


ENVIR 202: Lesson No. 20



Natural & Unnatural Disasters

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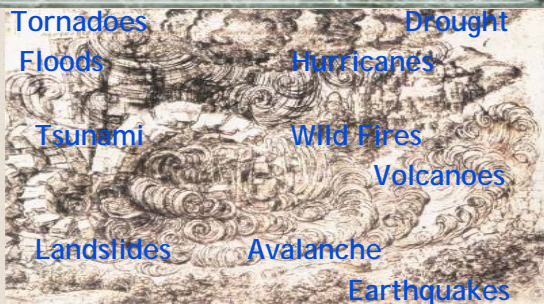
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Natural Disaster

- ❖ A natural disaster is the consequence or effect of a natural phenomenon becoming enmeshed with human activities.
- ❖ “*Disasters* occur when hazards meet *vulnerability*”
- ❖ So is it *Mother Nature* or *Human Nature*?

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Natural Phenomena



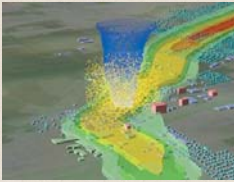

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Natural Hazards

- ❖ Why do Populations Live near Natural Hazards?
 - > High voluntary individual risk
 - Low involuntary societal risk
 - > Element of probability
 - > Benefits outweigh risk
 - Economical
 - Social & cultural
 - > Few alternatives
 - > Concept of resilience; operationalized through policies or systems

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Tornado Alley



<http://www.spc.noaa.gov/climo/torn/2005deadlytorn.html>

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Oklahoma City, May 1999


- ❖ 319 mph (near F6)
- ❖ 44 died, 795 injured
- ❖ 3,000 homes and 150 businesses destroyed



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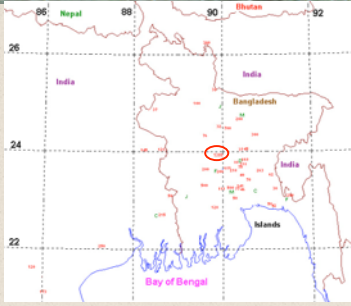
World's Deadliest Tornado

- ❖ April 26, 1989
- ❖ 1300 died
- ❖ 12,000 injured
- ❖ 80,000 homeless
- ❖ Two towns leveled
- ❖ Where?



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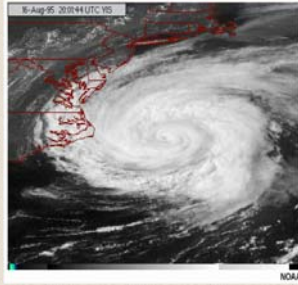
Bangladesh



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Hurricanes, Typhoons & Cyclones

- ❖ winds over 74 mph
- ❖ regional location
- ❖ 500,000 Bholá cyclone, 1970, Bangladesh
- ❖ 229,000 Typhoon Nina, 1975, China
- ❖ 138,000 Bangladesh cyclone, 1991



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U.S. Hurricanes

- ❖ 8000, Galveston Hurricane, 1900
- ❖ 1417, Hurricane Katrina, 2005

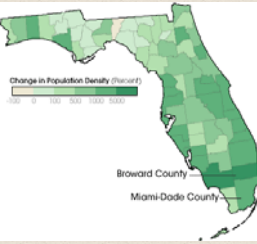
Costliest U.S. Atlantic hurricanes
Cost refers to total estimated property damage.

| Rank | Hurricane | Season | Cost (2005 USD) |
|------|-------------------------|--------|-----------------|
| 1 | Katrina | 2005 | \$75 billion |
| 2 | Andrew | 1992 | \$44.9 billion |
| 3 | Charley | 2004 | \$15.4 billion |
| 4 | Ivan | 2004 | \$14.6 billion |
| 5 | Hugo | 1989 | \$12.6 billion |

Main article: [List of notable Atlantic hurricanes](#)

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Hurricane Zone




- ❖ Changes in society
 - Urbanization
 - Densification
 - Aging
- ❖ Broward County, FL.
 - 8000 % increase from 1930 to 2000
- ❖ Miami-Dade, FL.
 - 1,800 % increase

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Floods

- ❖ 13 of the world's 15 largest cities are on coastal plains
 - Environmental amenities
 - Economic opportunities



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China's Sorrow




- ❖ Yellow (Huang He) River
 - > 1887 - 2 million
 - > 1931 - 4 million
 - > 1938 - 1 million

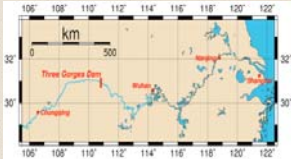


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Yangtze River & the Three Gorges Dam



- ❖ Flood control
- ❖ Improve navigation
- ❖ Power generation



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Landslides

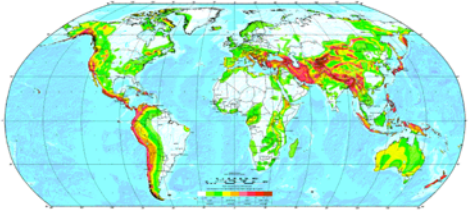
- ❖ Venezuela 1999
- ❖ Phillipine 2006



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Earthquakes

GLOBAL SEISMIC HAZARD MAP



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Earthquakes

Los Angeles, 1971



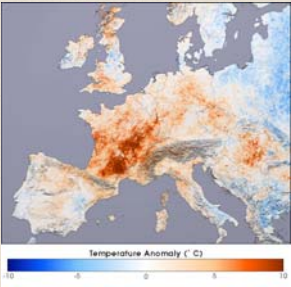
Alaska, 1964



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Heat Wave

- ❖ Europe, 2003
- ❖ 35,000
- ❖ elderly



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Limnic Eruption



❖ Lake Nyos, Africa

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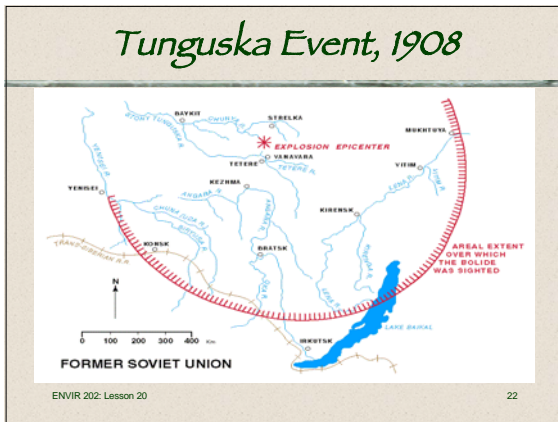
Extreme Natural Phenomena

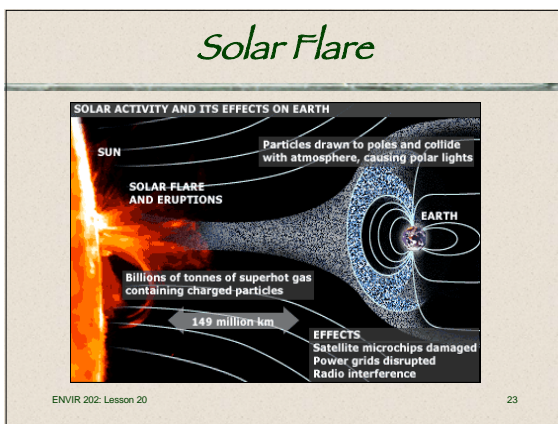
- ❖ Impact event
- ❖ Solar flare
- ❖ Super-volcano
- ❖ Mega-tsunami

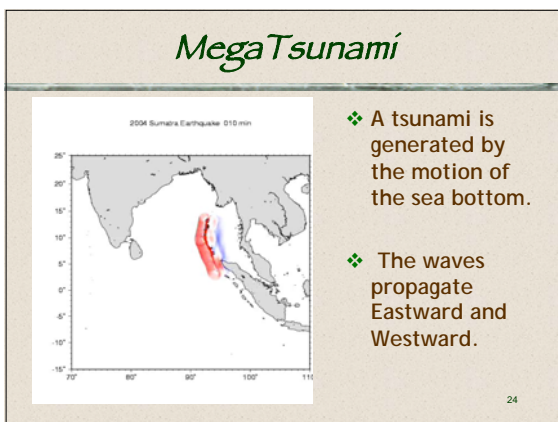
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Barringer Meteor Crater, Arizona



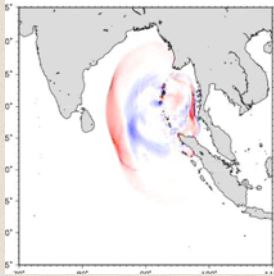






MegaTsunami

2004 Sumatra Earthquake 080 min

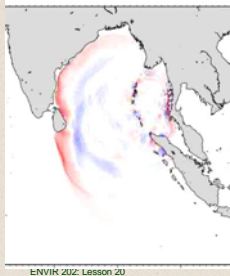


❖ 1 hour and 20 minutes later, the wave hits Phuket and the Indian ocean coast of Thailand and Myanmar.

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MegaTsunami

2004 Sumatra Earthquake 120 min

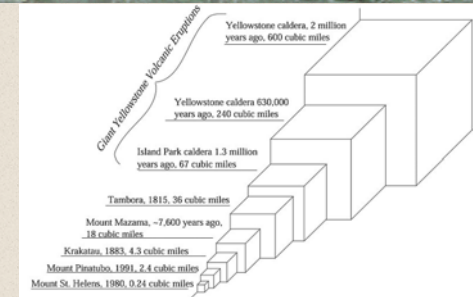


❖ 2 hours later, the wave hits Sri Lanka and the East coast of India.

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Volcanic Eruptions



| Volcanic Eruption | Volume (cubic miles) |
|---|----------------------|
| Cline Yellowstone Volcanic Eruption | 600 |
| Yellowstone caldera, 2 million years ago | 600 |
| Yellowstone caldera 630,000 years ago | 240 |
| Island Park caldera 1.3 million years ago | 67 |
| Tambora, 1815 | 36 |
| Mount Mazama, ~7,600 years ago | 18 |
| Krakatau, 1883 | 4.3 |
| Mount Pinatubo, 1991 | 2.4 |
| Mount St. Helens, 1980 | 0.24 |

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Yellowstone Caldera

Huge volcano sleeps under Yellowstone

Reading the geochemical time path found in tiny crystals of zircon and quartz, scientists are writing a new chapter of the US history — and a geologic chronicle — of a type of volcano in the western United States capable of dramatically altering climate sometimes within the next 100,000 years. These are volcanoes that occur over "hot spots" in the Earth and they erupt in catastrophic eruptions, sending hundreds to thousands of cubic kilometers of ash into the atmosphere and wreaking climate havoc on a global scale. By comparison, the eruption of Mount St. Helens sent a mere two cubic kilometers of ash skyward.

Comparative Volumes of Eruptions in Cubic Kilometers

Mount St. Helens (1980), 2 km³

Laas Creek Tuff (200,000 years ago), 1,600 km³

Huckleberry Ridge Tuff (2 million years ago), 2600 km³

The 1980 eruption of Mt. St. Helens produced an ash zone that extended over 20 km — minuscule when compared to the areas below.

The Laas Creek eruption occurred 600,000 years ago.

The Huckleberry Ridge eruption occurred 2 million years ago.

Could it erupt again?

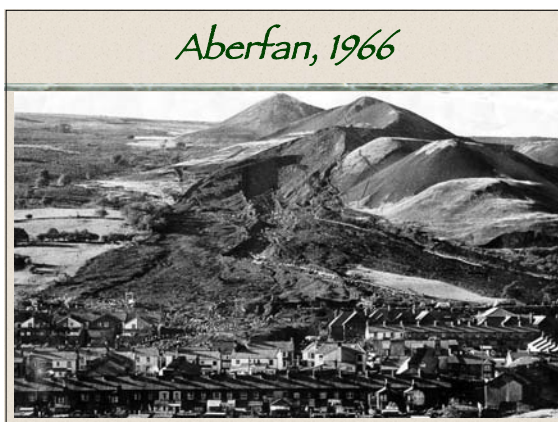
The near-clockwork timing of eruptions at Yellowstone — 2 million years ago, 1.3 million years ago and 600,000 years ago — show a regular periodicity of cataclysmic eruptions, and suggest a high probability of a future catastrophic eruption. Yet, the zircon and quartz data show the geochemical signature of a waning cycle.

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Unnatural Disasters

- ❖ Amplification of natural phenomena
 - > Increased urbanization
 - Between 1990 and 1995, Worldwatch says, "the cities of the developing world grew by 263 million people — the equivalent of another Los Angeles or Shanghai forming every three months".
 - > Increased densification
 - > Anthropogenic Impacts on the natural environment
- ❖ Conflict

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Aral Sea




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Aral Sea cont'd

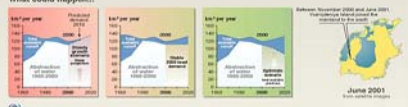
Will the Aral Sea Disappear Forever?
The last 40 Years and Alternative Future Scenarios

What has happened...



1957, 1977, 1982, 1984, 1993, November 2000

What could happen...



Between November 2000 and June 2001, the Aral Sea experienced a dramatic rise in sea level.

June 2001

Source: United Nations, UNEP, World Bank, Scientific Information Center of International Cooperative Water Commission (SICWC), International Fund for Saving the Aral Sea (IFAS), The World Bank, Ministry of Agriculture and Forestry Administration (MARA), United States Geological Survey (USGS), Earthwatch Institute, Ministry of Environment and Forestry, United States Department of the Interior, 2000.


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World Wars

- ❖ World War 1 - 66,000,000
- ❖ World War 2 - 62,000,000


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Questions



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Next Lesson



The Livable City

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