- Earth, Planetary, and Space Sciences 13: Natural Disasters
  - Overview
    - More than half of this course associated with climate change
    - Species extinctions are proceeding presently at a pace without precedent since five extinction events associated with extraterrestrial impacts or extraordinary volcanic events: we are on the precipice of a Sixth Extinction
  - Role of the scientific method for investigating these issues
    - Dangers of post-truth, alternative facts, and fake news
      - Slick presentation is often more "appealing" than real information from scholars
      - Fact checking is rarely performed
    - Sturgeons' rule for the internet
      - 90% of what you find is wrong; sourcing information and fact checking is imperative
      - Pommer's Law: internet misinformation often transforms “no opinion” into “wrong opinion”
      - Godwin's Law: statistical average of public opinion (collectively) sometimes better than opinions of individuals
    - Qualifications of experts; opinions are not equal, criticality of evidence; need to assess combination of the following
      - Education
      - Talent
      - Experience
      - Peer review (degrees, licenses, certification, awards)
    - Era of misinformation: techniques employed (e.g., tobacco industry & climate change deniers, like fossil fuel industry)
      - Issue or claims are controversial; disagreement among scientists
      - Quality of data used by scientists is poor, possibly fraudulent
      - More time is needed to get better data
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- Natural disasters can be characterized by their degree of association with climate change
  - Natural disasters not directly associated with climate change
    - Earthquakes
    - Volcanoes
    - Tsunami
    - Impact events (meteorites, asteroids, and comets)
  - Natural disasters partlypotentially associated with climate change
    - Mass wasting (landslides)
    - Soil subsidence (sinkholes) and soil erosion/desertification
    - Space weather (falsely claimed by deniers as source of change)
  - Natural disasters directly associated with climate change
    - Extreme weather events
    - Hurricanes with increased frequency and magnitude
    - Tornadoes with increased frequency and magnitude
    - Flooding with increased frequency and magnitude
    - Coastal erosion
    - Storm surges associated with sea surface temperature rise
    - Eustatic sea level rise (thermal expansion of deep ocean); land-based glacial melting; land-based glaciers sliding into ocean
    - Wildfire frequency and magnitrude (plus soil erosion and transport)
    - Pandemics due to migration of pathogen sources, disease vectors; zika, chikungunya, Ebola, tropical diseases (e.g. malaria)
    - Global climate changte via changing wind and ocean currents
    - Alteration in geographic distribution of rainfall and effects on crops, drought
    - Overpopulation and resulting famine/droughts
    - Local conflict and potential for escalation; India-Pakistan border and nuclear weapons
    - Increasing growth of atmospheric greenhouse gases

- Need to cease fossil fuel burning
- Need to sequester carbon dioxide to restore pre-industrial revolution atmospheric composition
- Need to find sustainable and renewable energy alternatives

▼ Human impacts

▼ Role of diversity

- Historical racism (Hurricanes Katrina and Edward and role of segregation)
- Socioeconomics and extreme poverty; lack of infrastructure, capacity to treat victims of disaster (Haitian 2010 earthquake); implicit segregation
- Post-colonial authoritarian governments, illiteracy, inadequate public health resources and water supply

▼ Role of ignorance and denial

- Failure to evacuate during Katrina, Superstorm Sandy
- Failure to seek higher ground during post-earthquake tsunamis in Andaman Island/Sumatra M9 earthquake, 12/16/2004; also, Chile
- Failure to maintain fire prevention standards and eliminate underbrush in forested areas, and not allowing natural fires to reduce cataclysmic fire threat
- Anti-vaccination movements (Jenny McCarthy) and fake autism scare (fraudulent physician Andrew Wakenfield); MMR, TDaP, and Polio vaccinations needed, with rising risk and potential for major outbreaks

▼ Role of human fossil fuel burning and waste mismanagement

- Anthropogenic carbon dioxide 125 ppm over normal value (over 16 Ma) of 280
- Level could rise to 1100 ppm by end of century
- Leads to oceanic acidification (carbonic acid)
- Latter, coupled with ocean current change triggered by anthropogenic global warming, leading to massive species extinctions due to disappearing food sources, etc.
- Disposal of waste materials in landfills and the oceans (especially non-biodegradable plastics)

- Each American/European is contributing 20 tons of carbon dioxide to the atmosphere each year and is burning approximately 10 kW of energy all of the time; pre-industrial equivalent values were 50 times smaller