

## ERSC 1F90 Summer 2008

### Assignment 5. Identifying plate boundaries on Trafalmadore.

#### Introduction

Aside from causing disasters on Earth, earthquakes provide valuable information about the structure of the Earth, particularly its crust. Earthquakes delineate plate margins, as we saw in the section on the distribution of earthquakes. In this assignment you will use the distribution of earthquakes on the fictitious planet of Trafalmadore (a place created by American Fiction Guru Kurt Vonnegut in his novel "Slaughterhouse Five; or, The Children's Crusade: A Duty-Dance with Death") to determine the location of tectonic plate boundaries and other features that are related to plate tectonics.

In this assignment you are given a map (page 4 of this document) showing the location where earthquakes have taken place on the planet as well as the distribution of land masses that are surrounded by an ocean. You are also given additional data based on the locations of additional earthquake foci within the Trafaladoran crust. You will plot this additional data on the map and to create a cross-sectional diagram showing the distribution of earthquakes with depth beneath the planet's surface.

You should review the lecture material on the distribution of earthquakes in order to interpret the data on the map provided.

#### Materials needed:

All you need is a regular pencil plus a red and blue pencil for the final step.

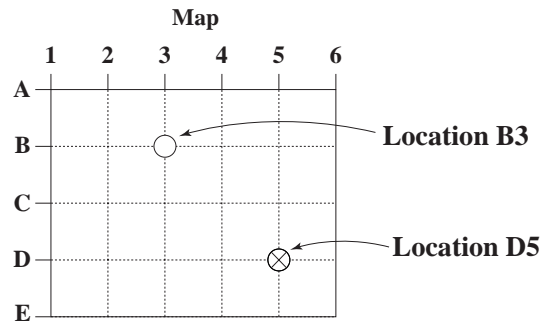
#### Instructions

It is important that you go over the tutorial for this assignment. It is available at the Assignment 5 web page.

1. Complete the map by plotting the additional data listed in the table at the bottom of the Assignment Answer Sheet. The table lists data for 44 earthquake foci that are not plotted on the map. The information includes the location of each focus location on the map (i.e., the epicentre is given in letter/number coordinate) and the elevation of the focus (with respect to sea level) beneath the planet's surface. Note that elevations are negative numbers as all are below sea level (sea level is at an elevation of zero).

Plot a point on the map for the location of each earthquake in the table. If you are not familiar with plotting spatial data the following figure should help.

- Location B3, focus at -45 km elevation.
- ⊗ Location D5, focus at -160 km elevation.



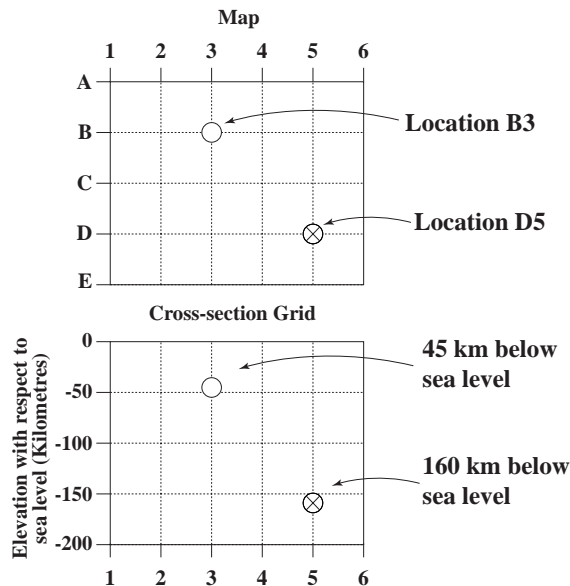
For each focus that you plot use the symbol indicated for focus depth shown in the legend at the top left of the map:

- Plot foci in the range of 200-400 km depth as solid black circles.
- Plot foci in the range 100-199 km depth as open circles with an “X” within it.
- Plot foci in the range 0-99 km as open circles.

By plotting this data you will have completed the map.

2. Plot the depth of each earthquake focus in the table on the Cross-section Grid that is immediately beneath the map. The vertical position of each point is determined by the elevation of the focus (listed for each focus in the table of data) and its horizontal position is determined by the location of the focus across the map (positions 1 through 30). To make this process easier the Cross-Section Grid is in line with the numbered coordinates on the map. The figure, below, illustrates the plotting of points on the map and the Cross-Section Grid.

- Location B3, focus at -45 km elevation.
- ⊗ Location D5, focus at -160 km elevation.



3. You now have a completed map showing the spatial distribution of earthquake foci on Trafalmdore and a cross-section showing the distribution of foci with depth within the planet.

To complete the assignment, do the following:

Sketch the location of all plate boundaries that can be identified on the basis of the distribution of earthquakes:

Show any trenches as a continuous RED line.

Show any oceanic ridges that you think might be present as BLACK lines.

Show the location of any transform faults that might be present as BLUE lines.

**Note: Be very precise in the placement of your lines for these tectonic boundaries.**

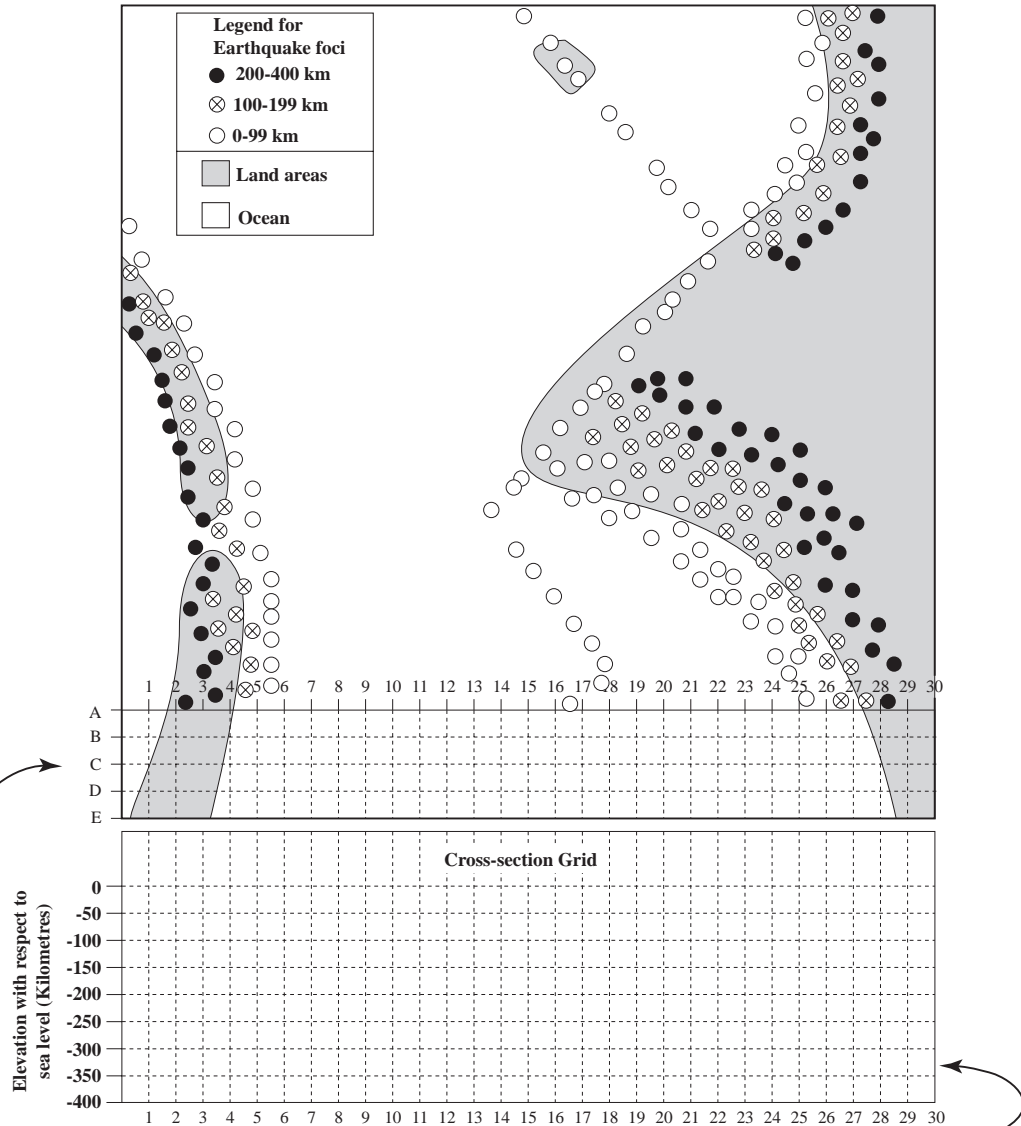
Clearly label the locations of any other features that are due to plate tectonic processes (e.g., the positions where you think that mountain belts, failed rifts, volcanic islands, etc.).

If there are subduction zones on the map area, label the location where subduction is steepest with a large letter "A" (i.e., the subducting slab is descending at the steepest angle) and label the area where the subducting slab is descending at the lowest angle with a large letter "B".

4. Hand in only the completed answer sheet. This assignment must be handed in at the final examination (Friday, August 22, 1400h, location to be announced) **OR** it can be handed in at the course drop box outside of Mackenzie Chown D319 prior to the exam.

Your name: \_\_\_\_\_

Your student number: \_\_\_\_\_



Plot the location of earthquake foci in the table below in the grid at the bottom of the map.

Next, plot the elevation of each focus in the cross-section grid.

Location	Elevation(km)	Location	Elevation (km)	Location	Elevation (km)	Location	Elevation (km)
B30	-314	A26	-62	B4	-95	A5	-60
D3	-116	B15	-6	D2	-198	E4	-24
C30	-271	A29	-256	C4	-80	B3	-152
D17	-5	C5	-10	C3	-130	D4	-70
D30	-262	A4	-115	A16	-8	E29	-140
E27	-37	A3	-175	E28	-85	D27	-52
B5	-48	B28	-172	B27	-106	B29	-251
E2	-185	C28	-121	B2	-270	B26	-41
C29	-242	C26	-15	C16	-15	E1	-230
E18	-12	E3	-90	C2	-225	C27	-62
D1	-265	C1	-310	D29	-186	E30	-195