LECTURE #1: Course Overview and Introduction to Natural Disasters

Date: 8 January 2025

***** RECITATIONS BEGIN NEXT WEEK (Jan. 13, 2024) *****

I. Course Details

- course instructor:
  - Prof. Michael Ramsey
  - Office: SRCC 509/511
  - Email: mramsey@pitt.edu
  - Office hours: Tu, Th (3:00 pm - 4:00 pm)

- recitation teaching assistants (TAs):
  - Emrah Ozpolat
  - Office: TBA
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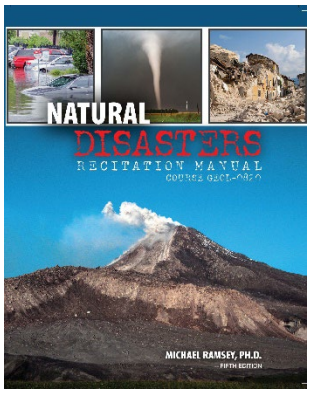
  - Office hours: TBA
  - Adnan Deshaee
  - Office: TBA
  - Email: add138@pitt.edu
  - Office hours: TBA

- important information:
  - text books:
    - "NATURAL DISASTERS (12th ed.)," by P.L. Abbott. *McGraw Hill Publishing* (ISBN: 978-1-264-09116-4), 2023.
    - "NATURAL DISASTERS: Recitation Manual" (5th ed.), by M.S. Ramsey. *Kendall Hunt Publishing* (ISBN: 979-8-3851-2098-7), 2024.



  - **Website/Syllabus:**
    - **http://ivis.eps.pitt.edu/courses/geol0820/**
      - *Note: this is not Canvas, but I will post this link there as well*
      - *bookmark this link – it is the syllabus and the link to the schedule & online notes can be found at the bottom of the page*

  - exams:
    - two mid-term and one final examination *(all non-cumulative)*
      - multiple choice format
      - I will drop the lowest of the two mid-terms
    - everyone **must** take the final exam
      - ***final exam: Wednesday, 4/30/25 @ 8:00 am!***

- recitations:
  - everyone must be registered for a recitation section
  - these are mandatory and account for a larger % of your final grade
  - *see note on the syllabus about switching into under-enrolled recitation sections*

- curving
  - if needed, I will curve based on the final averages of the class
  - I curve based on the average of the entire class, making the median score equal to a C+ / B-
  - *please do not ask what the curve was after each exam*

- grading
  - mid-term exam = 30%
  - final exam = 30%
  - recitation = 35%
  - class participation = 5%

  - recitation grades:
    - solely the responsibility of the TAs
    - could be based on quizzes, laboratory/computer exercises, in-class problem sets and/or homework
    - TAs also have input into your class participation grade

  - final letter grades:
    - >100%: **A+**, 100% - 92%: **A**, 91% - 90%: **A-**, 89% - 88%: **B+**, 87% - 82%: **B**, 81% - 80%: **B-**, 79% - 78%: **C+**, 77% - 72%: **C**, 71% - 70%: **C-**, 69% - 68%: **D+**, 67% - 62%: **D**, 61% - 60%: **D-**, <60%: **F**

- email
  - I regularly communicate course information using email
  - so, please check your email and keep your pitt.edu mailbox from filling up

II. Disasters: Very relevant over the past two decades

- tsunami disaster in South Asia (2004)
- Mt. St. Helens eruption (2004)
- multiple hurricanes in Florida
  - flooding here in Pittsburgh (2004)
- Hurricane Katrina (2005)
- Haiti earthquake (2010)
- Japan earthquake & tsunami (2011)
- Hurricane Sandy (2012)
- Hurricane Maria (2017)
- California wildfires (every year!)

photo: M. Ramsey (2004)

III. What is a Geohazard?

- geohazard:
  - Earth processes involving the lithosphere, hydrosphere, and/or atmosphere, which releases large amounts of energy

- natural disaster:
  - a geohazard interaction with human activity causing loss of life and property
  - important to understand the human element
    - without it, there would be no disaster
    - because of it, the topic/science of geohazards becomes more important every year

Banda Aceh, Indonesia *(23 June 2004)*

Banda Aceh, Indonesia *(28 December 2004)*

US Federal Government Identified Hazards (natural hazards in red)

Dam Safety	Nuclear
Earthquakes	Terrorism
Extreme Heat	**Thunderstorms**
Fires	**Tornadoes**
Floods	**Tsunamis**
Hazardous Materials	**Volcanoes**
Hurricanes	**Wildfires**
Landslides	**Winter Storms**

- *WHY is the human element so critical??*
  - population increase
  - more people living in hazard-prone areas
  - populations are becoming hyper-concentrated
  - examples:
    - today there are 8.1 billion people on Earth ***(~ 4 humans/sec)***
    - by 2037, there will be ~9 billion people
      - this growth rate has slowed in the past decade
      - then, the 9 billion mark was projected to be reached by 2037

    - currently, 55% live in urban environments
    - by 2050, ~ 68% of the population will live in cities
      - of these cities, 40% are coastal
      - more prone to severe storm and tsunami damage
      - and a large majority lie in areas subject to other geohazards (volcanoes, earthquakes, etc.)

- Deadliest Disasters (1970-2020)

Fatalities	**Date**	**Event**	**Country**
655,000	1976	Earthquake	China
500,000	1970	Hurricane	Bangladesh
316,000	2010	Earthquake	Haiti
220,000	2004	Tsunami	South Asia
159,000	2010	Earthquake	Haiti
140,000	2008	Hurricane	Myanmar
139,000	1991	Hurricane	Bangladesh
88,000	2005	Earthquake	Pakistan
84,000	2008	Earthquake	China
66,000	1970	Earthquake/Landslides	Peru
56,000	2010	Heat Wave/Fires	Russia
40,000	1990	Earthquake	Iran
26,200	2003	Earthquake	Iran

- Economic Losses

	1950-59	**1960-69**	**1970-79**	**1980-89**	**1990-99**	**1950-1999**
number of great events	21	27	47	63	91	2.1 times
economic losses*	48.1	87.5	151.7	247.0	728.8	6.6 times
insured losses*	1.6	7.1	14.6	29.9	137.7	24.8 times

** in billions of $US (2005)*

- Common misconceptions:
  - thinking Earth is not a closed system
    - material is neither lost/gained
    - pollution never truly disappears

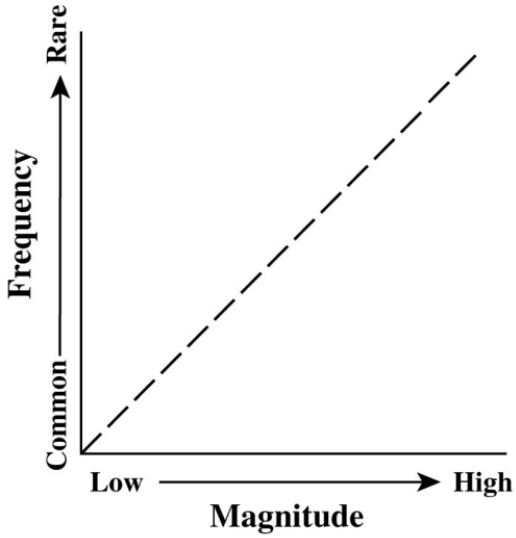
  - "out of sight/out of mind"
    - displaced problems

- frequency of the event
  - "major events will not happen to me (or happen where I live)"
  - human memory is short compared to the geologic time scale

- *So, what is the GOAL here??*
  - cannot stop the geologic processes
  - cannot stop the population growth/expansion
  - therefore, we must try to reduce (mitigate) the hazards through:
    - scientific study
    - population education → ***YOU!***
    - changes in engineering/building practices
    - development of management plans and hazard response scenarios

IV. Time Scales

- Magnitude vs. Frequency
  - (M): how powerful (amount of energy released) an event is
    - for example, high M hazards happen with low F, but are much more destructive
  - (F): how often a given event occurs in a certain region
    - <u>return period:</u> number of years between the same sized event
    - equivalent to the amount of energy released in the event
  - how does this impact probability estimates?



- Scope
  - (S): area affected by a given hazard
    - <u>local:</u> landslides, floods, EQ, fire …
    - <u>regional:</u> tsunamis, volcanoes, larger EQ, hurricanes …
    - <u>global:</u> large volcanoes, global warming, meteorite impacts …