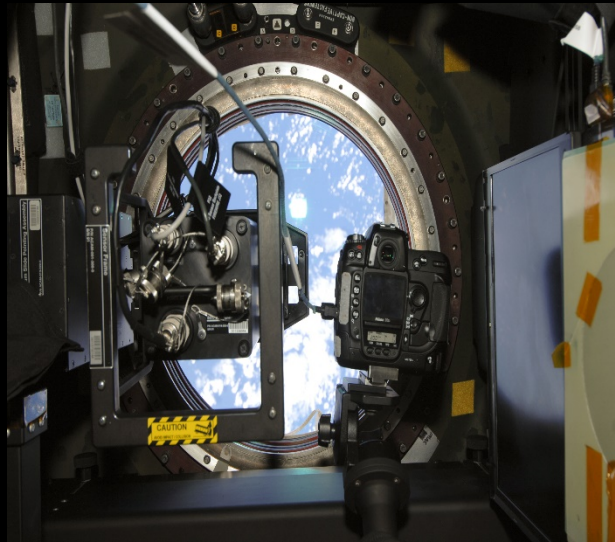
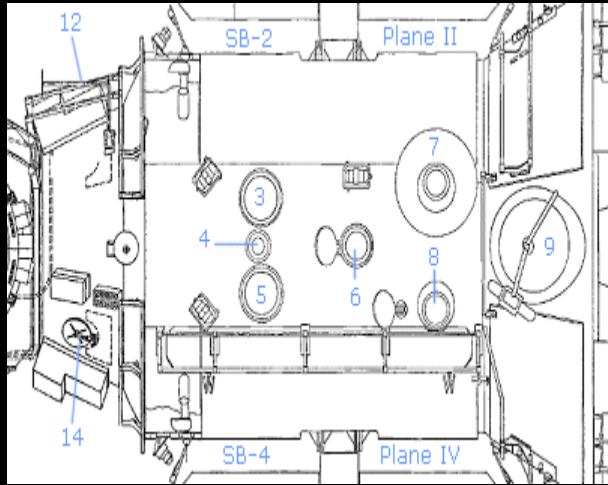
# Acknowledgments

- Thanks to the Astronauts of NASA, ESA, CSA-ASC, ROSCOSMOS and JAXA That takes the pictures.





# ESA Nightpod





# Acknowledgments

- Daniel Lombraña and Alejandro Dominguez for their support and help with everything.
- To Peter Caltner, our mentor.
- To Jaime Zamorano and Jesús Gallego, my Phd. Advisors.
- CCM Kyba for his impulse to go to the **Citizen Cyberscience Summit**.
- To Pablo Ripolles, Beatriz Fernandez, Juan Rodrigo Solera Sánchez-Seco y Marta Vela Ibañez (our MediaLab natives).
- To José Gómez Castaño, main developer of Lost at Night and Night Cities apps.
- Thanks also to NASA, ESA, and CSA-ASC staff that had help us so much.
- To all our translators.
- To all the Thousands of volunteers.
- To the MediaLab, GUAIX-UCM team, LoNNe Network, REECL, ....
- And finally....

# Speacial thanks to ESA staff:

- [Rosita Suenson](#) (ESA Human Spaceflight and Operations Communication Officer) ESA HQ (ESTEC)

[Massimo Sabbatini](#), (Nightpod responsible - ESA ERB-2 coordinator)  
ESA HQ (ESTEC)

[Erica Rolfe](#), (ESA Portal chief online publisher) ESA - Italia

# What is Cities at Night?



- Cities at Night is a citizen science project to catalog, locate and georeference the archive of the Images of the ISS.
- Our main web page is [www.citiesatnight.org](http://www.citiesatnight.org)

# Why we need to catalog the images of ISS?

- First, NASA, ESA, CSA ... don't know where the images have been taken.
- They have a small team to catalog them.
- They had classified 15.000 images of 300.000 on 15 years.
- The volunteers had classify 130.000 images in one month.



# Why we need to catalog the images of ISS?

- They are the best images actually at night.
- They have colors.
- We have images at any time.



# Help to save energy



Less Light the houses and the Sky

More light on the Street

# Cancer Research: Breast and Prostate

*Chronobiology International*, 25(1): 65–81, (2008)  
Copyright © Informa Healthcare  
ISSN 0742-0528 print/1525-6073 online  
DOI: 10.1080/07420520801921572

informa  
healthcare

## LIGHT AT NIGHT CO-DISTRIBUTES WITH INCIDENT BREAST BUT NOT LUNG CANCER IN THE FEMALE POPULATION OF ISRAEL

Itai Kloog,<sup>1</sup> Abraham Haim,<sup>2</sup> Richard G. Stevens,<sup>3</sup> Micha Barchana,<sup>4,5</sup> and Boris A. Portnov<sup>1</sup>

<sup>1</sup>Department of Natural Resources & Environmental Management, University of Haifa, Haifa, Israel

<sup>2</sup>Department of Biology, University of Haifa-Oranim, K

<sup>3</sup>University of Connecticut Health Center, Farmington,

<sup>4</sup>School of Public Health, University of Haifa, Haifa

<sup>5</sup>Israel National Cancer Registry, Ministry of Health, J

Recent studies of shift-working women have reported that light at night (LAN) may be a risk factor for breast cancer. However, we have not attempted to examine the co-distribution

*Chronobiology International*, 26(1): 108–125, (2009)  
Copyright © Informa Healthcare USA, Inc.  
ISSN 0742-0528 print/1525-6073 online  
DOI: 10.1080/07420520802694020

## GLOBAL CO-DISTRIBUTION OF LIGHT AT NIGHT (LAN) AND CANCERS OF PROSTATE, COLON, AND LUNG IN MEN

Itai Kloog,<sup>1</sup> Abraham Haim,<sup>2</sup> Richard G. Stevens,<sup>3</sup> and Boris A. Portnov<sup>1</sup>

<sup>1</sup>Department of Natural Resources & Environmental Management, Faculty of Social Sciences, University of Haifa, Haifa, Israel

CA CANCER J CLIN 2014;64:207-218

## Breast Cancer and Circadian Disruption From Electric Lighting in the Modern World

Richard G. Stevens, PhD<sup>1\*</sup>; George C. Brainard, PhD<sup>2</sup>; David E. Blask, PhD, MD<sup>3</sup>; Steven W. Lockley, PhD<sup>4</sup>; Mario E. Motta, MD<sup>5</sup>

Breast cancer is the leading cause of cancer death among women worldwide, and there is only a limited explanation of why. Risk is highest in the most industrialized countries but also is rising rapidly in the developing world. Known risk factors account for only a portion of the incidence in the high-risk populations, and there has been considerable speculation and many false leads on other possibly major determinants of risk, such as dietary fat. A hallmark of industrialization is the increasing use of electricity to light the night, both within the home and without. It has only recently become clear that this evolutionarily new and, thereby, unnatural exposure can disrupt human circadian rhythmicity, of which three salient features are melatonin production, sleep, and the circadian clock. A convergence of research in cells, rodents, and humans suggests that the health consequences of circadian disruption may be substantial. An innovative experimental model has shown that light at night markedly increases the growth of human breast cancer xenografts in rats. In humans, the theory that light exposure at night increases breast cancer risk leads to specific predictions that are being tested epidemiologically: evidence has accumulated on risk in shift workers, risk in blind women, and the impact of sleep duration on risk. If electric light at night does explain a portion of the breast cancer burden, then there are practical interventions that can be implemented, including more selective use of light and the adoption of recent advances in lighting technology and application. *CA Cancer J Clin* 2014;64:207-218. © 2013 American Cancer Society.

**Keywords:** breast neoplasms, circadian clock, melatonin production, shift work, sleep duration

### Introduction

#### The Breast Cancer Burden

Breast cancer is the leading cause of cancer death among women worldwide.<sup>1</sup> Risk is highest in the economically developed societies and is increasing rapidly in those developing societies that historically showed low risk.<sup>2</sup> Until the 1980s, it was

# Light pollution and Air Pollution (NOX)

The image shows a screenshot of a web page from Nature Geoscience. At the top left is the 'nature geoscience' logo. To the right is a search bar with a 'Go' button and a link to 'Advanced search'. Below the logo is a navigation menu with links for Home, Current issue, Comment, Research, Archive, Authors & referees, and About the journal. A breadcrumb trail reads 'home > archive > issue > correspondence > abstract'. The main content area is titled 'ARTICLE PREVIEW' with a link to 'view full access options'. The article is categorized as 'NATURE GEOSCIENCE | CORRESPONDENCE' and has share and print icons. The title is 'City lights and urban air' by authors H. Stark, S. S. Brown, K. W. Wong, J. Stutz, C. D. Elvidge, I. B. Pollack, T. B. Ryerson, W. P. Dube, N. L. Wagner & D. D. Parrish. It includes links for 'Affiliations' and 'Corresponding author'. The publication details are 'Nature Geoscience 4, 730–731 (2011) | doi:10.1038/ngeo1300' and 'Published online 31 October 2011'. At the bottom are buttons for 'Citation', 'Reprints', 'Rights & permissions', and 'Article metrics'. On the right side, there is a blue promotional banner for 'nature MIDDLE EAST' with the text 'Emerging science in the Arab world' and 'Sign up for FREE'. It features social media icons for Twitter, Facebook, and Google+, and a 'Sponsored by' logo. Below the banner is an 'Editors' pick' section with a small image of a coastal scene.

nature  
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NATURE GEOSCIENCE | CORRESPONDENCE

City lights and urban air

H. Stark, S. S. Brown, K. W. Wong, J. Stutz, C. D. Elvidge, I. B. Pollack, T. B. Ryerson, W. P. Dube, N. L. Wagner & D. D. Parrish

[Affiliations](#) | [Corresponding author](#)

*Nature Geoscience* **4**, 730–731 (2011) | doi:10.1038/ngeo1300  
Published online 31 October 2011

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Editors' pick



# Wild life environmental impact

## PROCEEDINGS B

[rspb.royalsocietypublishing.org](http://rspb.royalsocietypublishing.org)

### Research



**Cite this article:** Robert KA, Lesku JA, Partecke J, Chambers B. 2015 Artificial light at night desynchronizes strictly seasonal reproduction in a wild mammal. *Proc. R. Soc. B* **282**: 20151745.  
<http://dx.doi.org/10.1098/rspb.2015.1745>

Received: 21 July 2015

Accepted: 7 September 2015

#### Subject Areas:

behaviour, ecology, physiology

#### Keywords:

anthropogenic disturbance,  
circadian disruption, light pollution

## Artificial light at night desynchronizes strictly seasonal reproduction in a wild mammal

Kylie A. Robert<sup>1</sup>, John A. Lesku<sup>1</sup>, Jesko Partecke<sup>2,3</sup> and Brian Chambers<sup>4</sup>

<sup>1</sup>Department of Ecology, Environment and Evolution, La Trobe University, Melbourne 3086, Australia

<sup>2</sup>Max Planck Institute for Ornithology, Radolfzell 78315, Germany

<sup>3</sup>Department of Biology, University of Konstanz, Konstanz 78457, Germany

<sup>4</sup>School of Animal Biology, The University of Western Australia, Perth 6009, Australia

KAR, 0000-0002-8554-8440; JAL, 0000-0001-5073-6954

Change in day length is an important cue for reproductive activation in seasonally breeding animals to ensure that the timing of greatest maternal investment (e.g. lactation in mammals) coincides with favourable environmental conditions (e.g. peak productivity). However, artificial light at night has the potential to interfere with the perception of such natural cues. Following a 5-year study on two populations of wild marsupial mammals exposed to different night-time levels of anthropogenic light, we show that light pollution in urban environments masks seasonal changes in ambient light cues, suppressing melatonin levels and delaying births in the tamar wallaby. These results highlight a previously unappreciated relationship linking artificial light at night with induced changes in mammalian reproductive physiology, and the potential for larger-scale impacts at the population level.

### 1. Introduction

# Wars, earthquake and disasters



Alexander Gerst  
@Astro\_Alex



Siguiendo

My saddest photo yet. From [#ISS](#) we can actually see explosions and rockets flying over [#Gaza](#) & [#Israel](#)

Ver traducción

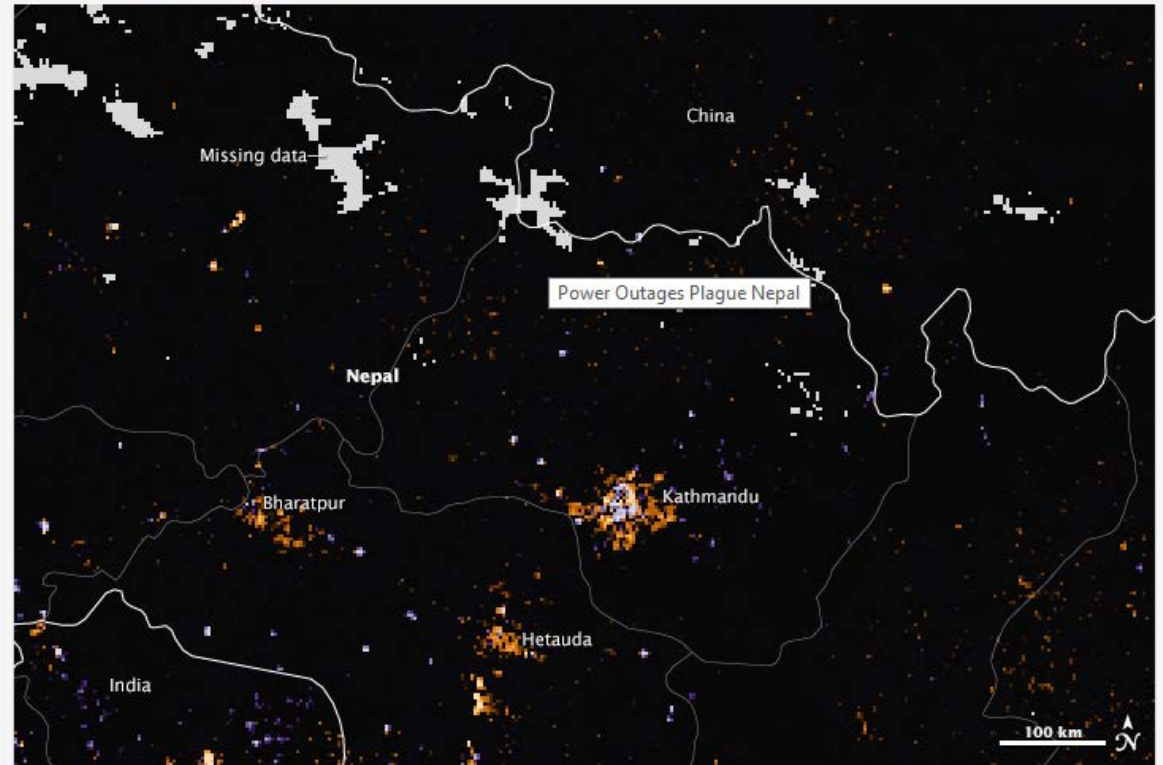


RETWEETS 45.051  
FAVORITOS 13.108



NASA EARTH OBSERVATORY  
Where every day is Earth Day

Home Images Global Maps Features News & Notes



Lighting Change

less same more

download large image (2 MB, JPEG, 1704x1174)

acquired April 19 - 28, 2015

images/imagerecords/85000/85816/nepal\_vir\_2015113\_lrg.jpg

country on April 25, 2015, continuous access to electricity was

# Why we need to catalog the images of ISS?

- We will help to:
  - municipalities to save energy.
  - the research on Breast cancer.
  - reduce the air pollution.
  - mitigate the light pollution.
  - sleep better.
  - save money.
  - Increase the road safety
  - Increase the nocturnal safety.
  - see more stars.
- preserve the World Heritage Site
- preserve the nocturnal biodiversity.
  - Save the migration birds
  - Save the glowworms
  - Save the bats
  - Save the turtles
  - Save the fish overexploitation
  - Better tree growth
  - .....

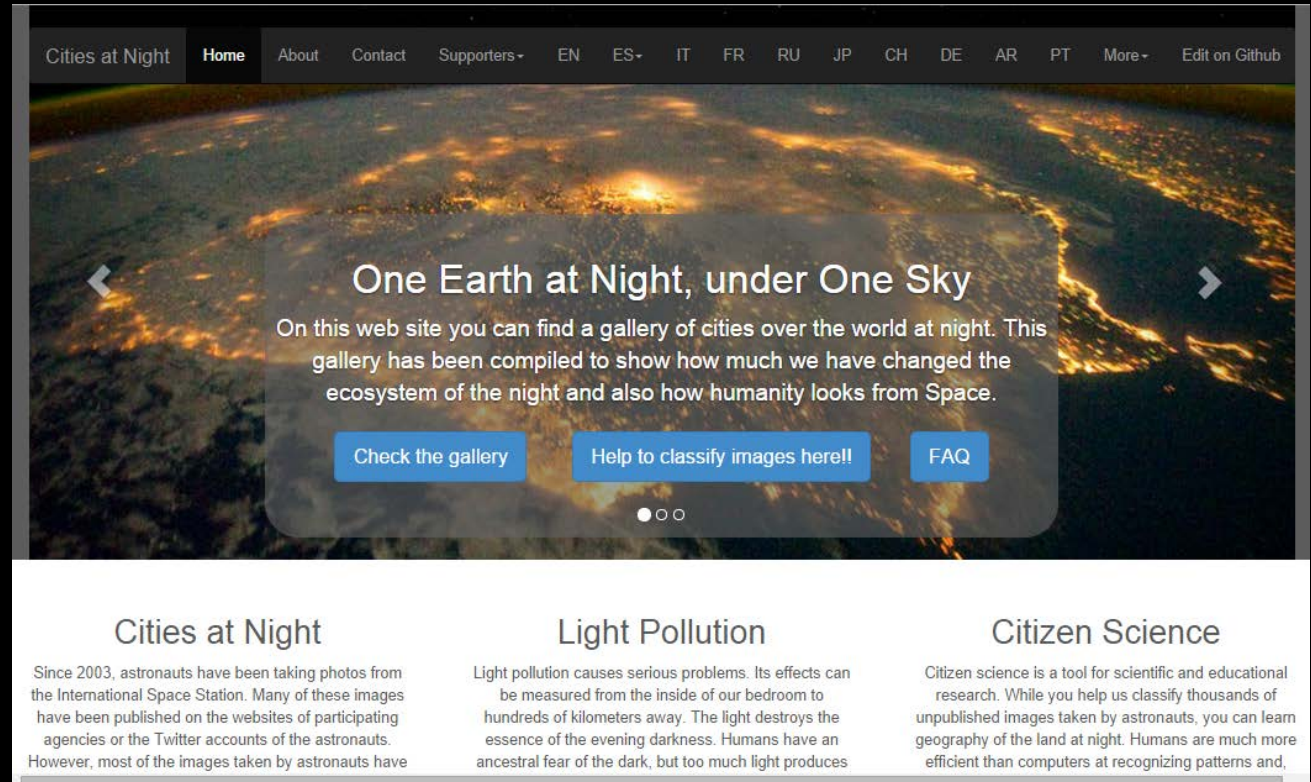
# How to do that?

- First, we need an attractive web site:

[www.citiesatnight.org](http://www.citiesatnight.org)

(design made by Media Lab volunteers)

It's translated to 13 languages



# How to do that?

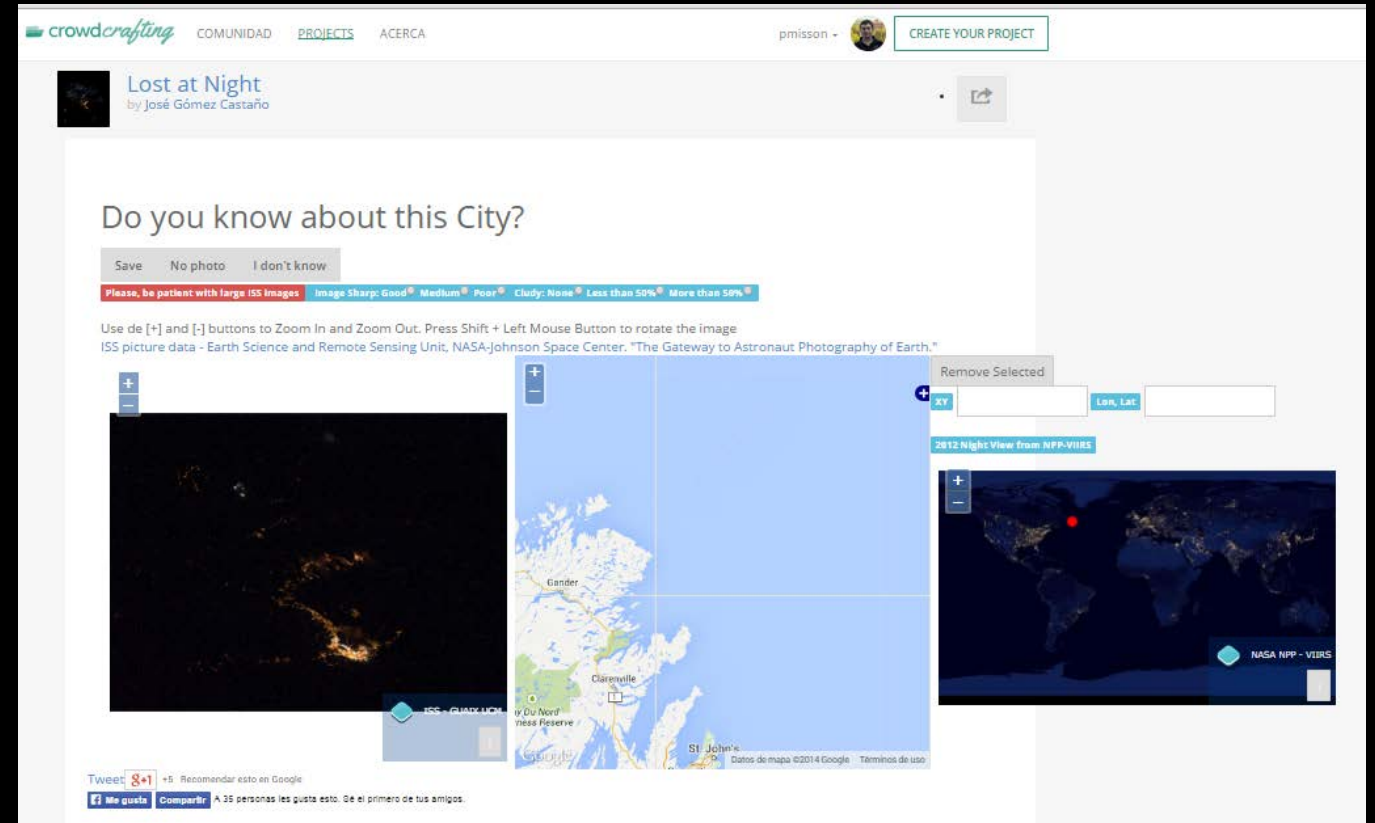
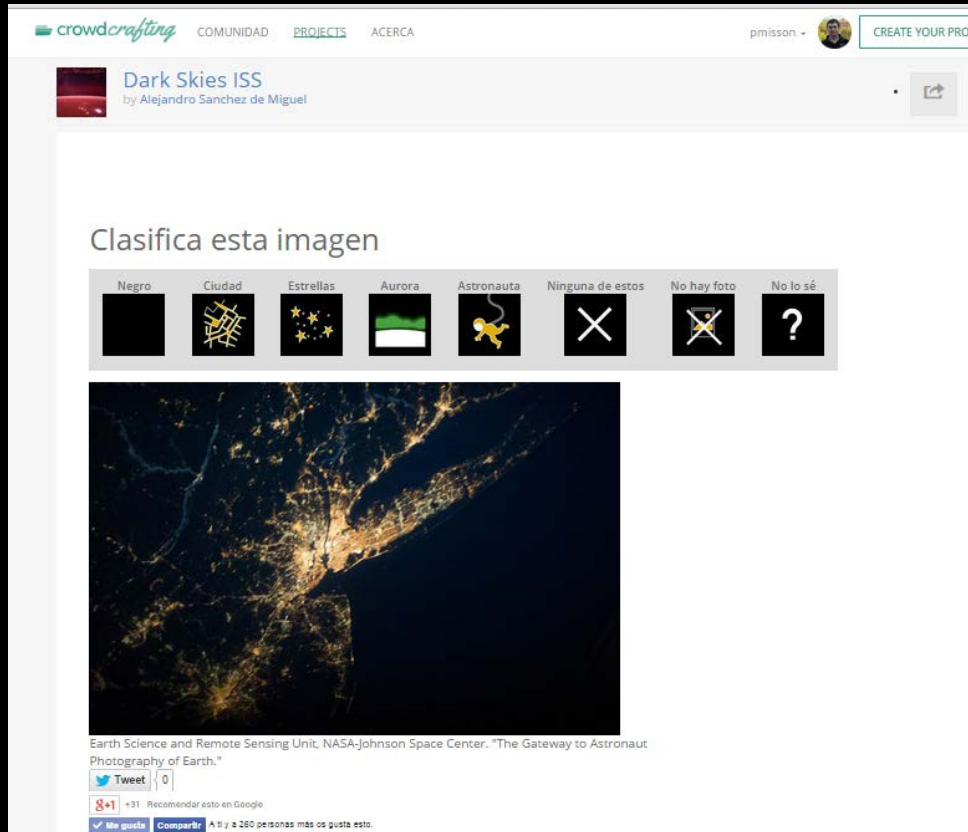
- Second, we need a platform to do the classification:

Crowdcrafting.org



# How to do that?

- Third, we need a interface:



Icons and first tests by MediaLab volunteers

# How to do that?

- Fourth, we need volunteers over the world.
  - We contact NASA, ESA and CSA-ASC and they help us to spread the word.



es **ESA España**   Siguiendo

RT @cities4tnight: Hoy presentamos [citiesatnight.org](http://citiesatnight.org) gracias al proyecto [comunidad.medialab-prado.es/es/proyectos/d...](http://comunidad.medialab-prado.es/es/proyectos/d...) de @medialabprado con la colab @esa\_es

Responder Retwitteado Marcado como favorito Más

RETWEETS 5 FAVORITOS 4

13:50 - 9 de jul. de 2014

Responder a @esa\_es @medialabprado



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Text Size 73 186

Space Station Sharper Images of Earth at Night Crowdsourced For Science August 14, 2014

A wealth of images of Earth at night taken by astronauts on the International Space Station (ISS) could help save energy, contribute to better human health and safety and improve our understanding of atmospheric chemistry. But scientists need your help to make that happen.

The images are available to the public through The Gateway to Astronaut Photography of Earth, the most complete online collection of images of Earth taken by astronauts. This database contains photographs beginning with those taken during Mercury missions in the early 1960s up to recent images from the station, with more added daily. As of August 2014, the collection included a total of nearly 1.8 million images, more than 1.3 million of them from the space station. Approximately 30 percent of those were taken at night.

The photographs taken by astronauts on the station are the highest-resolution night imagery available from orbit, according to William Stefanov, Ph.D., associate program scientist for Earth observations for the space station. Satellites collect data on a more regular basis, but those images typically have much lower resolution. This clarity is possible thanks to the European Space Agency's

North Korea (the dark area) and South Korea at night. Image Credit: NASA

Other potential applications include evaluating lighting for road and public safety and correlating light pollution with effects on human health and biodiversity.

The atlas is a collaboration of UCM, [Medialab-Prado](http://Medialab-Prado), Spanish Light Pollution Research Network, European Cooperation in Science and Technology's Action Loss of the Night Network, Crowdcrafting, Celfosc and AstroMadrid

NightPod also was used for Crew Earth Observations (CEO), an investigation for which astronauts photographed natural and

And then it became viral....

*the Atlantic*

CNN

FOX  
NEWS  
channel

NBC NEWS

CBS  
NEWS

GIZMODO

From *The Atlantic*  
CITYLAB

EL CORREO

 Digital  
Photography  
Review  
dpreview.com

rtve.es

la Repubblica.it  
Il mondo in diretta 24 ore su 24

EL MUNDO





esa



planetario



de pamplona



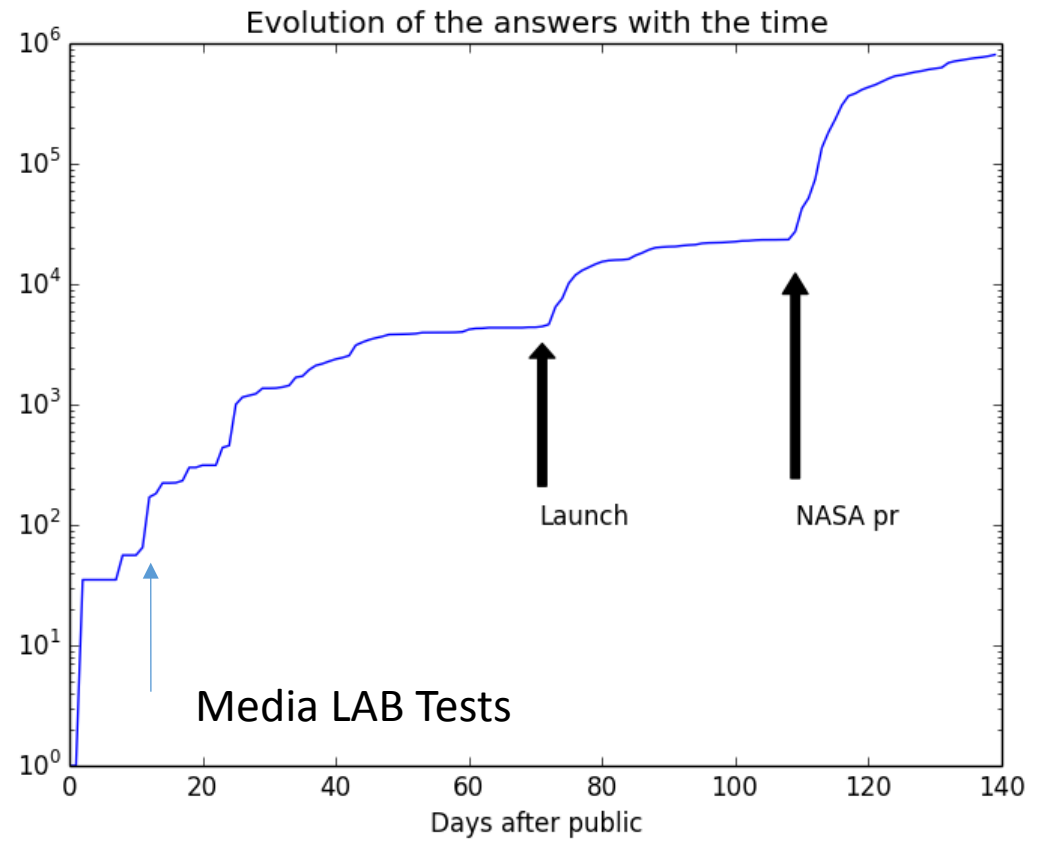
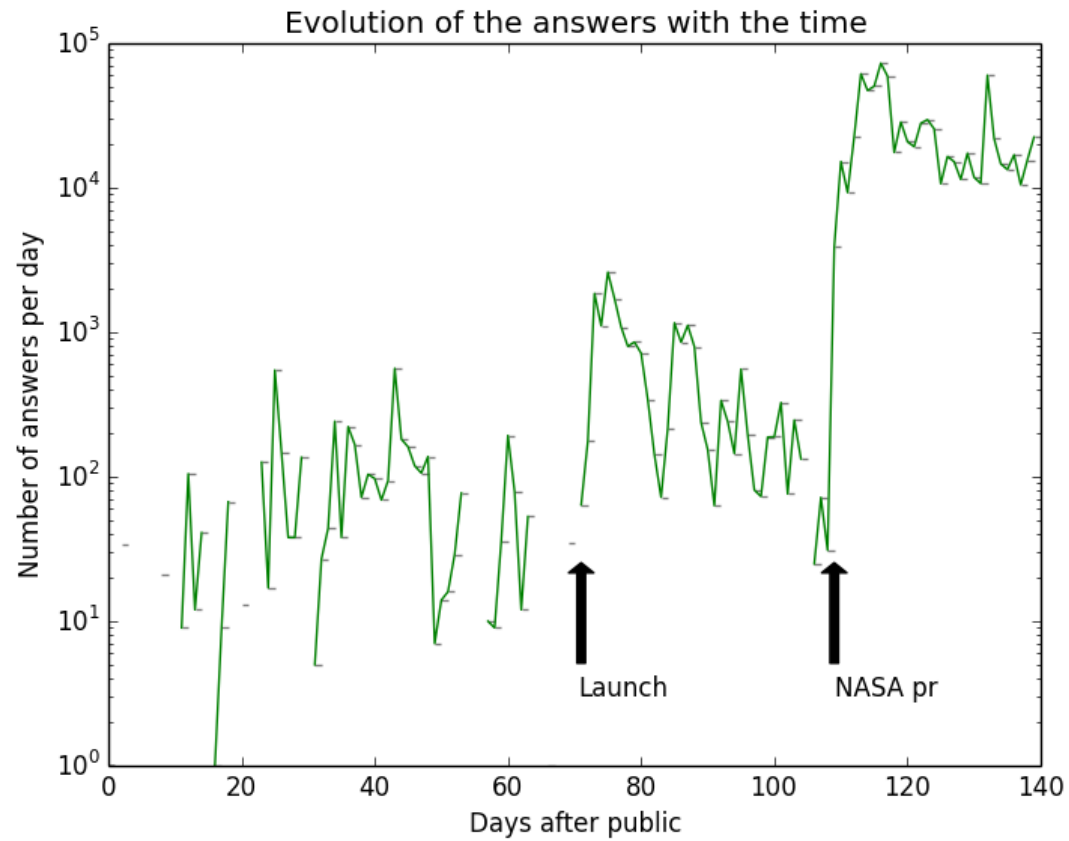
INTERNATIONAL  
DARK-SKY  
ASSOCIATION



Partnerships:

Help on the spread of the project or  
paid for some travels and costs

# The Evolution of the answers.



And then we got a prize.



# What are the results?

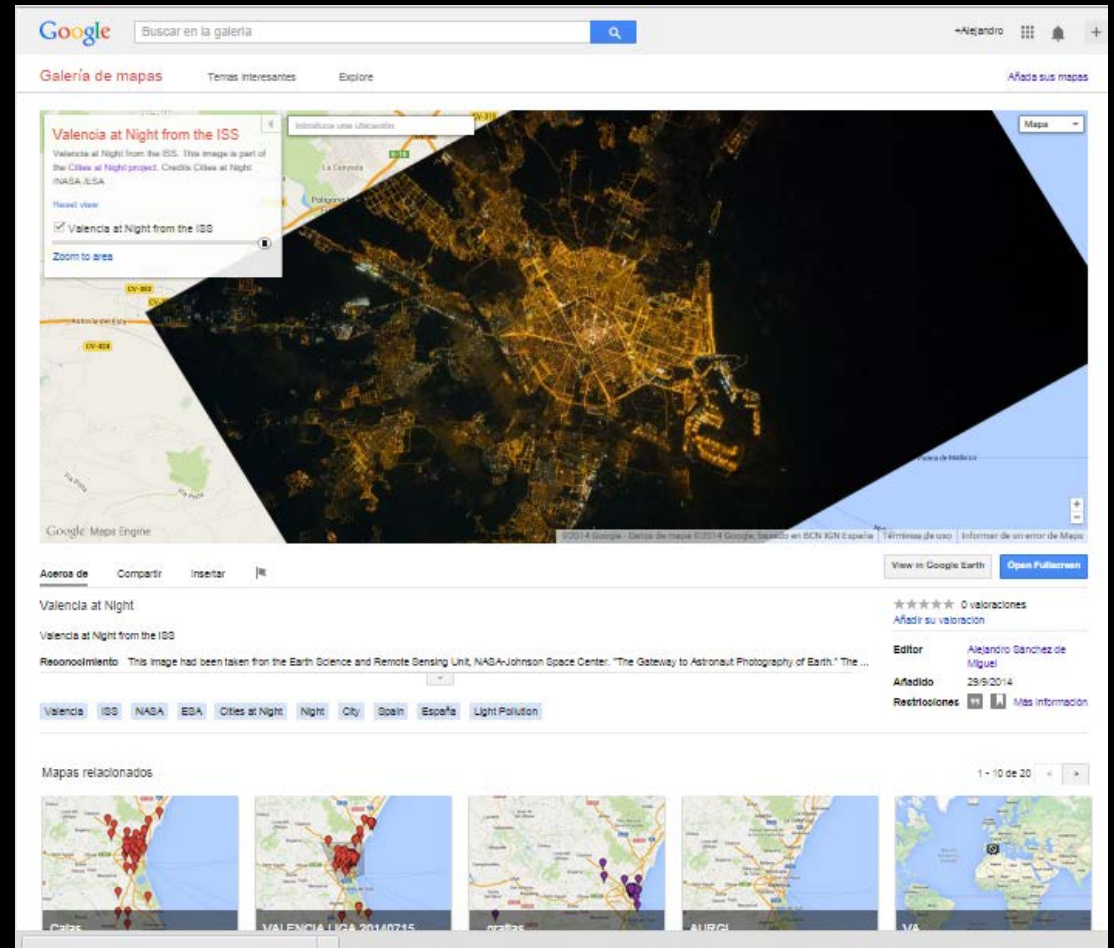
- We are actually making the analysis of the data.
- The first result is that the cities at Night volunteers had classify all the High resolution archive of the ISS:
  - 130.000 images taken with lens from 40 mm to 999 mm.
  - 30.000 of those images are images of cities with few clouds (5 times at least each).
  - We near a 1.000.000 of classifications and involved to 15.638 people.
- The Lost at Night users had tried to located 5720 images (at least 5 times each).
- The Night Cities ISS users had try to georeference 1714 images (at least 30 times each).

# What happen now?

- Present the first results
- Guarantee the future of the project
- Improve the apps and the design
- Cities at night logo?

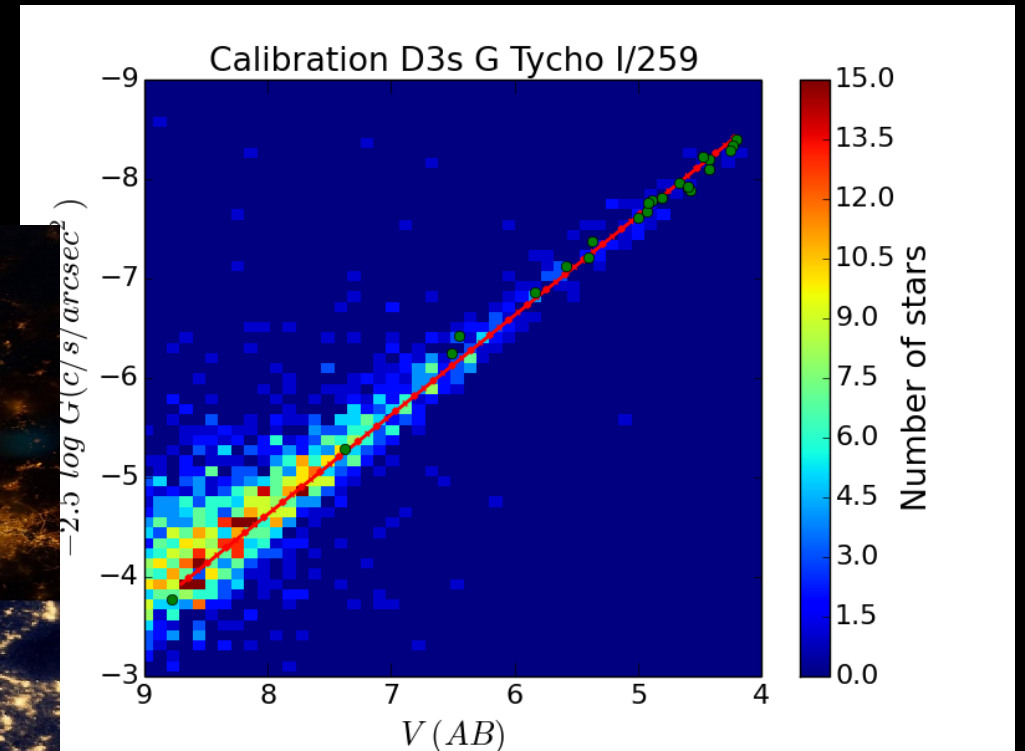
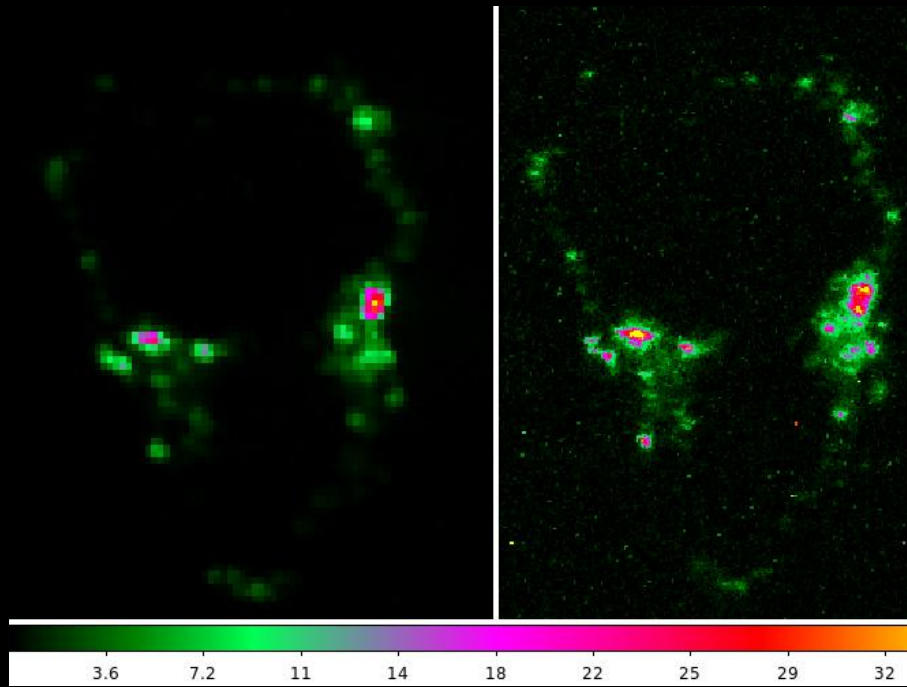
# What we want to present?

- First results and the first maps:
  - You can navigate in side the maps on Google Earth gallery.  
(Thanks to Google for give us unlimited free space for the project but until feb 2016)
- Cartodb may host us instead of Google



# What we want to present?

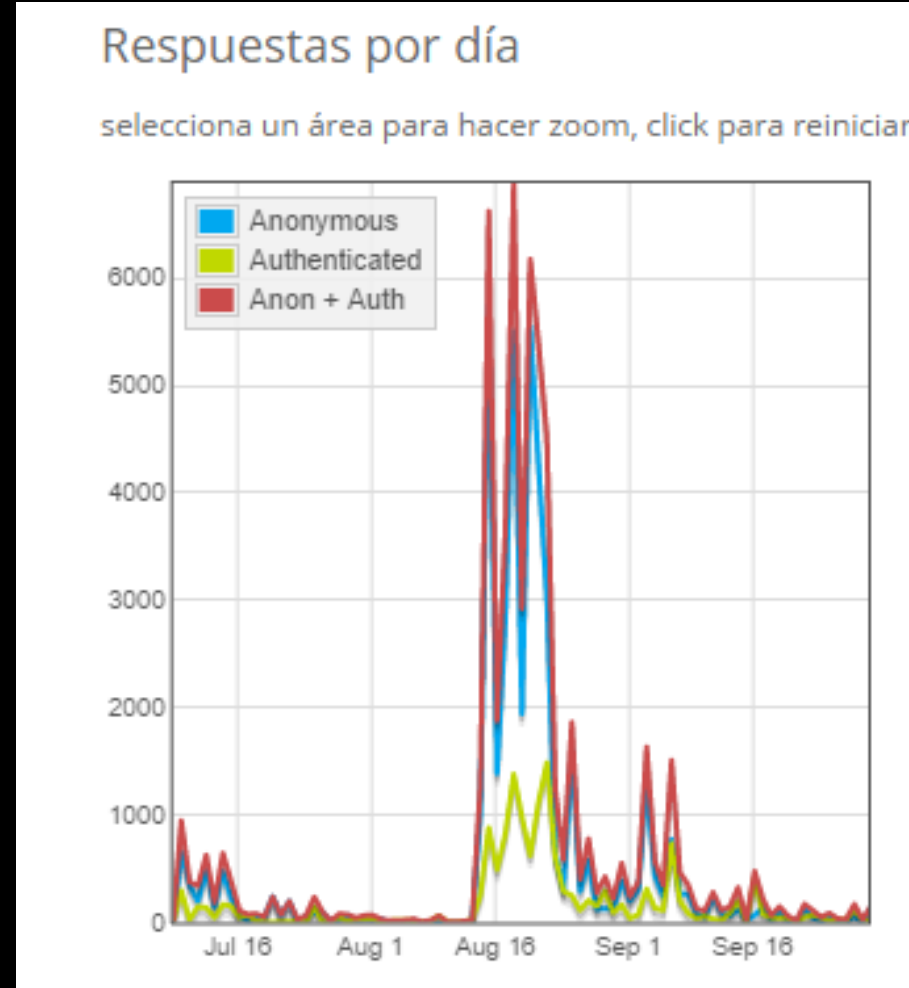
- Scientific calibration:



Alejandro Sánchez de Miguel Phd. Thesis.

# What we want to present?

- Push Lost at Night and Night Cities.





# What we want to present?

- New multilingual interface:



Spanish

French

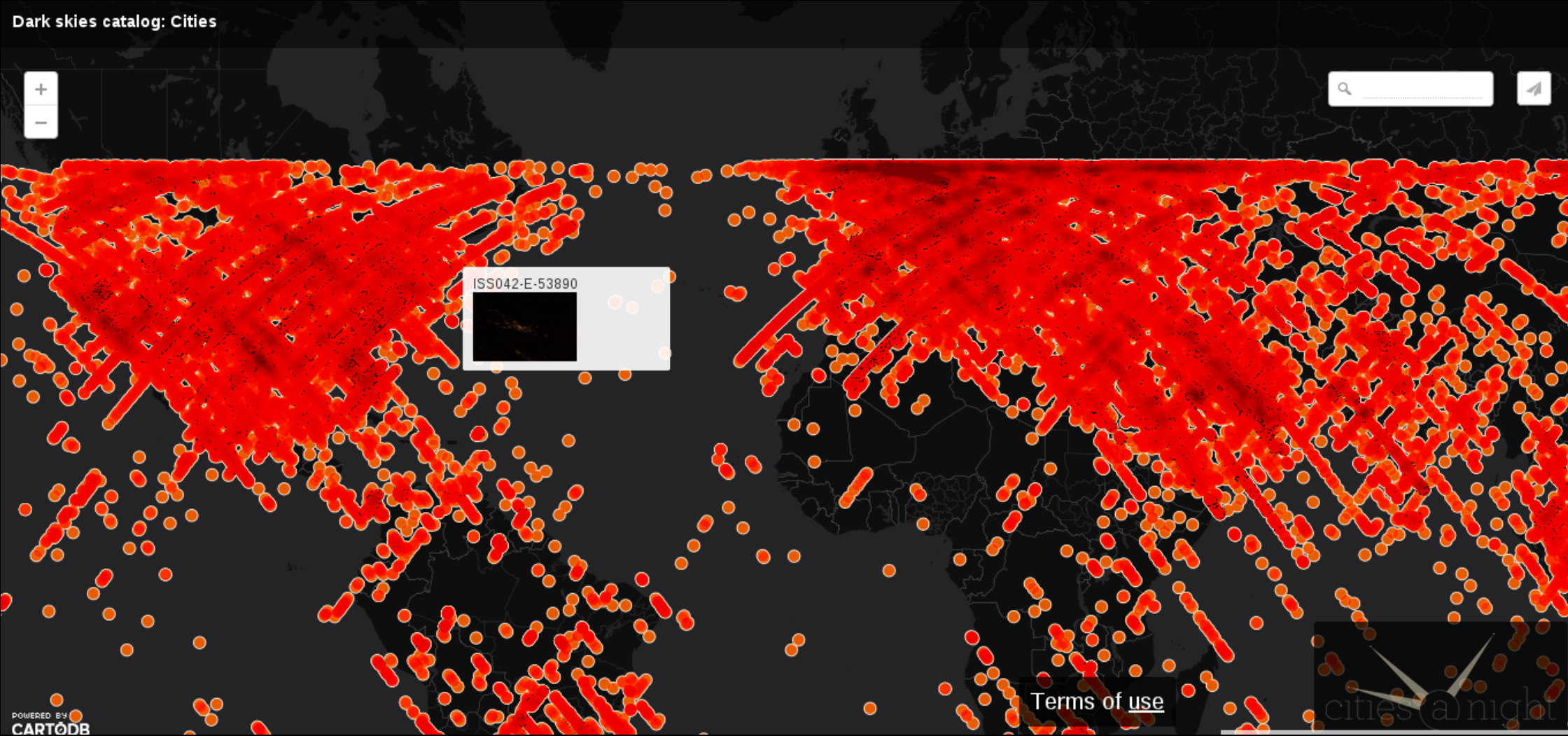
English

Also we have already the translation for Italian and Japanese.

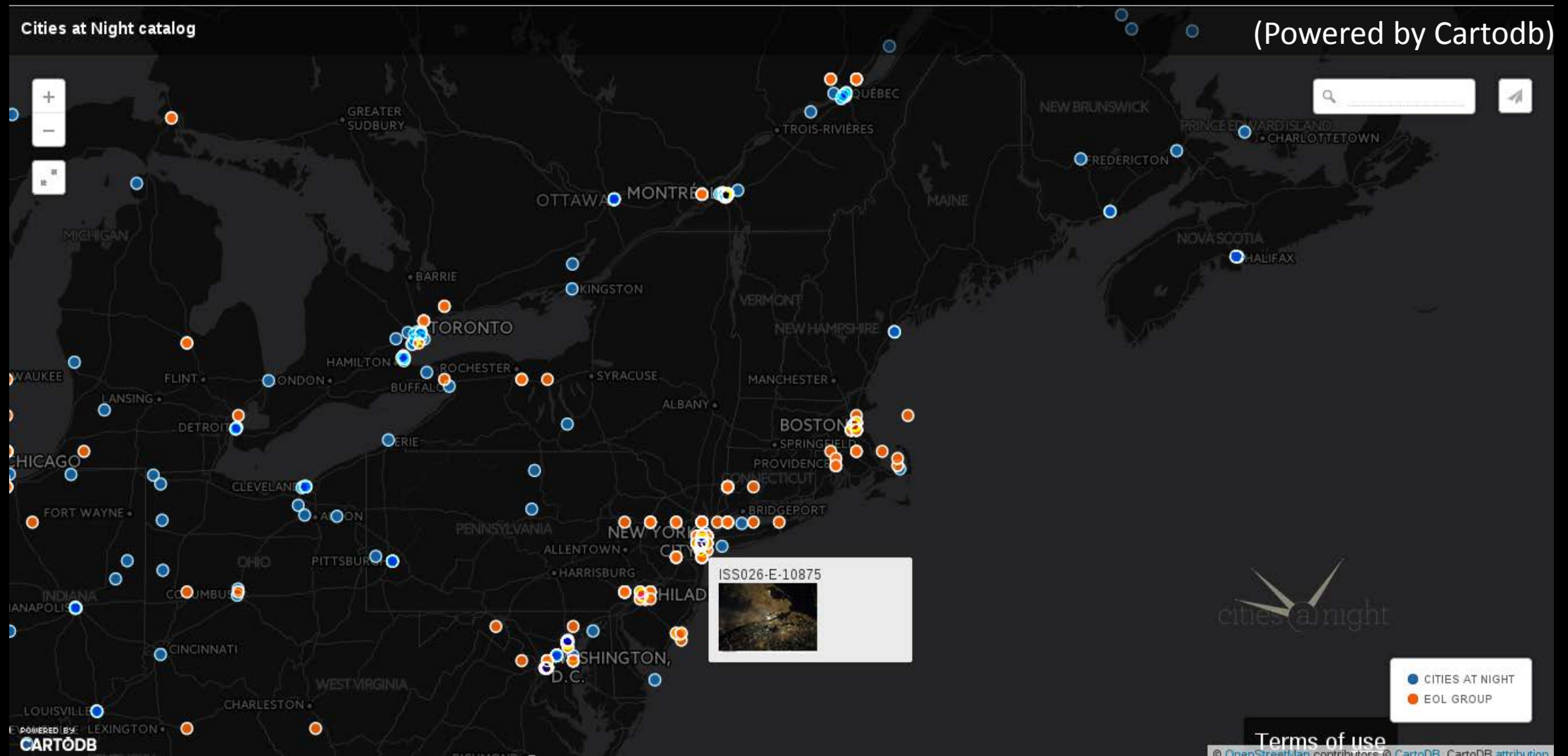
But not supported yet by the platform

# Nadir of the ISS Cities from Dark SkiesCatalog

(Powered by Cartodb)



# Coordinates of ISS images from Lost at Night



# ISS maps from Night Cities app

The screenshot displays the 'Cities at Night V0.1' interface. On the left, a sidebar contains the following text and controls:

**Cities at Night V0.1**  
This is the Map of the first version of Cities at Night. The grey back ground it's an image of the earth at night from the SNPP (Credits: NGDC Earth Observation Group (EOG)). The color images are images taken from the "Gateway to Astronaut Photography of Earth" and georeferenced by the Universidad Complutense de Madrid Staff or the Cities at Night volunteers.

Restablecer vista

- VIIRS 2014
- Iberian peninsula at Night from the ISS 1.0  
[Acercar área](#)
- Cities\_at\_Night\_V0.1  
[Acercar área](#)
- New  
[Acercar área](#)
- London, Paris, Madrid, Amsterdam, Warsaw, Berlin at night from the ISS  
[Acercar área](#)

The main map area shows a satellite view of the Iberian Peninsula and surrounding regions, with a large black diagonal overlay. The interface includes a search bar at the top with the text 'Introduce una ubicación', a user name 'Alejandro Sanchez', and a 'Mapa' dropdown menu. The Google Maps logo and '©2015 Google' are visible at the bottom left.

# Already invested resources

- Astronaut acquisition cost of the images  
(Cost per minute of the ISS 3.000 €)
  - Between 2.500.000 € or 0€
- Pipeline cost and Scientific activities: 128.000€ (UCM/FPUGrant + CEGEP+LoNNe + Self+ Others)
- Human processing value/cost: 48.000 €/0€ (Citizen Science)
- Software development value/cost: ~15.000 € /0€  
(partnerships)(estimated)
- Maintenance value/cost: 109.500€/0 € (partnerships)

# Potential Value produced

- Market value of raw images:  $700 * 3.000\text{€} = 2.100.000 \text{€}$ .
- Market value of the processed images:  $700 * 50.000\text{€} = 35.000.000 \text{€}$
- On thesis and 2 articles, more than 7 articles on going.
- Cities analyses: 7

# Actual - Future resources

- Astronaut acquisition cost of the images  
(Cost per minute of the ISS 3.000 €)
  - Between ¿? € or 0€ (Will the nightpod still be on the ISS?)
- Pipeline development and Scientific activities: ¿0? €
- Human processing value: ¿?€ -> 0€ (Citizen Science)
- Software development: ~170.000 € (Stars4ALL EU project-CEFRIEL)
- Maintenance : 5.000€ -> 0 € (¿partnerships?)
  
- Potential 10.000 € from Crowdfunding (Kickstarter)

All the RAW data are Open since  
are acquired on  
[www.crowdcrafting.org](http://www.crowdcrafting.org)

Processed data on

<http://pmisson.cartodb.com>



Do you want access to the  
calibrated data?

Great!!! Fund US!!

Or propose us a project were we could be coauthors

Also you can wait until we find funds from some where else and we make the  
data release

# YOU CAN GET A VERY SUCCESSFUL CITIZEN SCIENCE PROGRAM!!!


- Start trying to get a salary for Postdoc, improve the platform and a GIS expert to keep project on going.

(We have guaranteed the survival of the project at less than 4 months)  
Some grants and project had been requested already.



**Don't ask what the stars can do for you**

**but what you can do for the stars.**



**[www.citiesatnight.org](http://www.citiesatnight.org)**

[www.citiesatnight.org](http://www.citiesatnight.org)



**San Francisco 2014**




**Tokio 2014**

Sky over ....  
Tokio  
San Francisco  
Berlin  
Valencia  
Shanghai  
2014



**San Francisco 1850**



**Tokio 1850**



**Sky over Easter Island  
2014  
and All the World 1850**



**Berlin 2014**




**Valencia 2014**




**Shanghai 2014**



**Berlin 1850**



**Valencia 1850**



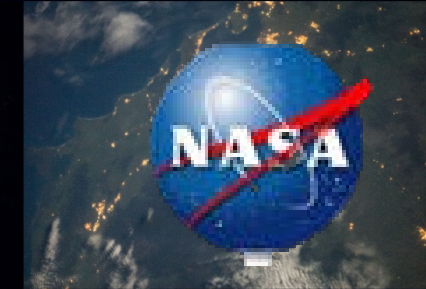
**Shanghai 1850**

[www.citiesatnight.org](http://www.citiesatnight.org)



# Cities at Night

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JR. Solera, M. Vela,  
J. Zamorano, J. Gallego, CC.M Kyba  
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Universidad Complutense de Madrid  
Cepeg Sherbrooke



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