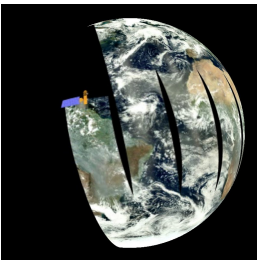
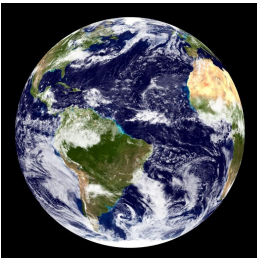
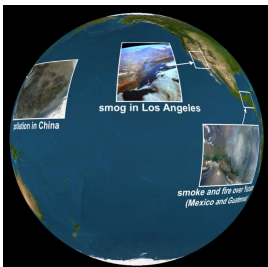
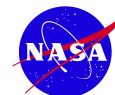


## SOS SCRIPT: AIR POLLUTION FROM SPACE

Key Points	Visuals
<p><b><u>Introduction</u></b> Our atmosphere supports and protects life on Earth.</p> <p>NASA satellites observe the impact that 7 billion humans are having on the atmosphere.</p>	<p><b>1) Aqua satellite swath</b></p> 
<p><b><u>Lights at Night</u></b> From space Earth at night reveals concentrations of human activity – and this activity is correlated to air pollutants.</p>	<p><b>2) Blue Marble Nightlights</b></p> 
<p><b><u>Blue marble with pollution pictures</u></b> NASA satellites observe the impact of 7 billion humans.</p> <ul style="list-style-type: none"> <li>-Slash-and-burn deforestation over Mexico</li> <li>-Los Angeles smog</li> <li>-pollution over China</li> <li>-haze over Bangladesh from fire and burning fossil fuels</li> <li>-West Africa fires and smoke from agricultural clearing</li> <li>-smog over France</li> <li>-smog over U.S. East Coast</li> </ul> <p><i>Natural air pollution caused by: volcanoes, sand storms, fires started by lightning</i></p>	<p><b>3) Blue Marble (no clouds) with pollution PIP's</b></p> 



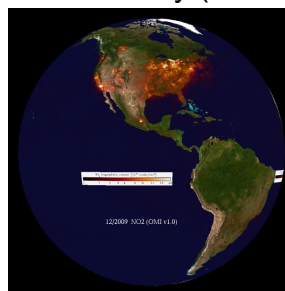
### **Air Quality: NO<sub>2</sub>**

Nitrogen Dioxide (NO<sub>2</sub>) is released into the air by burning coal, gasoline, and other fossil fuels. It is unhealthy to breathe and reacts with other gases to produce ozone, which is also unhealthy to breathe.

- Globally, greatest NO<sub>2</sub> emissions are from industrial, urban centers (coal, gas-fired power plants, vehicles), forest fires.
- High levels of NO<sub>2</sub> contribute to:
  - 1) haze that reduces visibility
  - 2) irritation of the eyes, nose, throat, and lungs
  - 3) acid rain
- Strong seasonal pattern corresponds to more heating and longer pollutant lifetime in winter
- Emissions controls have successfully decreased NO<sub>2</sub> in some areas, but new development corresponds to increasing NO<sub>2</sub>

### **4) Nitrogen Dioxide over Night Lights**

OMI monthly (2004-2009)



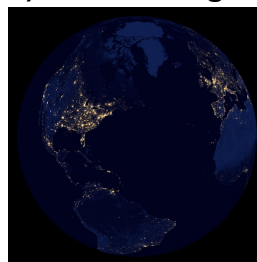
### **Lights at Night: 1992, 2002, 20012**

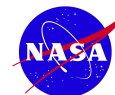
Earth is never really dark everywhere at once, but here the whole Earth is shown at night over 20 years: 1992, 2002, 2012. Notice how many more lights turned on over two decades. More people. More cities. More lights. More energy consumption.

What do most power plants use to generate electricity?

Humans are having a noticeable effect on our atmosphere. More people and industry impact air quality, especially in places like China and India with growing populations and development.

### **5) Earth at Night: 1992, 2002, 2012**



**Aerosols:**

**sea salt** from the oceans (blue)

**dust** off the deserts (red)

**soot/black carbon aerosols** (green) can occur naturally (e.g. forest fires caused by lightning) or from human activity (e.g. agricultural fires, fossil fuel combustion).

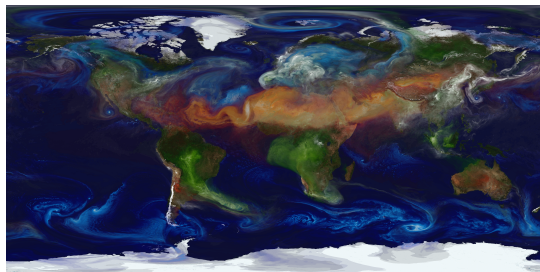
**sulfate aerosols** (white) comes from the combustion of fossil fuels and the eruption of volcanoes, most commonly found downstream of large industrial areas.

The good news is that there have been improvements in air quality over the United States and Europe thanks to tougher regulations and using cleaner energy sources.

Monitoring our atmosphere with satellites and working together with other countries, we can identify pollution sources to clean up our air. Our atmosphere is essential for life on Earth.

**6) Aerosols**

from GEOS-5 and the GOCART Model



New NASA images highlight U.S. air quality improvement:

<http://www.nasa.gov/content/goddard/new-nasa-images-highlight-us-air-quality-improvement/>

NASA Aura A Global Perspective: Pollution in the Atmosphere

<http://aura.gsfc.nasa.gov/airquality.html>

NASA Earth Observatory Air Quality feature:

<http://earthobservatory.nasa.gov/Features/AirQuality/>

NASA Aura "Breathable" movie:

<http://www.youtube.com/watch?v=2yd2s5vdQeQ>

Gorgeous Glimpses of Calamity:

<http://www.nytimes.com/2013/08/18/opinion/sunday/gorgeous-glimpses-of-calamity.html>