

Using GLOBE at Night Data

Gary Randolph





Engage students worldwide in observing the nighttime sky



Encourage citizen and family science with a hands-on learning activity outside of the classroom

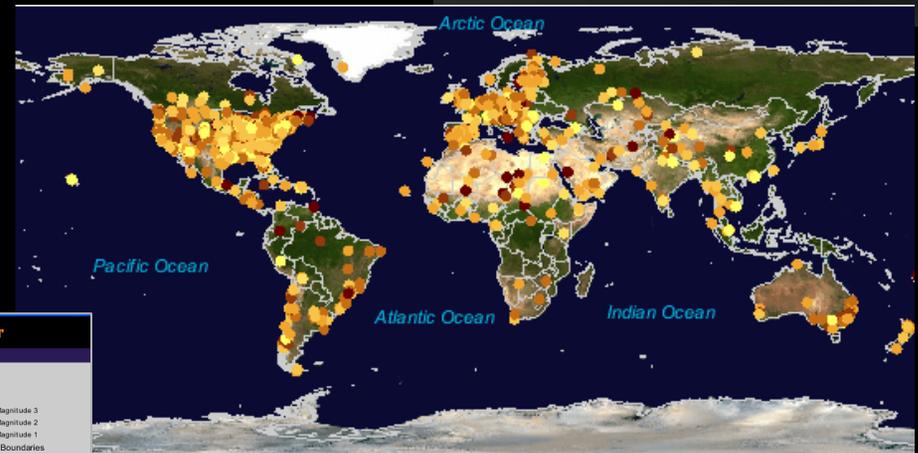


Gather light pollution data from an international perspective

Highlights from GLOBE at Night:

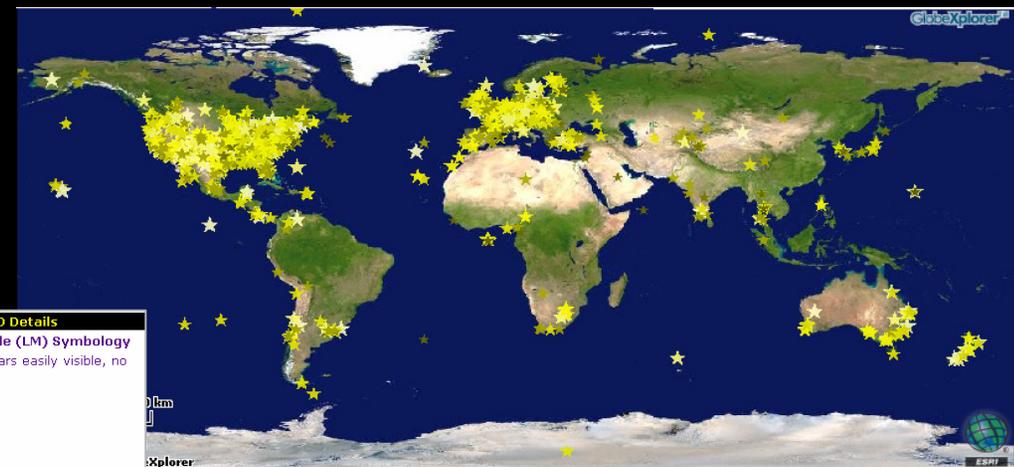
2006:

- From 96 countries
- 4,591 observations reported



2007:

- From 66 countries
- 9,116 observations reported



So, what do the data tell us?

**First, the observations per
magnitude from 2007:**

Magnitude 1: 467

Magnitude 2: 544

Magnitude 3: 2,079

Magnitude 4: 2,096

Magnitude 5: 1,306

Magnitude 6: 520

Magnitude 7: 249

Cloudy: 1,230

(Cloudy observations are less usable, so first let's discard those)



Observations per magnitude:

Magnitude 1: 467

Magnitude 2: 544

Magnitude 3: 2,079

Magnitude 4: 2,096

Magnitude 5: 1,306

Magnitude 6: 520

Magnitude 7: 249

LEGEND Details

Limiting Magnitude (LM) Symbology

- ★ LM 7: Very dim stars easily visible, no light pollution
- ★ LM 6
- ★ LM 5
- ★ LM 4
- ★ LM 3
- ★ LM 2
- ★ LM 1: Only the brightest stars visible, severe light pollution



We can look at observations per magnitude as percentages:

Magnitude 1: 467 = 6.43%

Magnitude 2: 544 = 7.49%

Magnitude 3: 2,079 = 28.63%

Magnitude 4: 2,096 = 28.87%

Magnitude 5: 1,306 = 17.98%

Magnitude 6: 520 = 7.16%

Magnitude 7: 249 = 3.44%

Total observations in sample: 7261

We can look at the 2007 observations per magnitude:

Magnitude 1:	467	=	6.43%
Magnitude 2:	544	=	7.49%
Magnitude 3:	2,079	=	28.63%
Magnitude 4:	2,096	=	28.87%
Magnitude 5:	1,306	=	17.98%
Magnitude 6:	520	=	7.16%
Magnitude 7:	249	=	3.44%



LEGEND Details	
Limiting Magnitude (LM) Symbology	
★	LM 7: Very dim stars easily visible, no light pollution
★	LM 6
★	LM 5
★	LM 4
★	LM 3
★	LM 2
★	LM 1: Only the brightest stars visible, severe light pollution

Once we have the percentages they can be compared. The largest percentages of observations, and therefore the largest number of observations, were made under limiting magnitudes of 4, 3 and 5 (in that order).

The smallest percentages of observations, and therefore the smallest number of observations, were made under limiting magnitudes of 7, 1, 6, and 2.

We can look at observations per magnitude:

Magnitude 1:	467	=	6.43%
Magnitude 2:	544	=	7.49%
Magnitude 3:	2,079	=	28.63%
Magnitude 4:	2,096	=	28.87%
Magnitude 5:	1,306	=	17.98%
Magnitude 6:	520	=	7.16%
Magnitude 7:	249	=	3.44%



LEGEND Details	
Limiting Magnitude (LM) Symbology	
★	LM 7: Very dim stars easily visible, no light pollution
★	LM 6
★	LM 5
★	LM 4
★	LM 3
★	LM 2
★	LM 1: Only the brightest stars visible, severe light pollution

What can this information tell us?

The fewest GLOBE at Night observations were collected in perhaps the best condition for astronomical observations – magnitude 7 – no light pollution
the second fewest GLOBE at Night observations were collected in perhaps the worst conditions for astronomical observations – magnitude 1 – full light pollution.

Why is that? Most people live in urban areas rather than rural areas and more lights causing light pollution exist in urban areas rather than rural areas.

Do the 2006 data tell us the same or similar?

Observations per magnitude from 2006:

Magnitude 1:	403	= 10.1%
Magnitude 2:	356	= 8.9%
Magnitude 3:	1,013	= 25.4%
Magnitude 4:	1,127	= 28.2%
Magnitude 5:	658	= 16.5%
Magnitude 6:	307	= 7.7%
Magnitude 7:	126	= 3.2%



Total observations in sample: 3,990

The largest percentages of observations, same as in 2007, were made under limiting magnitudes of 4, 3 and 5 (in that order).

The smallest percentages of observations, similar to those in 2006, were made under limiting magnitudes of 7, 6, 2, and 1.

Similar to 2007, the fewest and second fewest GLOBE at Night observations were collected in perhaps the best conditions for astronomical observations, magnitude 7, no light pollution; the third and fourth fewest GLOBE at Night observations were collected in perhaps the worst conditions for astronomical observations, magnitude 1, full light pollution.



Chief Scientist's Blog Dr. Peggy LeMone

GLOBE at Night – can you see the stars?

May 8th, 2006

When I was in Washington, D.C., a few weeks ago, the TV weather forecaster said "It will be partly cloudy this afternoon with sunny skies tonight." After a few seconds, I realized what he said and laughed.

But, even without sunlight, the light in cities is bright enough to read a book by.

GLOBE at Night (<http://www.globe.gov/GaN/analyze.html>) was a web-based field campaign held a few weeks ago to let people report what the night sky looked like where they lived. They looked at a familiar constellation, Orion. The more stars that they could see, the "better" the net sky for observing stars. Some people probably drove or walked to their favorite observing spot. When I was a child, we had a favorite place to go just outside of town to view comets or satellites.

Light pollution is really what makes it hard to see the night sky. I thought when I was younger that the other types of pollution – especially dust, would be very important. Certainly, during the daytime, sunlight scattering off dust makes it difficult to see distant mountains or hills. But at night, with no lights, the stars are surprisingly easy to see, even under dusty conditions.

I learned this while working in Dakar, Senegal, the Summer of 1974. We lived near Dakar-Yoff airport, because we were flying research aircraft over the Atlantic to study the weather. During the day, the sky on fair-weather days was quite hazy from all the dust in the air. This dust came from the dry ground nearby (it was quite dry) and from the Sahara desert just to the north. At night, though, the stars shone brilliantly. If it wasn't raining or cloudy, we could see the Milky Way

Galaxy

I hope that you have a good place to go to – once in a while – to just look up at the night sky and see the stars.

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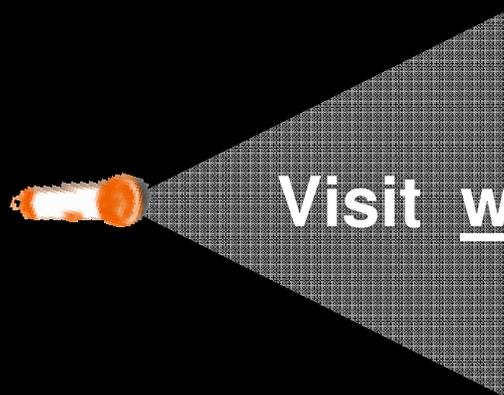
Read more comments on Dr. Peggy Lemone's Blog

But, doesn't this seem logical? Yes, but wouldn't the younger students understand this concept better by the collection and viewing of GLOBE at Night data?



Would it also be helpful to collect GLOBE at Night observations first under one magnitude and then under another magnitude?

2008 will provide you another opportunity to collect GLOBE at Night data – don't miss it!



Visit www.globe.gov/GaN for more information