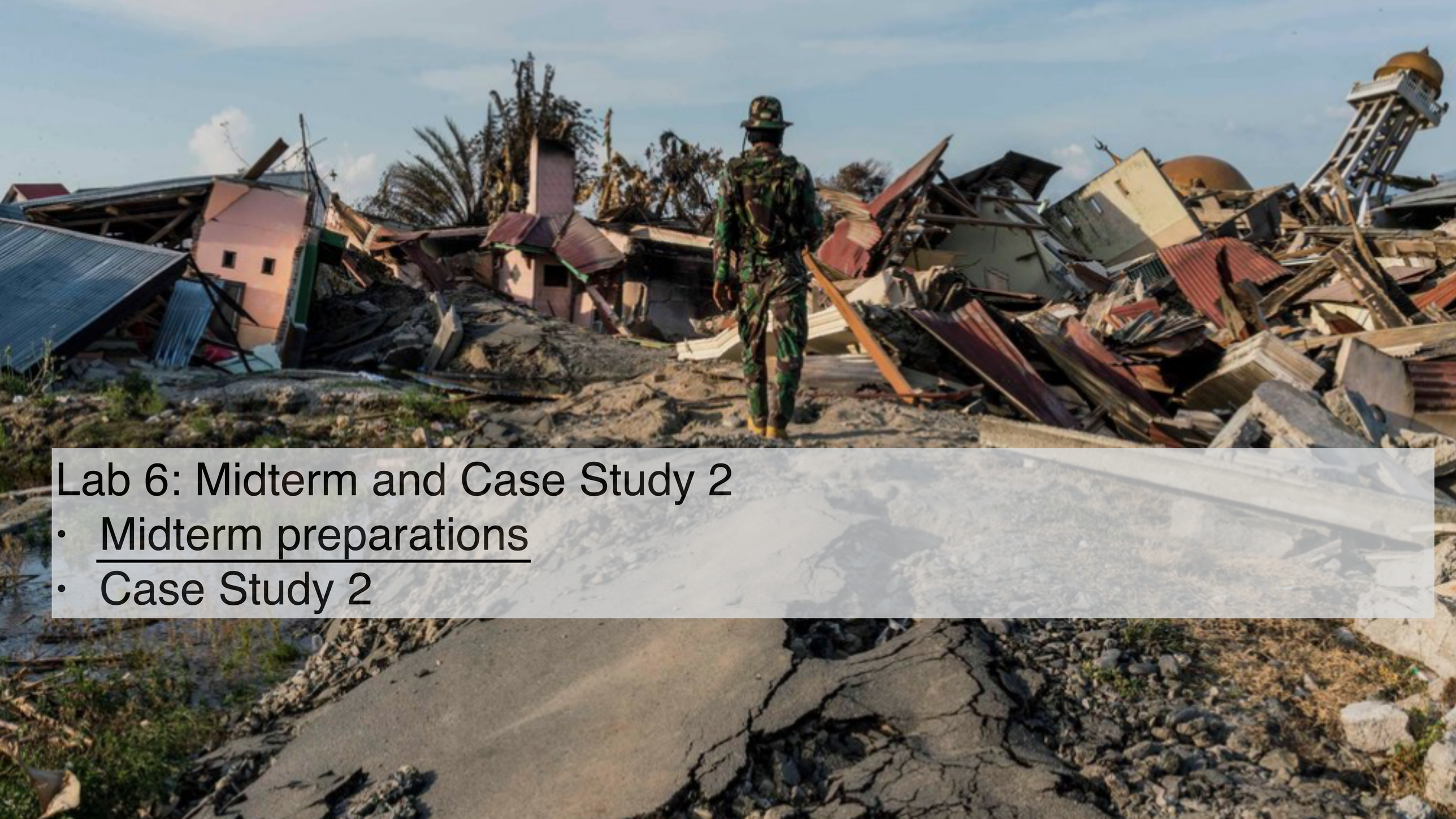


Lab 6: Midterm and Case Study 2

- Midterm preparations
- Case Study 2

Midterm Preparation

Midterm exam:

- October 22, 2018
- 4:20 PM to 5:30 PM

Three specific examples:

- Extraterrestrial: Carrington Event in 1859
- Earthquake: April and May 2015, Nepal
- Volcanic Eruption: 2010 Iceland

Questions will relate to:

- the hazard: general description of the type, the specific event;
- the disaster: extent of damage and lives lost;
- cascading impacts;
- the specific reasons for the extent of the disaster;
- particulars of the risk management cycle, in particular: risk assessment prior to the event, early warning; impact mitigation, and recovery;
- potential impacts of similar events in the future.

Carrington Event 1859

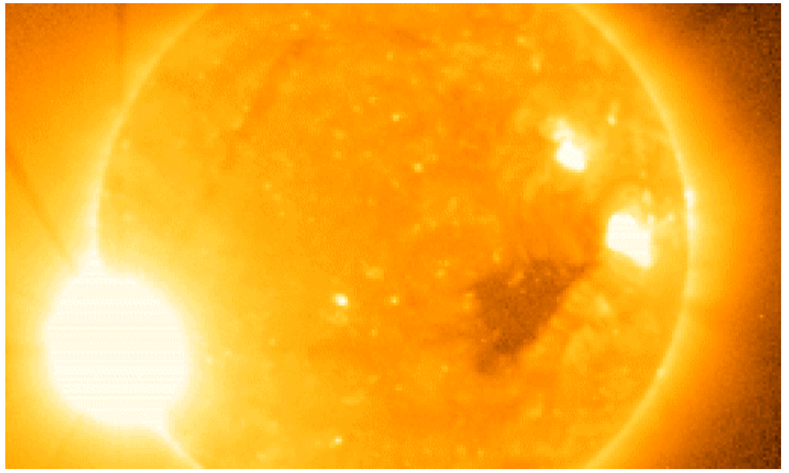
The Carrington Superstorm

Records of major solar flares and their associated coronal mass ejections first began in 1859. Solar flares are classified today according to their strength in watts per square meter reaching Earth, using a lettered scale in which each level is 10 times greater than the next lower rating. For example, an M0 flare is ten times greater than a C9, and an M3 is ten times greater than an M2. The strongest, most damaging flares are given X values, with no upper limit. On September 1, 1859, an intense white-light solar flare was observed by British astronomer Richard Carrington. This was the first recorded observation of a solar flare, which lasted for about 5 minutes and is now classified as an X15 Super Geomagnetic Storm. When the intense burst of energy reached Earth it caused aurora-induced electrical currents in telegraph wires that were sufficient to give electric shocks to telegraph operators. In the hours before dawn next morning, bright auroras were visible as far south as Cuba.

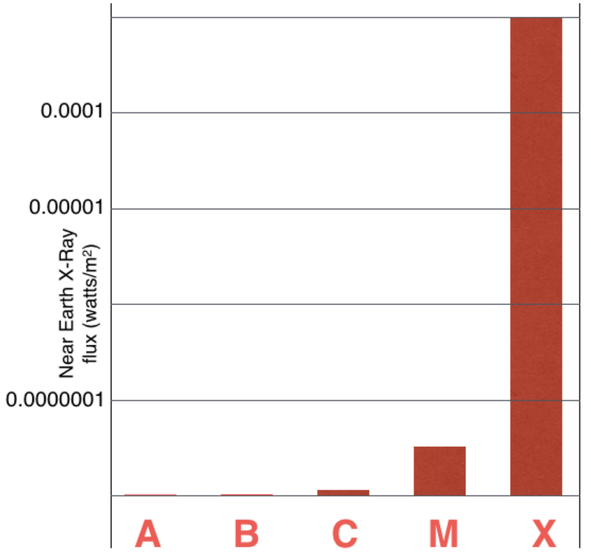
A large solar flare on August 4, 1972, disrupted telephone communication across the state of Illinois and caused AT&T to redesign its power system for transatlantic cable.

On April 2, 2001, an X20 flare became one of the largest so far on record; it generated a 2,000 km/s CME blast that, fortunately, was not directed toward Earth.

The July 23, 2012 solar flare of a similar strength as the Carrington Event nearly hit Earth.



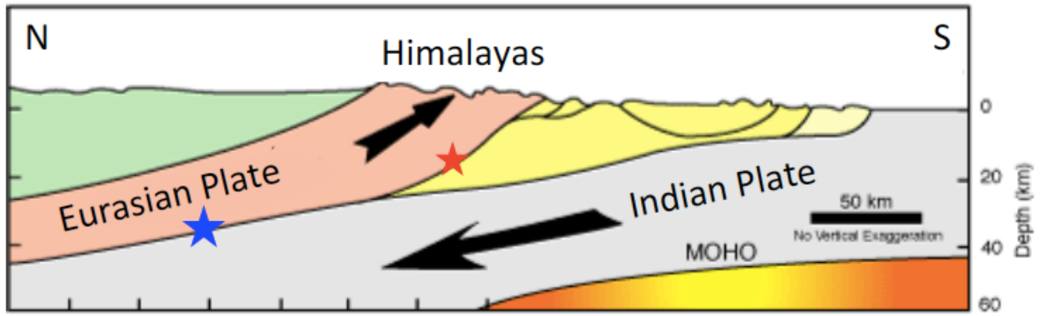
NOAA's GOES-13 satellite recorded this Xray image of a solar flare on December 5, 2006. The flare was not as intense as the Carrington flare, but it still damaged the satellite's imaging instruments.



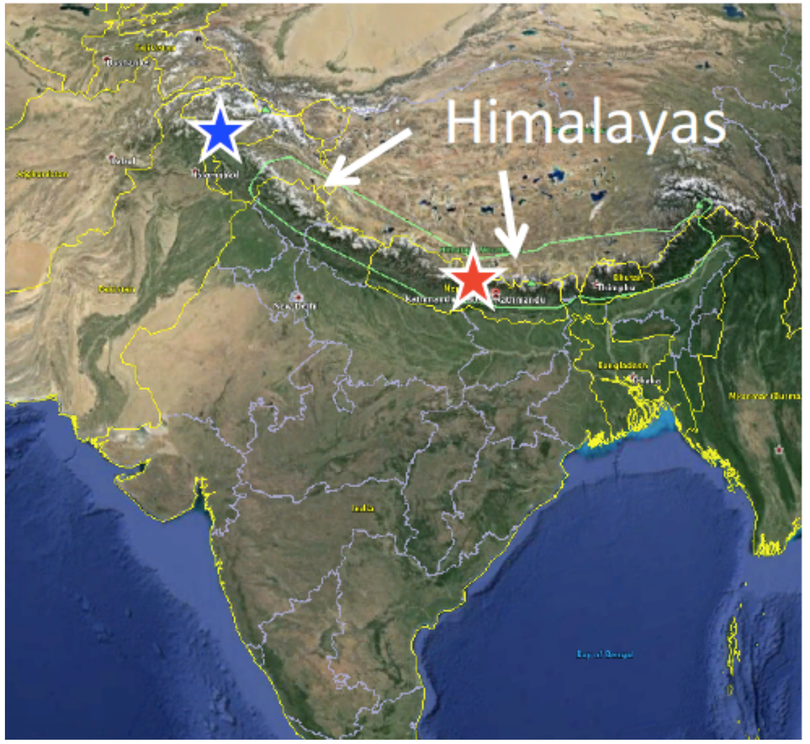
NASA's letter-scale rating of solar flare strength. The logarithmic scale goes from 1 to 9 within each letter, and extends beyond 20 for X-level flares.

April and May 2015 Earthquakes in Nepal

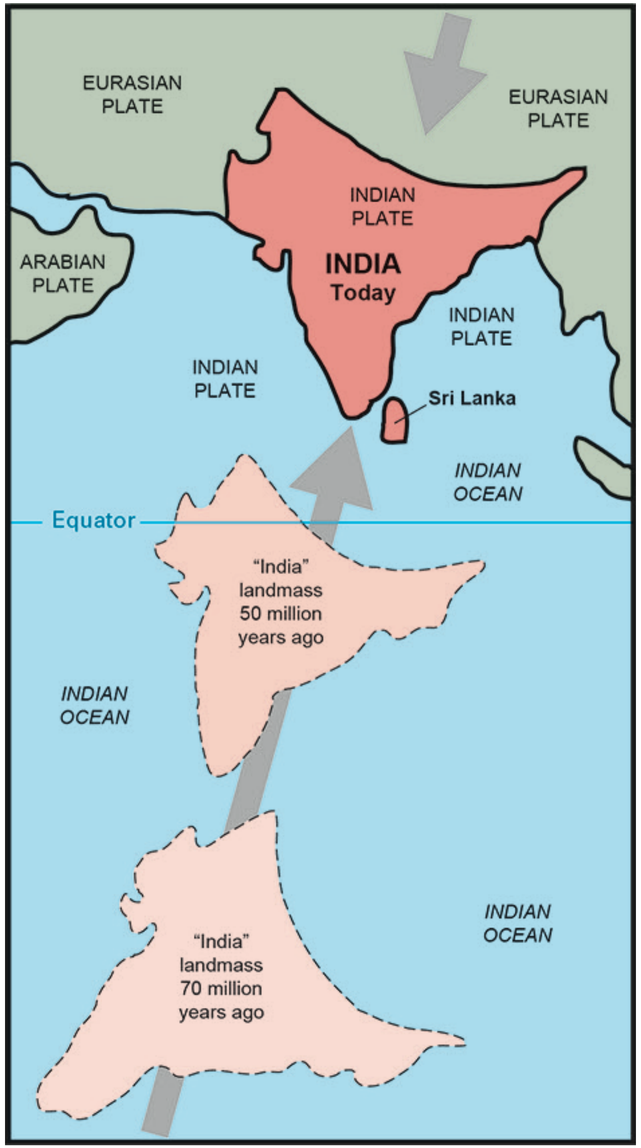
Oct. 8, 2005, Azad Kashmir, Mw=7.6, I=VIII, Depth 26 km
Death 86,000 to 87,000, Damage $5.2 billion



North-South profile of the present Indian-Eurasian plate boundary, with approximate focal depths of the 2005 Kashmir (blue star) and 2015 Nepal (red star) earthquakes.



The Indian Plate's northward migration culminated in continent-continent collision at between 50 and 40 million years ago, causing the uplift of the Himalayas. Epicenters marked by stars on Google Earth image for the 2005 Kashmir (blue) and 2015 Nepal (red) earthquakes.



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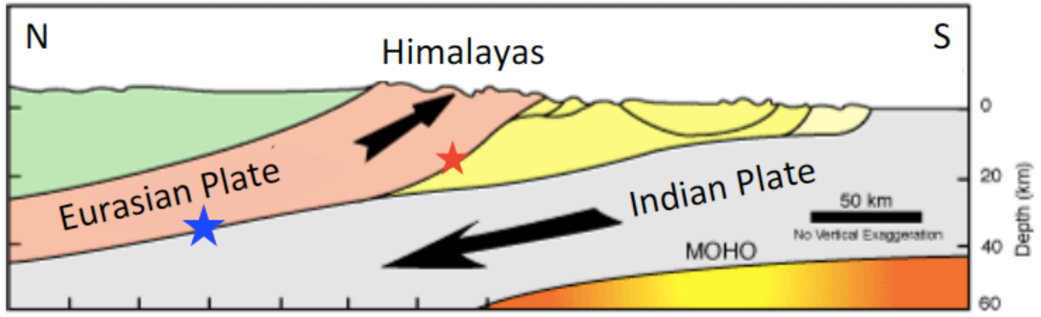
Deaths: 9,000, Damage: $10 billion

May 12, 2015, Nepal, Mw=7.3, Depth 15 km
Deaths: 218



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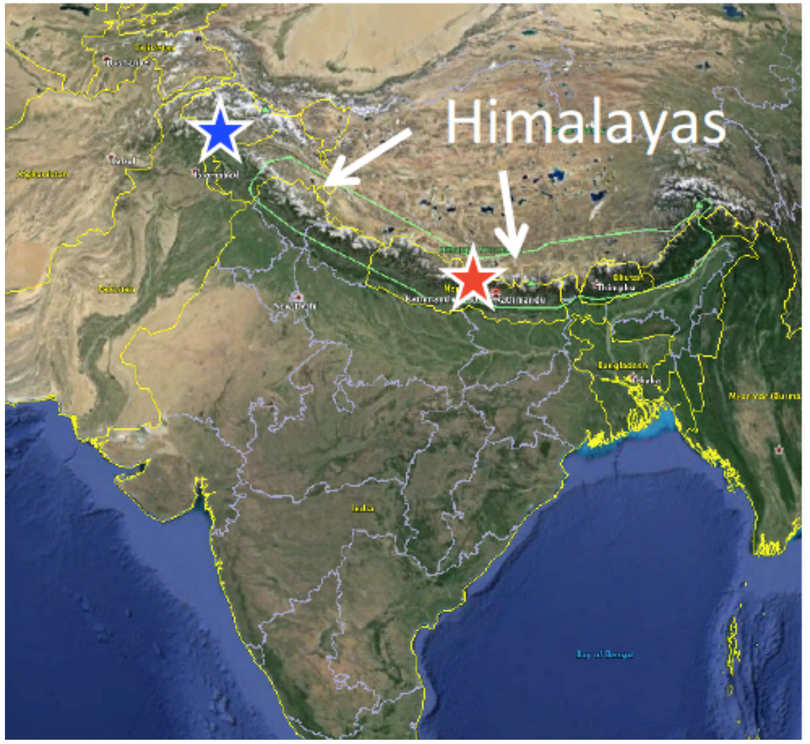

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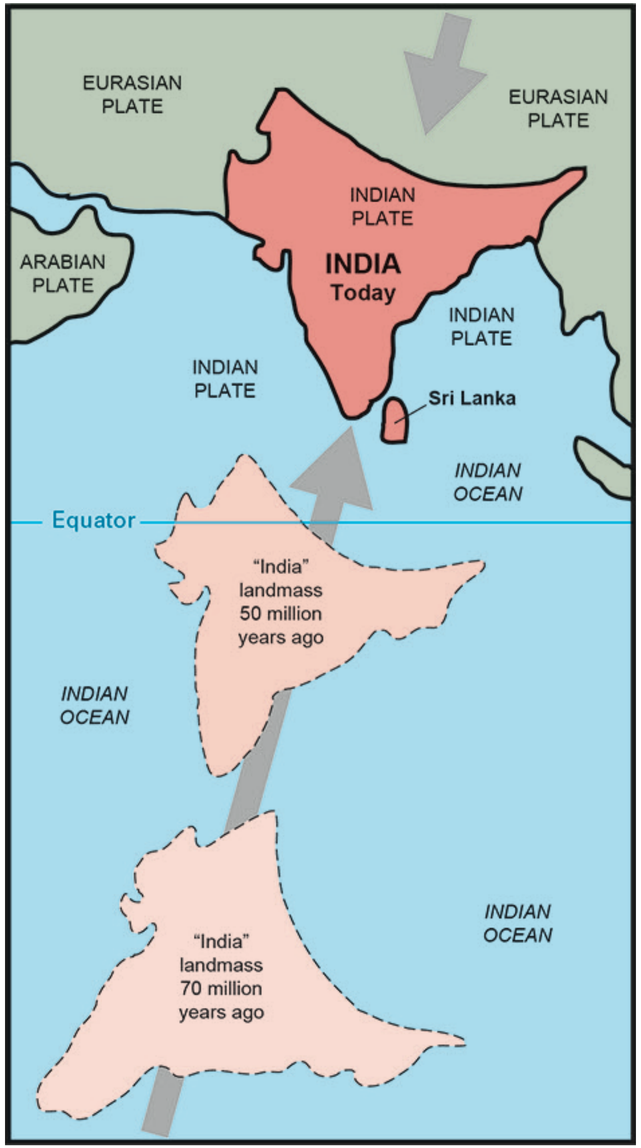

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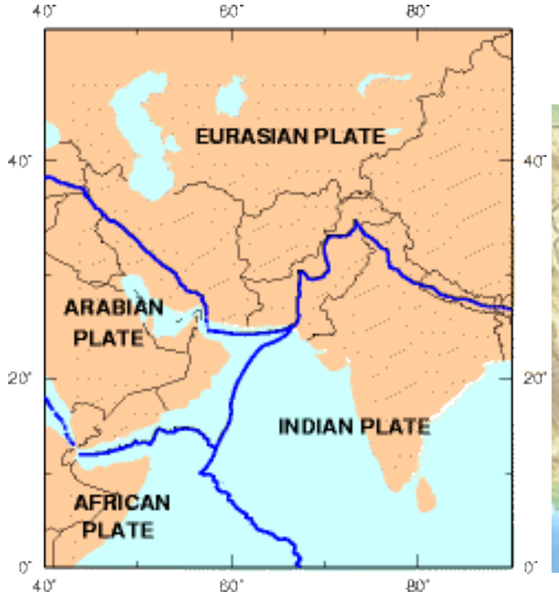

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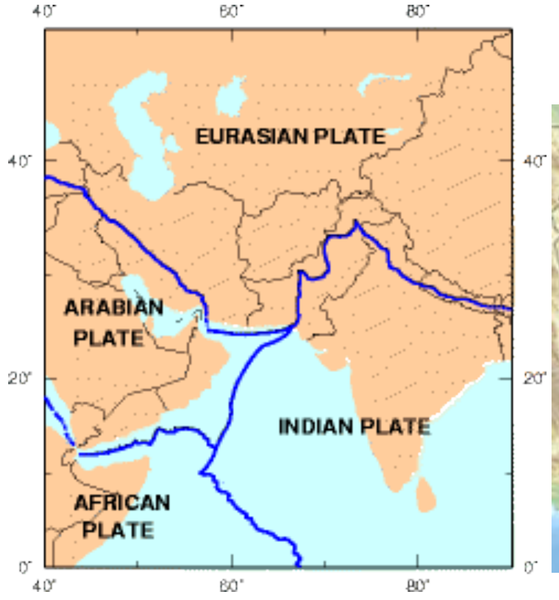

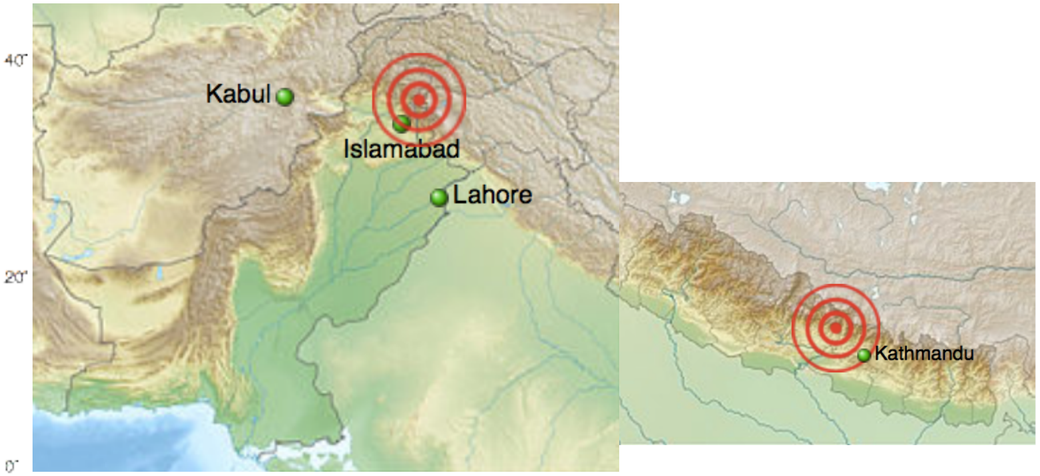

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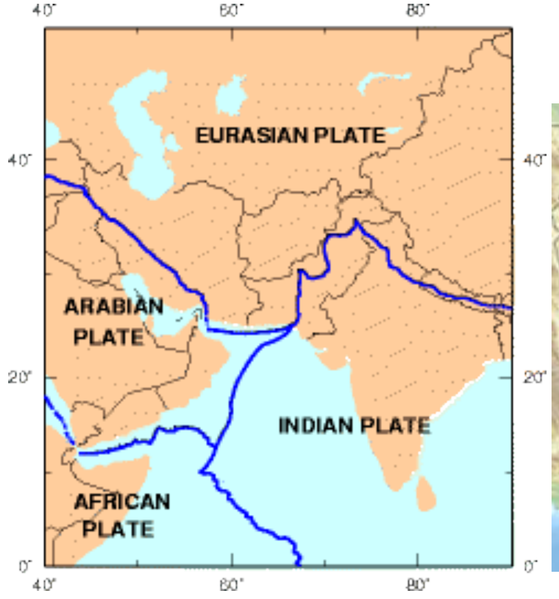

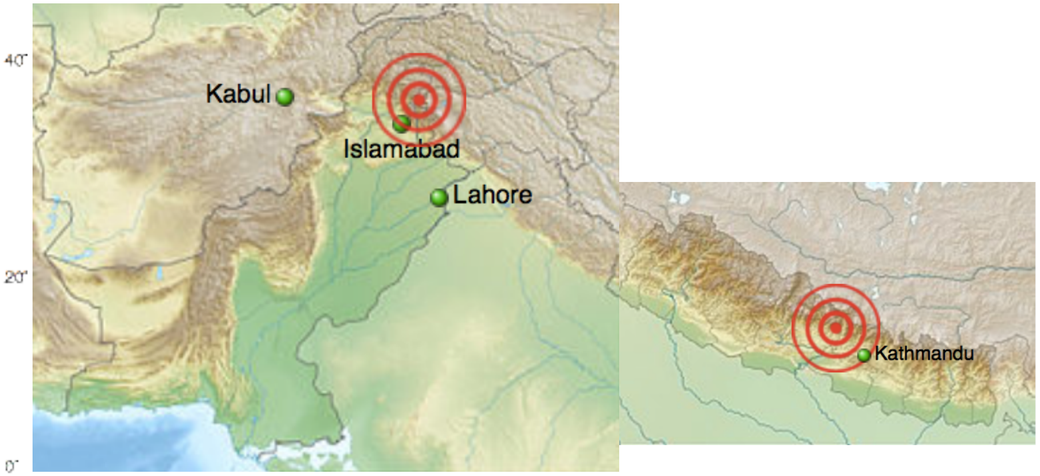

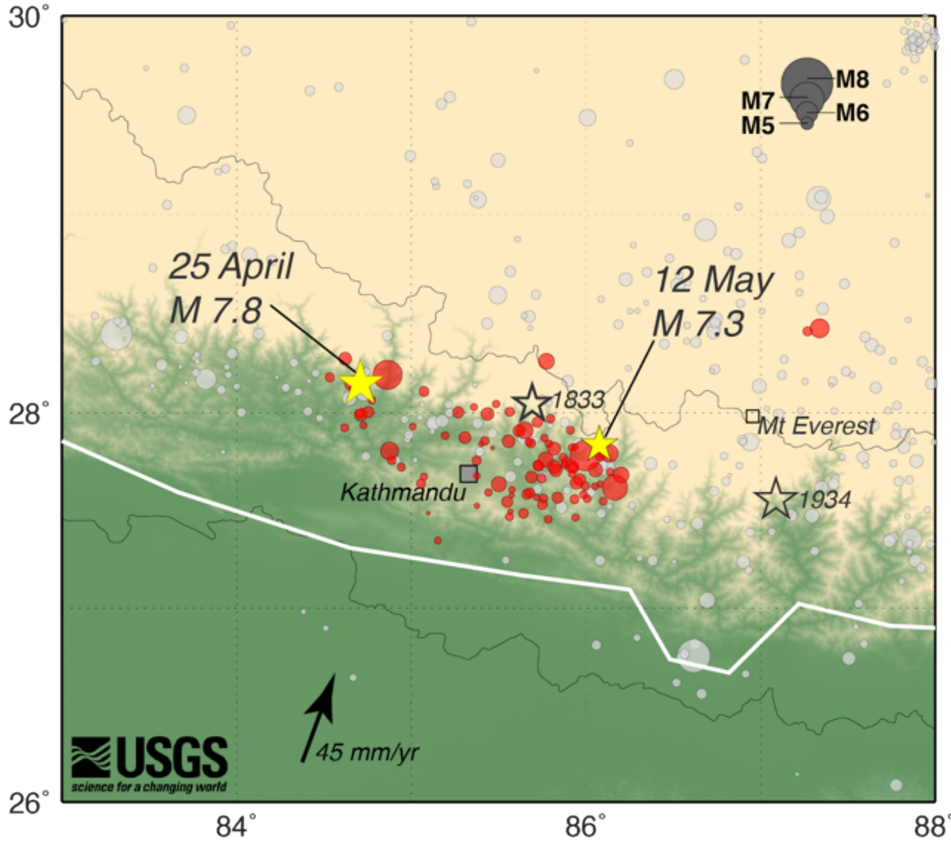

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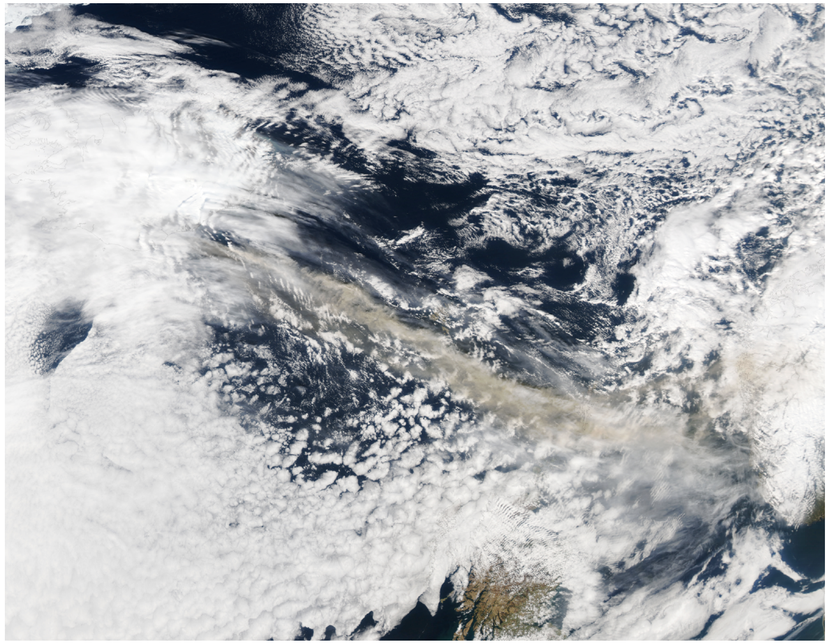
Destruction in Punjab, Pakistan Kashmir, caused by 23 seconds of ground shaking during the October 2005, M_W7.6 earthquake.

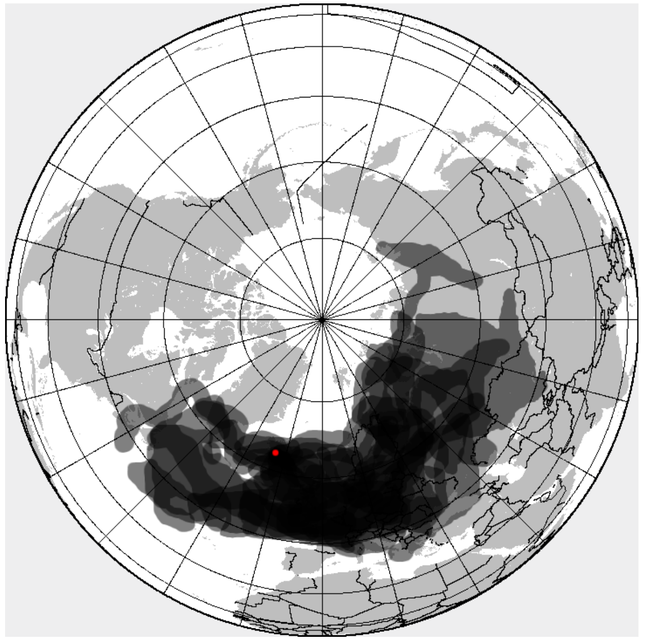
Nepalese village near Gorkha destroyed by a landslide that occurred during the April 2015, M_W 7.8 earthquake.

2010 Eyjafjallajökull Eruptions

Eyjafjallajökull, 2010: VEI 4, 0.25 km^3



Main eruption: April 14-20, 2010



Composite map of the volcanic ash cloud spanning 14–25 April 2010, based on data by the London Volcanic Ash Advisory Centre's website

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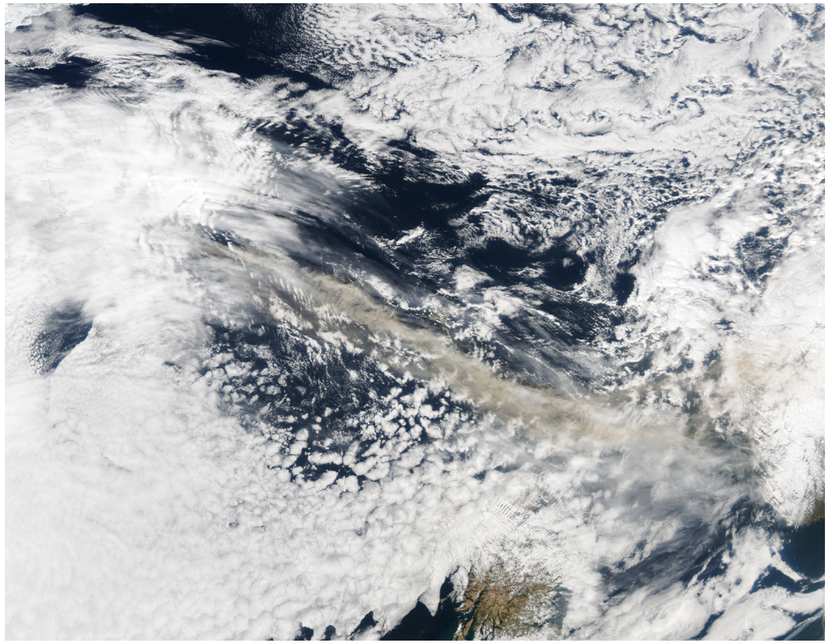
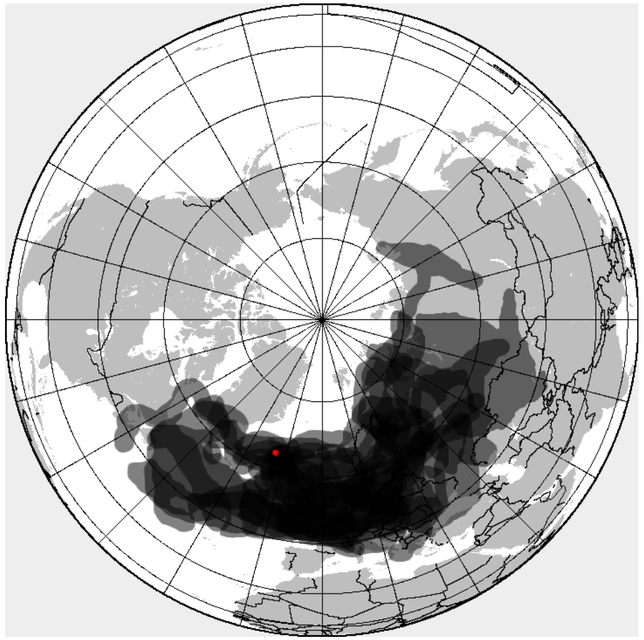


Main eruption: April 14-20, 2010

Laki 1783-85: VEI 6, 14 km^3



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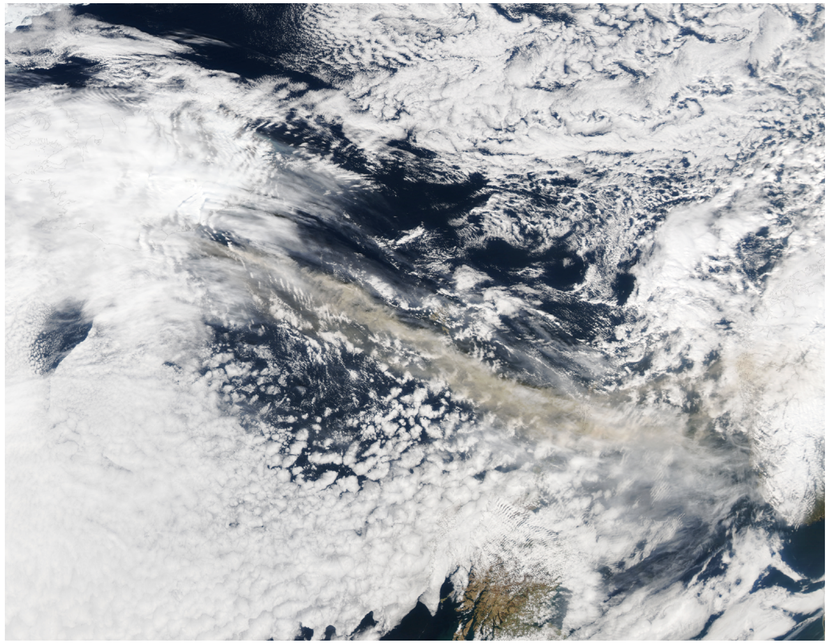
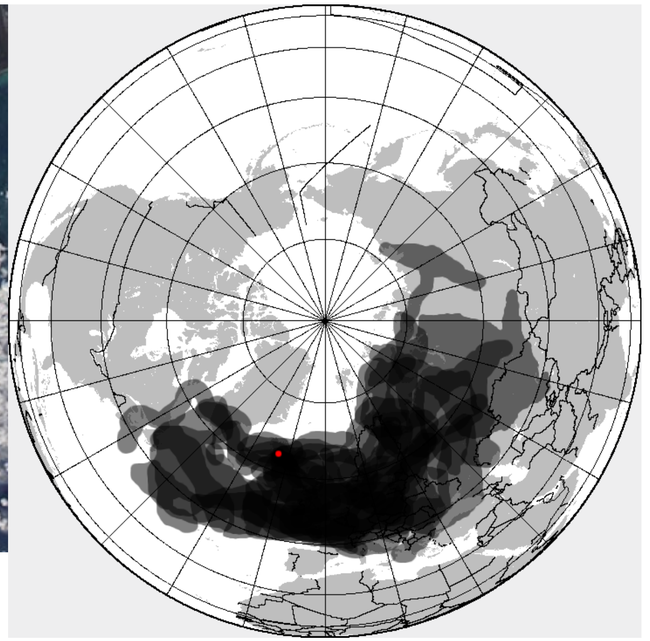


Saturday 17 April — Thick ash poured from Iceland's Eyjafjallajökull volcano when the Moderate Resolution Imaging Spectroradiometer (MODIS) on NASA's Aqua satellite acquired this image on April 17, 2010. The ash in this image is at two different altitudes. A concentrated plume rises over a more diffuse cloud of ash, casting a dark shadow on the ash below. The volcano had been emitting ash in puffs that reached between 16 000 (4.9 km) and 24 000 feet (7.3 km), according to the Icelandic Met Office. The higher plume seen here is likely from a more explosive event. NASA image Monday 19 April.



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https://www.bgs.ac.uk/research/volcanoes/icelandic_ash.html

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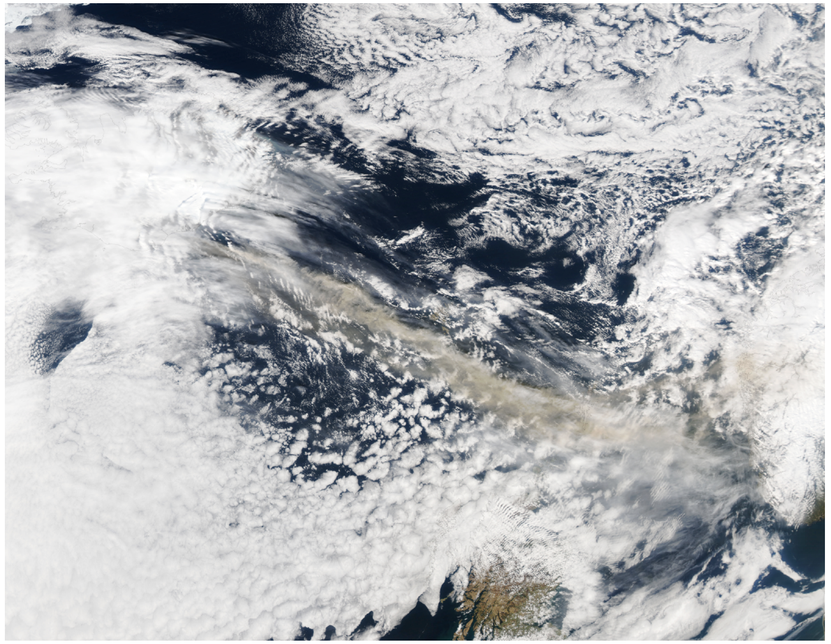
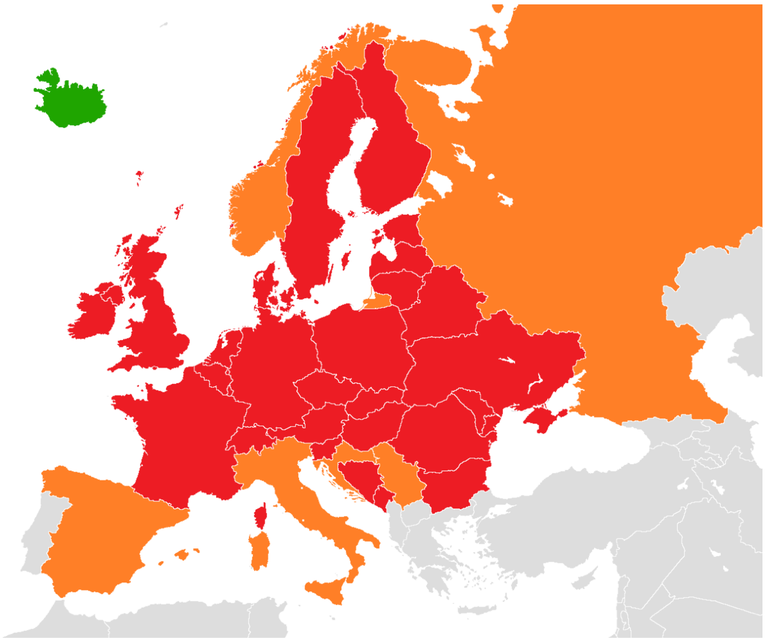
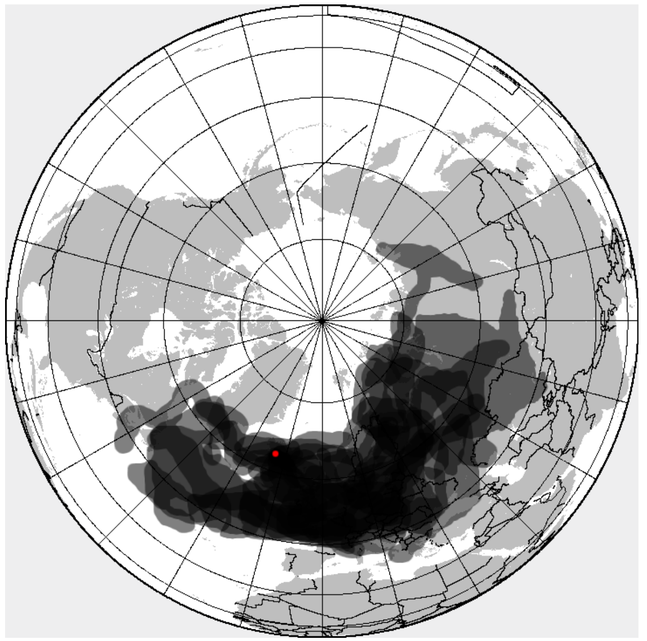


Major airspace restrictions between April 14 - 23, 2010



Airspace completely (red) or partially (orange) closed to IFR traffic on 18 April 2010



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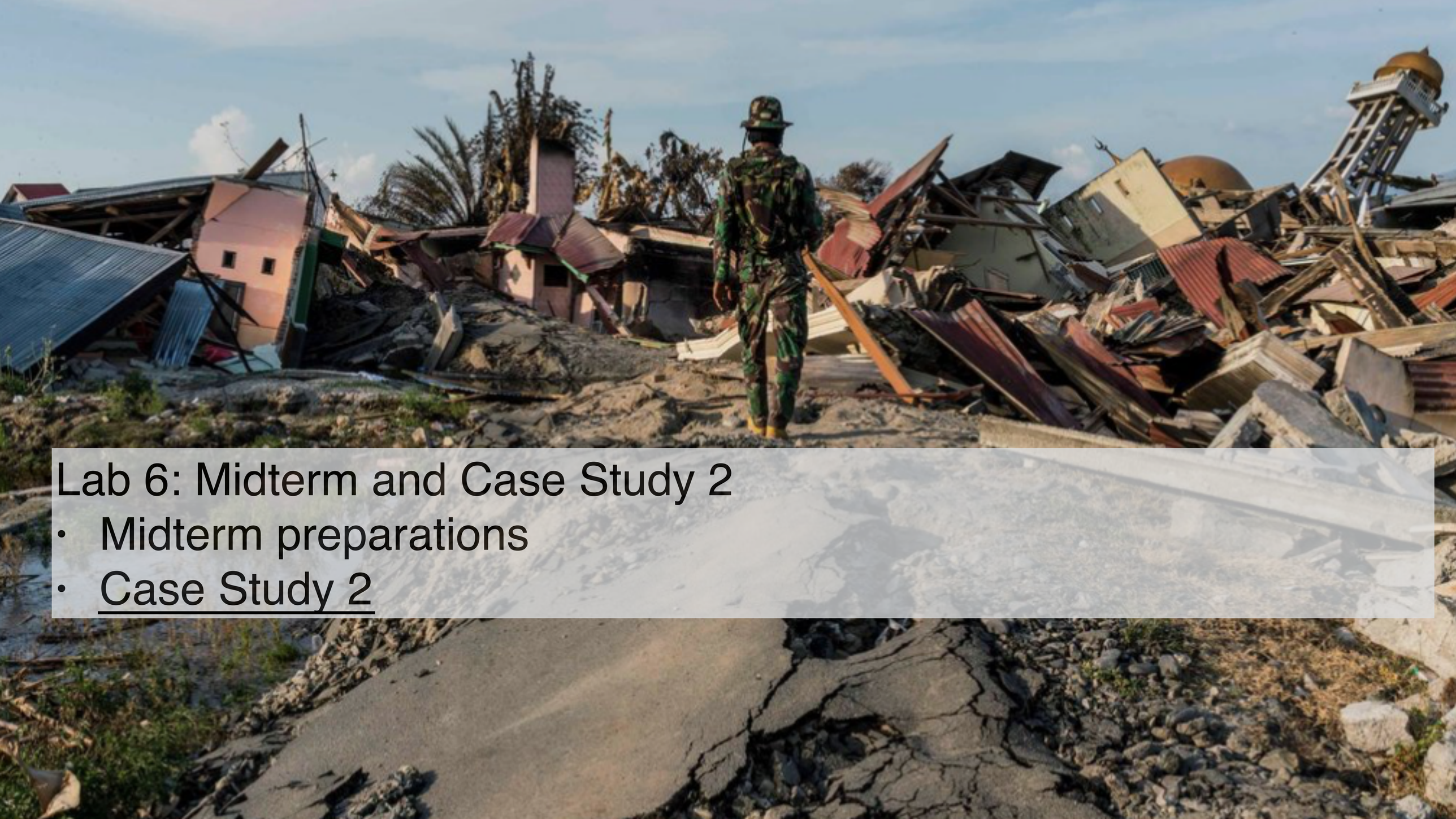

Lab 6: Midterm and Case Study 2

- Midterm preparations
- Case Study 2

Case Study 2: Geohazards

See **guidelines** at http://www.mari-odu.org/academics/2018f_disasters/index.php?file=case_study2

Select **one case** of a geohazard that has happened in the past.
The choice of the case is up to you, but you should select a case for which you can find evidence.

Draft: October 24, 2018 (optional)
Comments: October 28, 2018
Final paper: November 2, 2018

Length: 1,500 (not 1,200) words minimum, 2,000 words of text maximum.
Figure captions and reference citations are not included in the word count.

Readership: Non-expert audience.

Format: Typed, please. One-and-a-half line spacing preferred.
Start with the title of your Case Study.
Write you name and the class identifier below the title.

Case Study 2: Geohazards

Contents: The paper should have five sections:

1 Introduction:

- Which type of hazard, which event, where and when.
- What scientific reasoning makes this event relevant to study?
- Is an event of the type and size you selected frequent or of very low probability?
- What are the potential impacts of such an event?

2 The Hazard

- Describe the hazard, it's type, origin, physical/chemical characteristics, as well as the spatial and temporal extent and severity.
- If there is a scale to measure the severity, explain this scale and provide the rating of the event.
- Give details of the event (time, duration, location, etc.).

3 The Resulting Disaster

- What are the main direct impacts and losses?
- What losses occurred subsequently or indirectly?

4 Risk Management

- How was pre-event awareness and preparedness, risk perception?
- Were there any early warnings and did they have effects?
- Did the response made the disaster worse or less pronounced.
- How was recovery?

5 Concluding Remarks

- How is preparedness for a similar event in another region?
- What are the main impacts that could occur in this region?
- What is the awareness for such hazards there?
- Are there published plans to improve awareness and preparedness it in future?

References

Case Study 2: Geohazards

Figures, Diagrams, Tables:

- Include at least one picture relevant to the hazard and/or the disaster caused by the hazard.
- Cite the source of any pictures and include a short captions explaining the figure.
- Place the caption below the figure.
- The caption is not included in the word count.
- If you use a table, place a caption above the table.
- Refer to the figures/tables in the text.

Sources and Citations:

- Use at least three different peer-reviewed sources for your research!
- Citing of web pages without authors/dates is not acceptable.
- If you use Wikipedia pages, go to the original data sources wherever possible.
- If you use newspaper articles, try to locate the scientific papers they often refer to.
- Cite the sources in the text.
- Avoid quotations (unless you quote an eye-witness). If you quote, use quotation marks and cite the source. No more than 20 words in a quote!
- Included in the list of references only sources that were cited in the text.
- Use the Council of Scientific Editors (CSE style) for citations and references.

Send questions to me by email.

If you want to discuss “your” event, send the proposed event to me asap.