SIO 15 (FQ 2025) – Homework #2 Due October 14, 2025 (11:59 pm, no grace period)
Maximum score: 20 points + 1 bonus point
Divide by 4 for contribution to total cumulative

If you have not done so already, register on Gradescope and watch the Gradescope video on geowiki. When first registering on Gradescope, provide your UCSD email address, your full name (your family/last name first) AND student ID. We need your student ID to properly assign your homework!

1) Watch the homework 2 video on the class website! Submission and homework video available on Wednesday 10/8/25.

2) Add your full name (your family/last name first) to the top on each page.

3) Provide only answers (not the questions!) in the document you submit.

4) Label each of your answers (1a, 1b, 1c etc.), starting a new line for each of your answers.

5) Provide short answers. Shorter is better! No full sentences required. Points may be subtracted for answers that are too long/answers not relevant to the question (including cut-and-paste jobs from the class website).

6) include appropriate units where needed (not just numbers). E.g. a distance is 10 km, not 10. Points will be subtracted for missing units.

7) Hand-written ok as long as the handwriting is easily readable.

8) Submit a single pdf to Gradescope. Only submit a high-quality pdf. Cell phone photo scans are not ok!

9) Important!!!!!! After you uploaded your pdf but before hitting the submit button, please identify on which page each of your answers to problems 1 - 10 are. Only when this is completed.
******* Failing to do so will result in a 0.5 pt subtraction.**

10) Double-check that you did all of the above, then hit the submit button.

Topics 4 – 6

1) a) Name the three principal material properties relevant to Earth's rocks? (0.5 pt)
   b) What is Earth's radius? INCLUDE UNITS. (0.5 pt)
   c) What is the radius of the (outer) core, i.e. the radius of the core-mantle boundary? (0.5 pt)
   d) In percent, the core consequently takes up how much of Earth's radius? (0.5 pt)
   e) Using the concept of isostacy, which of Earth's layers floats on which other layer? (0.5 pt)
   (2.5 points total)

2) a) Name and describe the two angles that define the orientation of a magnetic field line. (0.5 pt)
   b) In 2000, what was the position of magnetic north and geomagnetic north? (0.5 pt)
   c) What were these positions in 2020? (0.5 pt)
   d) Consequently, which of the two poles migrates faster? (0.5 pt)
   e) Why do we have both a magnetic north and a geomagnetic north? (0.5 pt)
   (2.5 points total)

3) Flyer 3, lecture notes:
   a) What is the current deviation of Earth's magnetic dipole axis relative to the rotation axis? (0.5 pt)
   b) What is the depth of Earth's deepest earthquakes? (0.5 pt)
   c) Where do these earthquakes occur? (0.5 pt)
   d) How many earthquakes occur on Earth each ~~day~~ year (typo corrected 10/13 5 pm)? Why do people not feel most of these? (0.5 pt)
   e) At which speeds do the Nazca and the Cocos plate move? What is the normal speed of plate drift? (0.5 pt)
   (2.5 points total)

4) a) Relate the three types of earthquakes to the three types of plate boundary. (0.5 pt)
   b) On which type of plate boundary do we find subduction zones? (0.5 pt)
   c) In subduction zones, which type of plate sinks into the mantle? (0.5 pt)
   d) In a subduction zone setting, describe all locations where shallow earthquakes occur. Include plates and relative location to the trench. (0.5 pt)
   e) What does the Wadati-Benioff zone describe? (0.5 pt)
   (2.5 points total)

5) a) What is the approximate speed of a tsunami that travels across an ocean? (0.5 pt)
   b) Using the chart in the book or the lecture notes, and being as precise as possible (include units!), provide an estimate for how long it takes for a tsunami to travel from Kamchatka to Hawaii? (0.5 pt)
   c) The distance between Kamchatka and Hawaii is about 5400 km. Given your estimate under b) what is the speed of your tsunami? INCLUDE UNITS. (0.5 pt)
   d) Follow the link to https://sos.noaa.gov/catalog/datasets/tsunami-historical-series-kamchatka-russia-2025/ this site includes an animation on the spread of the tsunami. Watching the video (you may have to switch to full-screen mode or download the video and play on your device) what was the elapsed time when the tsunami reached the Big Island of Hawaii? (0.5 pt)
   e) If a tsunami-genic quake in Kamchatka occurred at 8 am (HST) is it ok to go back to the beach in Hawaii at 4 pm (HST)? Explain your answer. (0.5 pt)
   (2.5 points total)

CONTINUED NEXT PAGE!!

6) News Clip October 7, 2025:
   a) What is the name of the hurricane that could bring rain to San Diego? (0.5 pt)
   b) At the time of the news clip, the storm could reach which category? What are the expected wind speeds? Include units. (0.5 pt)
   c) Go to Wikipedia and find "2025 Pacific hurricane season". How many people have died from hurricanes so far? (0.5 pt)
   d) What is the average number of named storms? What is the average number of major hurricanes? (0.5 pt)
   e) What is the actual number (combine EPAC and CPAC numbers) for named storms and major hurricanes. Consequently, and ignoring that the season may go for another month, would you rate the current season as average, below-average or above-average? (0.5 pt)
   f) What were the names of the two strongest storms of the season, during which month(s) did they occur, what category did they have?
   (3 points total)

7) Wikipedia, "2025 Kamchatka earthquake":
   a) On which day (UTC) and time (UTC) did this earthquake occur? (0.5 pt)
   b) What was the maximum (local) height of the tsunami? Include units (0.5 pt)
   c) UTC is currently 7 h ahead of PDT. Provide date and time of the event in PDT. (0.5 pt)
   d) On which type of plate boundary (not zone!) did this event occur?
      Which two plates were involved? (0.5 pt)
   e) The quake had a 8.8 magnitude. In which year did a larger event happen?
      What was its magnitude? What was the height of that tsunami? (0.5 pt)
   f) Given the date/time in 7c), your speed given in 5c) and the fact that Kamchatka is about 6800 km from San Diego, at which time (PDT) on which date did the tsunami reach our beaches? (0.5 pt)
   (3 points total)

8) Google Earth (stand-alone or Web browser version ok but Google Earth Pro desktop works best)
   a) Zoom in on the Pacific coast of Mexico. Along the stretch between 15.5 and 20.5ºN, which 5 states have Pacific coasts? (0.5 pt)
   b) Provide the capital for each of the 5 states? Depending on which version of Google Earth you use, you may have to consult additional resources, such as Wikipedia. (0.5 pt)
   c) Provide the population number for each of the 5 states. Depending on which version of Google Earth you use, you may have to consult additional resources, such as Wikipedia. (0.5 pt)
   d) Acapulco was devastated by 2023 Hurricane Otis. In which of the states in 8a) do we find this city? (0.5 pt)
   e) Measure the distance, in km, between Acapulco and San Diego (INCLUDE UNITS! allowed error margin 50 km) (0.5 pt)
      Special hint: you will likely have to place placemarks on top of the marks in for one or both cities before you do a measurement. For the stand-alone app, you need a placemark only for Acapulco.
   (2.5 points total)