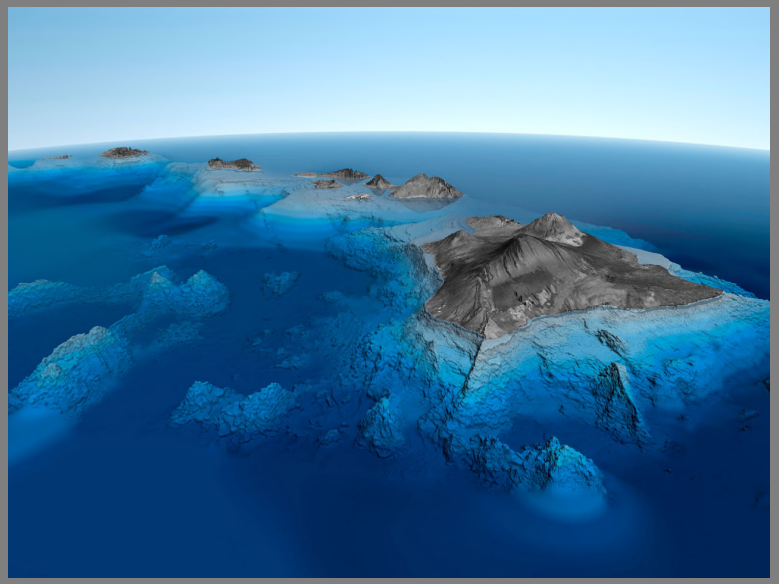
Hawaiian Natural Hazards

Review and Assessment



EOSC105 Natural Disasters Lab

Ray Rector - Instructor

Preview of Hawaii Natural Hazards Lab

I. What are Major Hazards on the Big Island?

Earthquakes
Lava Flows and Vog
Landslides
Flooding
Tsunami
Giant Surf

II. Examine each type of hazard using maps

Each table has a set a maps for a specific hazard
Reader handout broken down by hazard

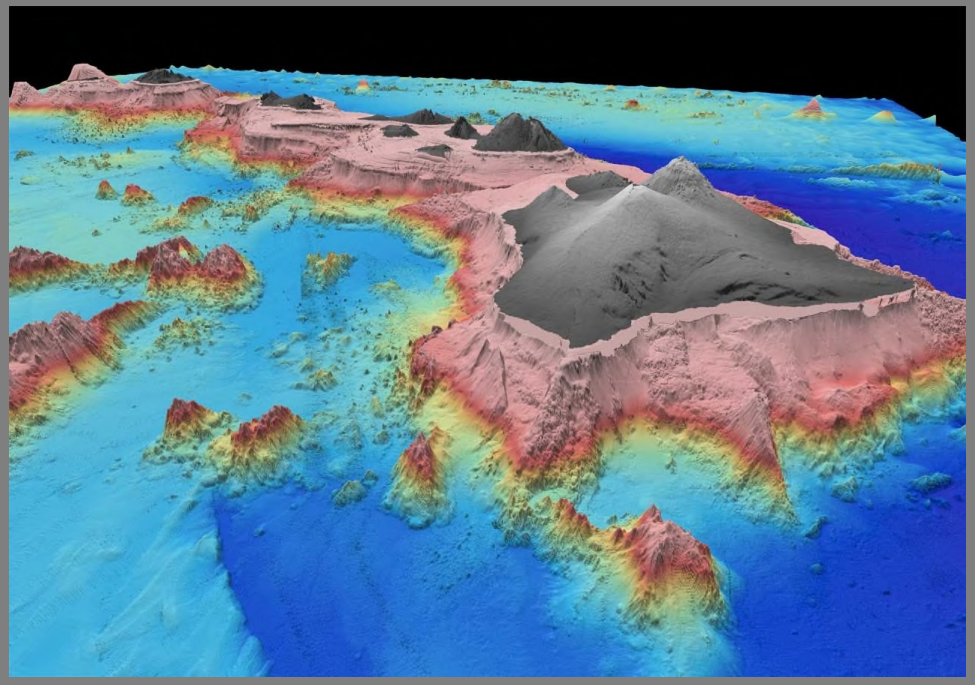
III. Assess each type of hazard

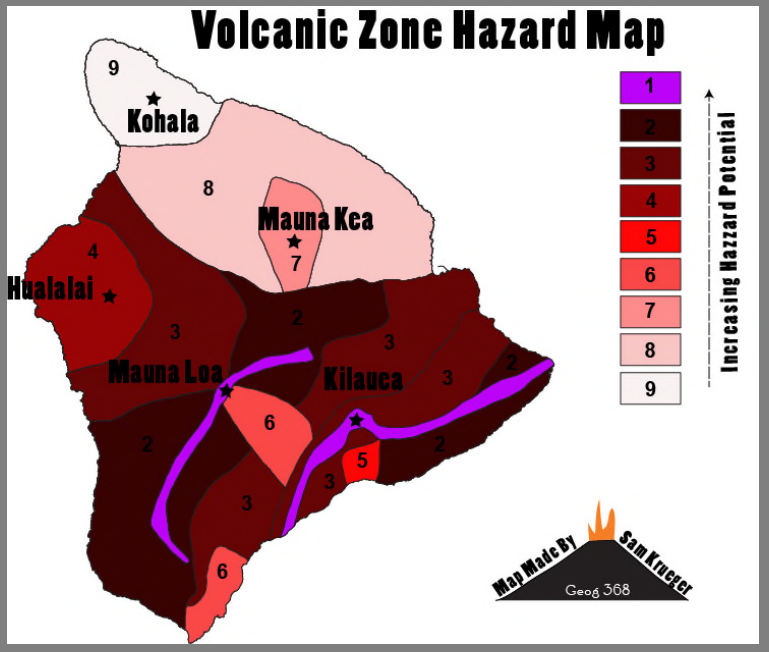
Location/Frequency
Origin/Causes
Magnitude/Extent
Damage/Mitigation

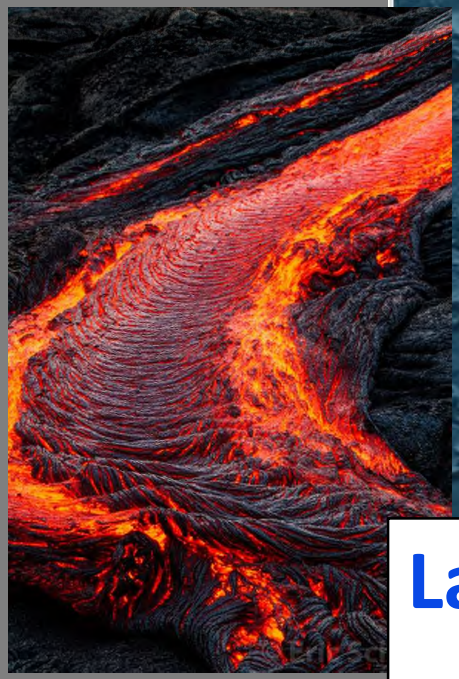
HAWAII HAZARD ASSESSMENT EXERCISES

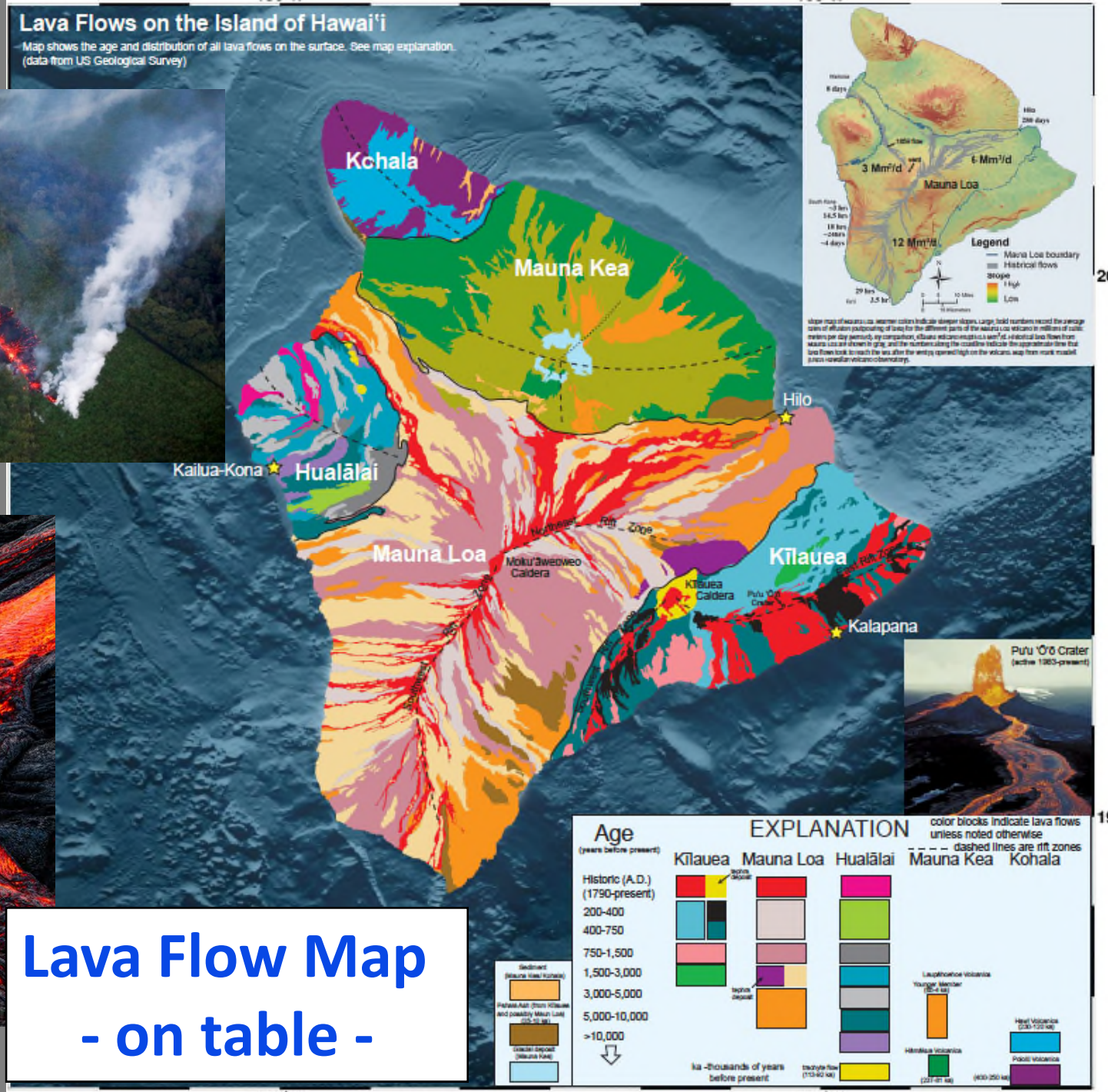
see **last pages** in your **reader p.27-31**

1) **Each big map has a set of questions, which are in your reader.**
2) **All maps, except tsunami, have supplementary exercises (in your reader).**
3) **Everyone should have one 8 1/2 x 11 topo map: use this to plot hazards.**
4) **Each team will turn in one report! Everyone does their own work! See last slide in this ppt**









Lava Flow Map
- on table -

LAVA FLOW MAP QUESTIONS:

1. Where do the lava flows originate (in general), and where do they end?

Start:

End:

2. How far did the longest historical flows travel? _____

3. Which volcanoes have historical lava flows (since 1790)?

4. Where are the oldest lava flows (in general), and where are the youngest lava flows?

Oldest:

Youngest:

5. How long does it take lava flows on Mauna Loa Volcano to travel from where they erupt to the coast? What factor is important in determining how fast lava flows travel?

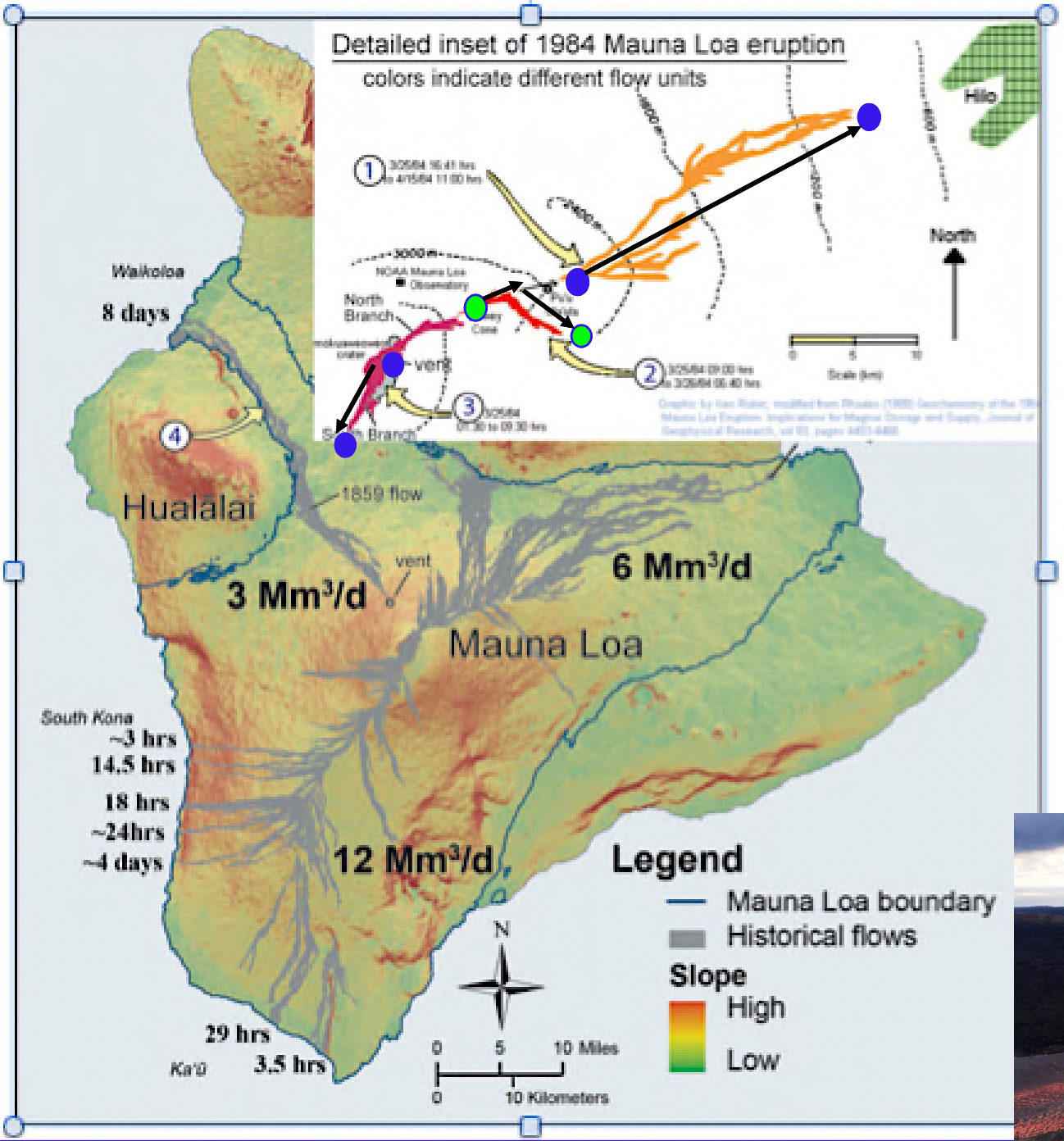
-
-

6. **Complete the lava flow velocity exercise** on your 8x11 printout of the Island of Hawaii.

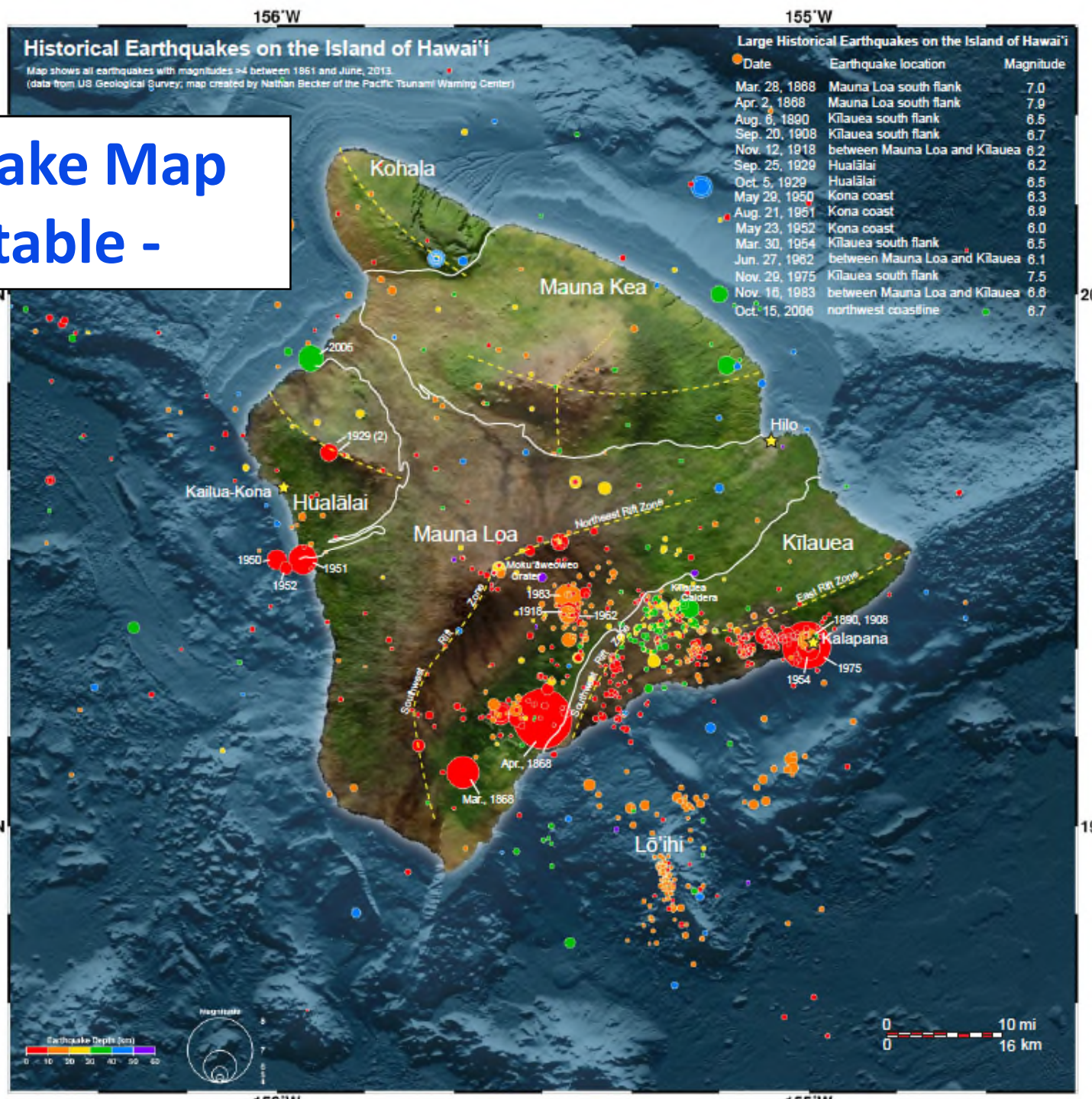
Lava Flow Rate Calculation Map

Black & white version in reader, color version is on table next to big map. (Please leave on the table).

Write answers to questions in reader (be neat please).



Earthquake Map
- on table -



EARTHQUAKE MAP QUESTIONS:

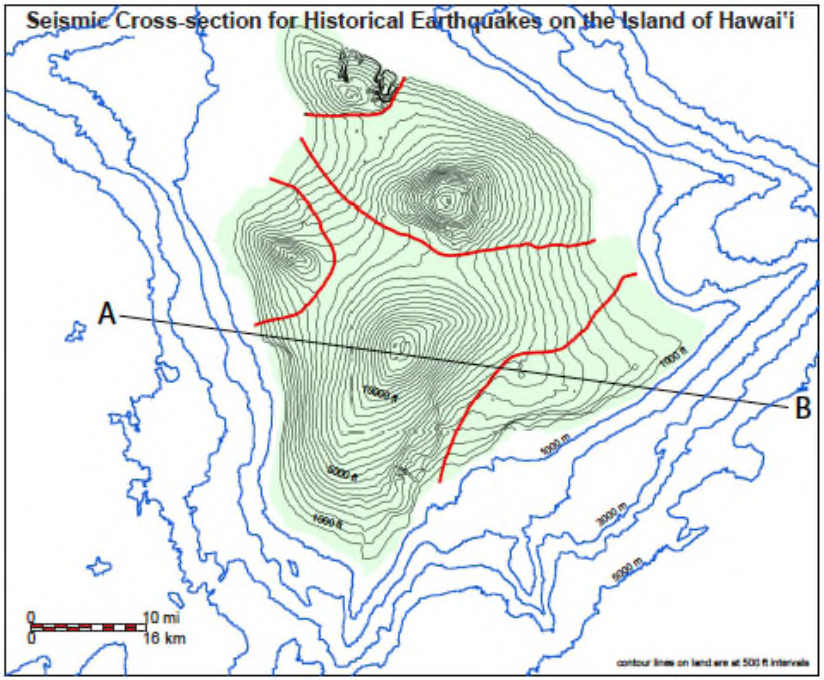
1. Beneath which volcanoes do most earthquakes occur?

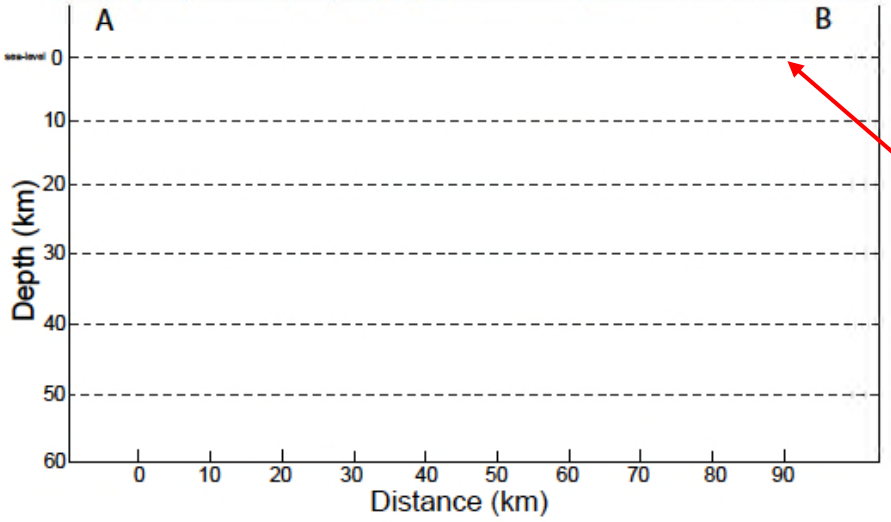
2. At what depth do the largest earthquakes occur?

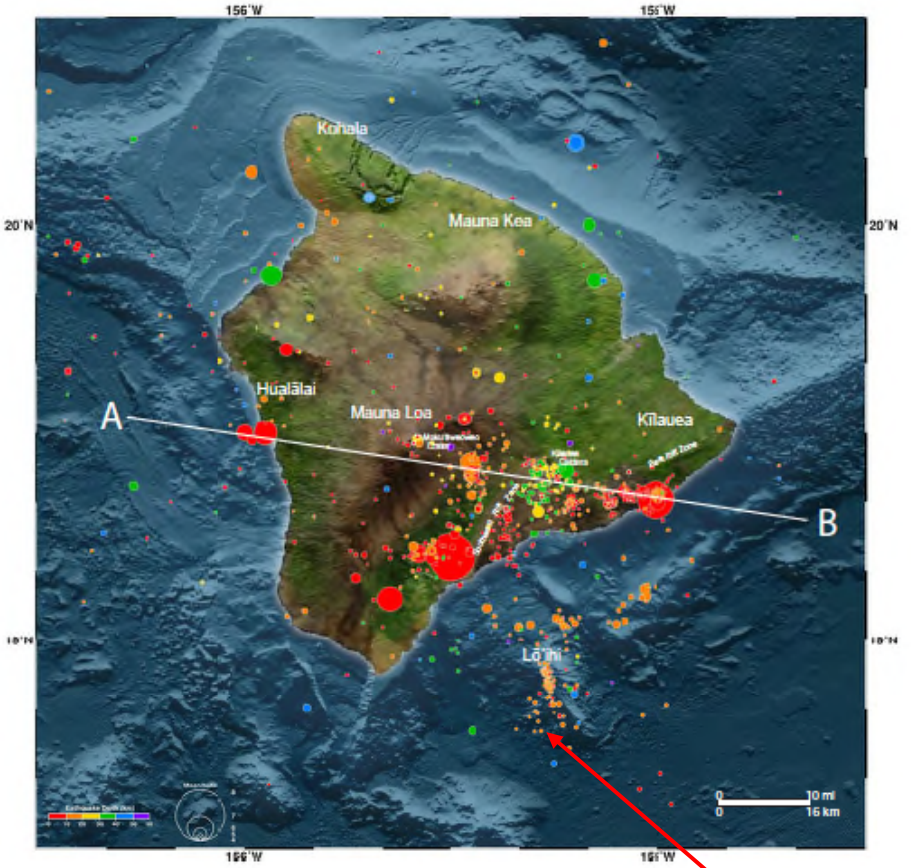
3. **Complete the Seismic cross-section exercise o**n your 8x11 printout with maps and axes. **Draw the approximate locations of earthquakes** along a cross section from A to B showing the depth of earthquakes beneath the Island of Hawaii.

4. What do the different earthquake magnitudes generally mean in terms of the shaking and damage?

5. What is a possible cause of earthquakes beneath Kīlauea Volcano?



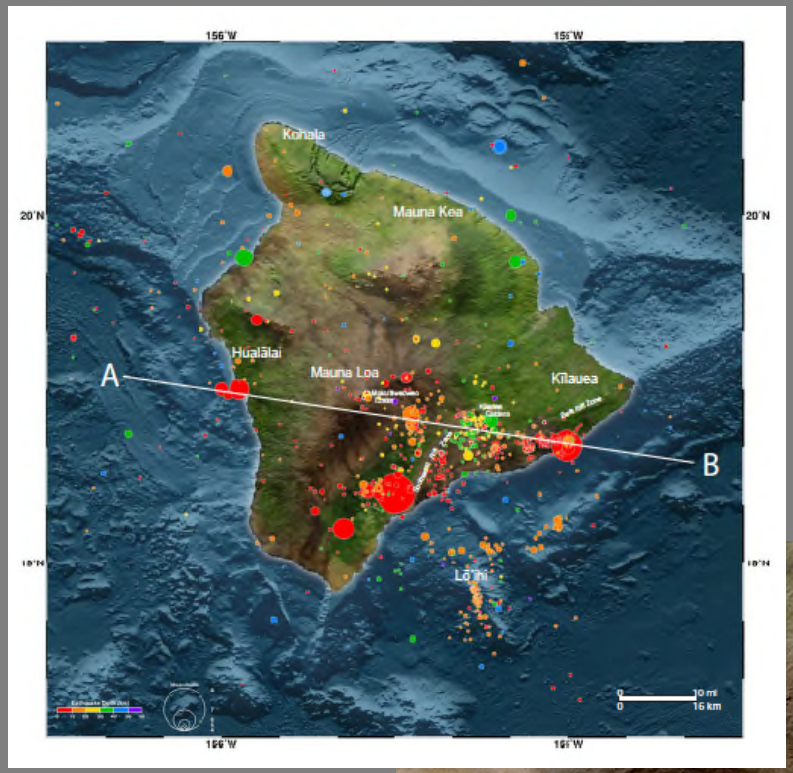


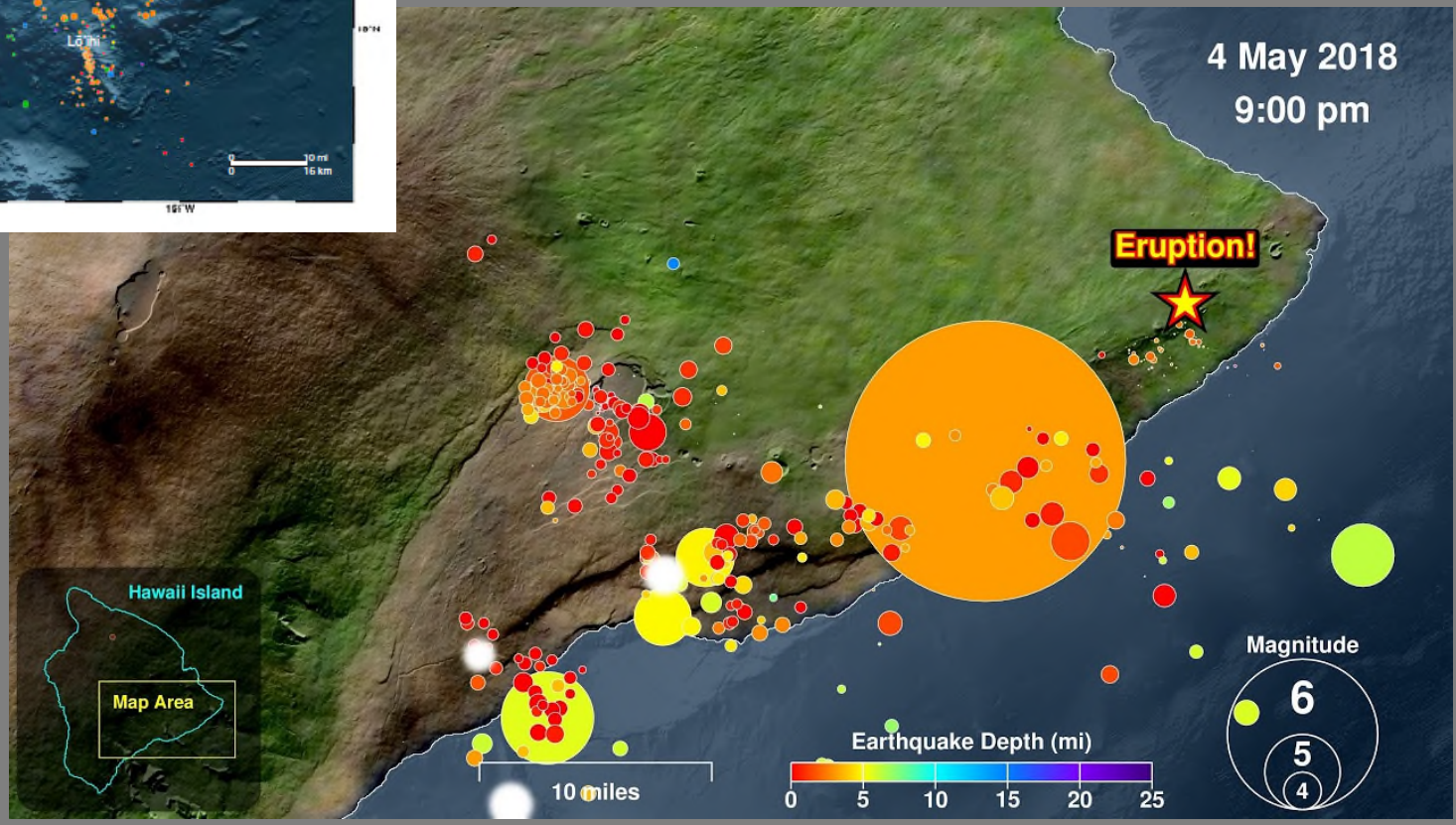


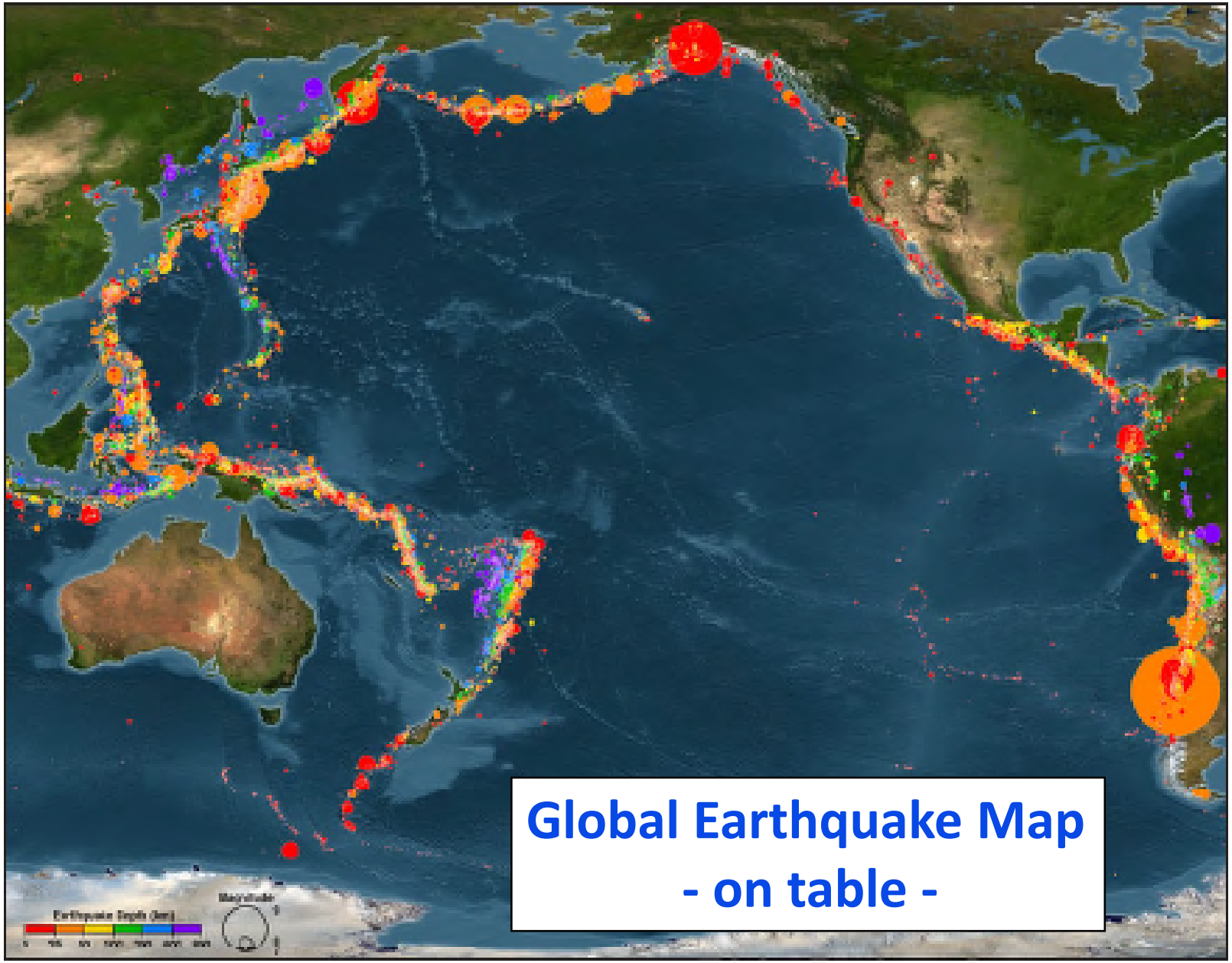
Black & white version in reader, color version is on table next to big map. (Please do not take).

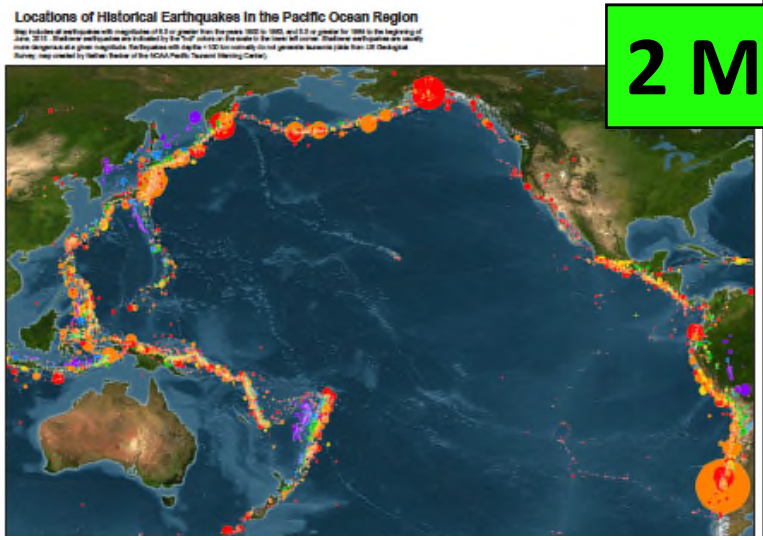
Write answers to questions in reader (be neat please).

Hawaiian Earthquake Hazard

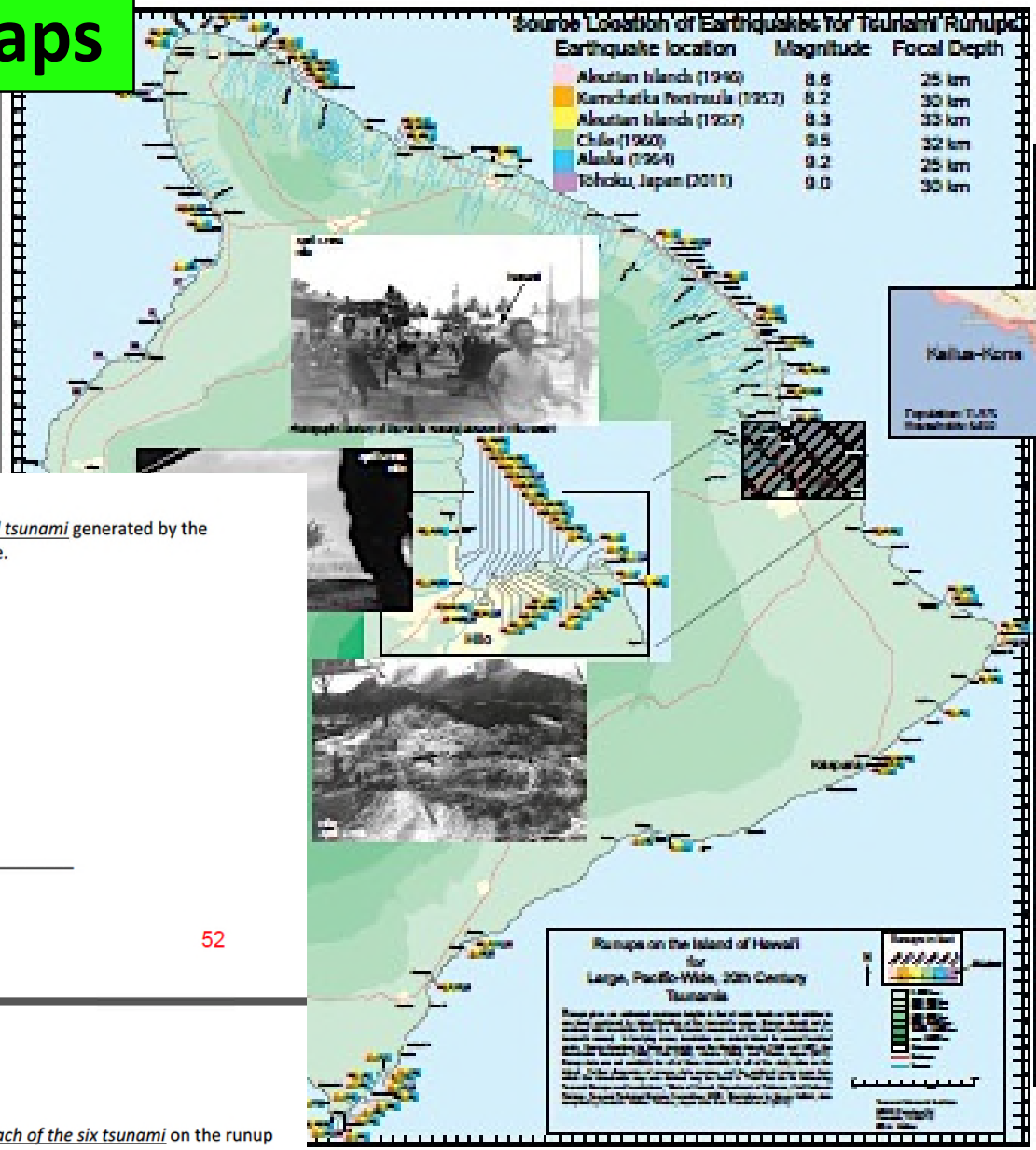





Global Earthquake Map
- on table -



2 Maps



TSUNAMI MAP QUESTIONS:

1) Where was the location of the **highest tsunami runup** *for each of the six large historical tsunami* generated by the different earthquakes around the Pacific Ocean? See figure at the bottom of the next page.

1.

2.

3.

4.

5.

6.

2) Which earthquake caused the highest runup? _____

3) Can you identify the location of the earthquakes on the Pacific Ocean Region map *for each of the six tsunami* on the runup map? What was the depth of each of the earthquakes?

1. _____ Depth: _____

2. _____ Depth: _____

LANDSLIDES OFFSHORE HAWAII QUESTIONS

See figures on the lab table for the following questions:

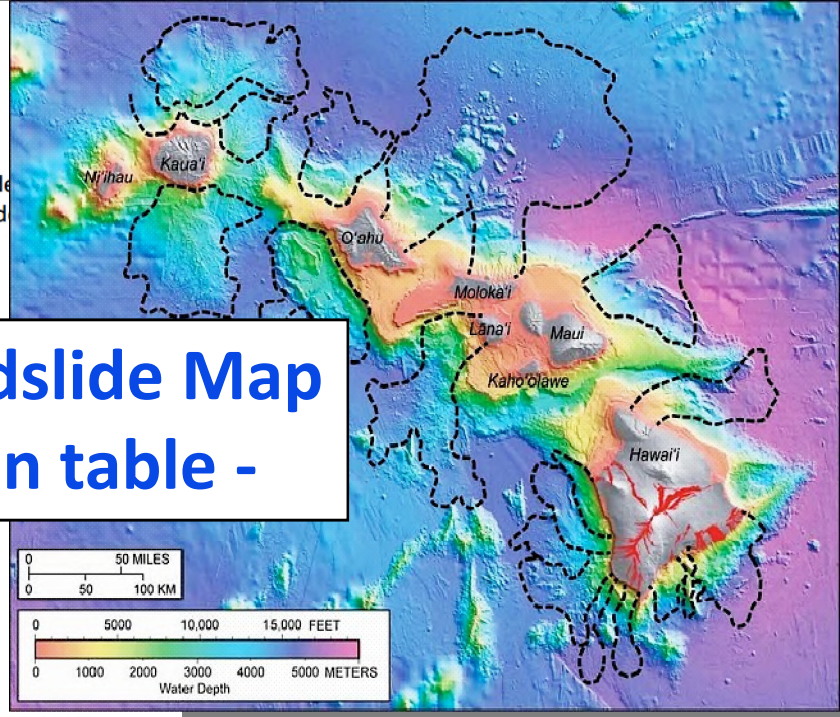
The Hawaiian Islands are home to some of the largest landslides on the planet. The steep cliffs along the side
are not due to wave erosion. They are scarps from the debris flows that extend out onto the abyssal plain (d
flat region of the seafloor).

1) Where is the largest landslide located? Offshore which islands and direction (N, S, SE, NE, etc.)?

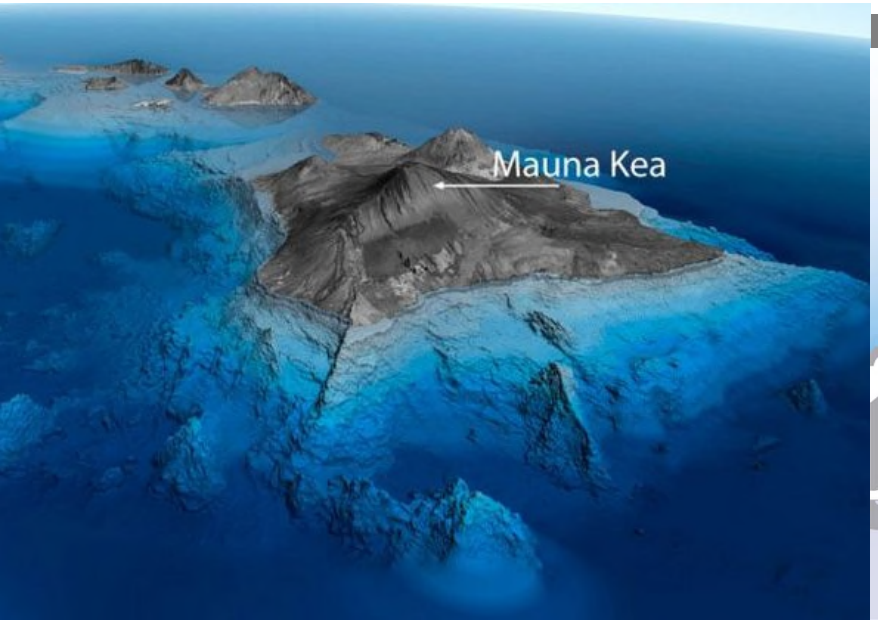
2) What would the effects be if a landslide occurred here today? (local effect, regional effe
   -
   -
   -

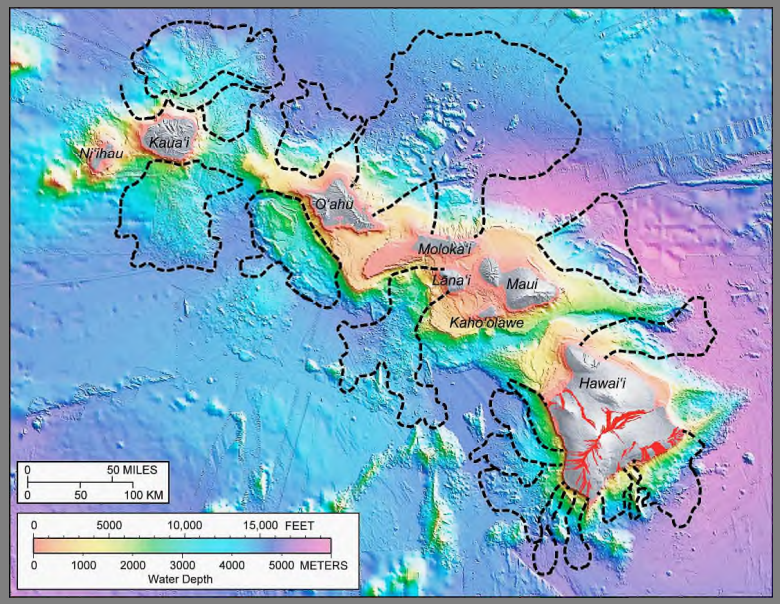
3) Give the approximate area of the largest landslide in km.

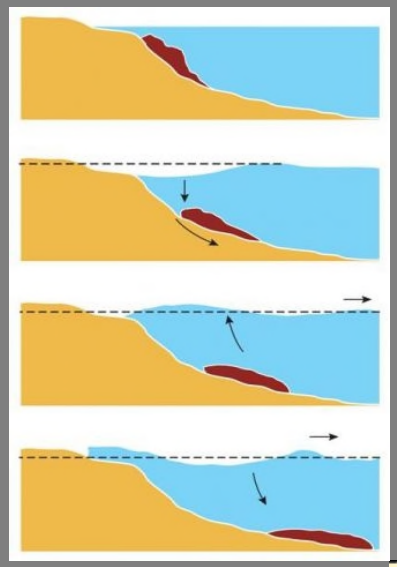
4) What is the relief from Mauna Kea to the abyssal plain (in ft)? How does this compare to Mt. Everest? (29,029')

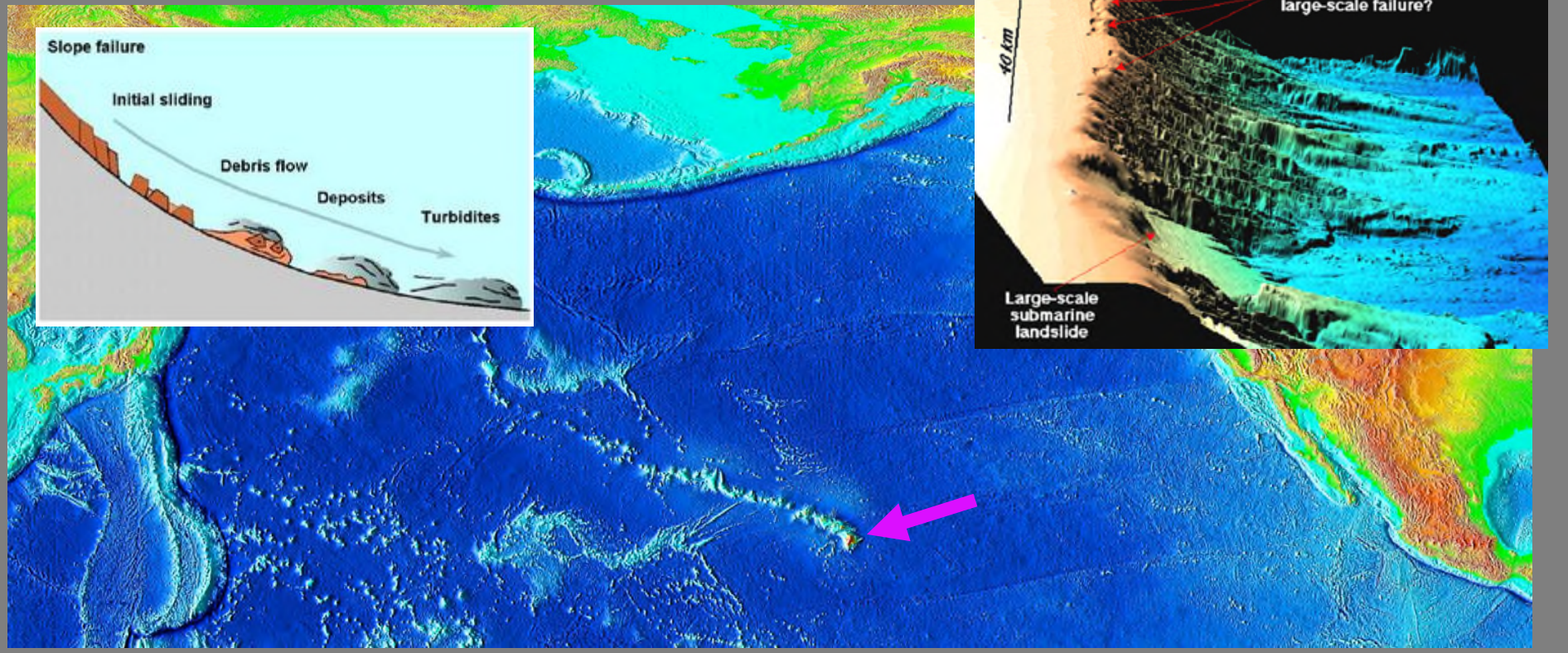


Landslide Map
- on table -



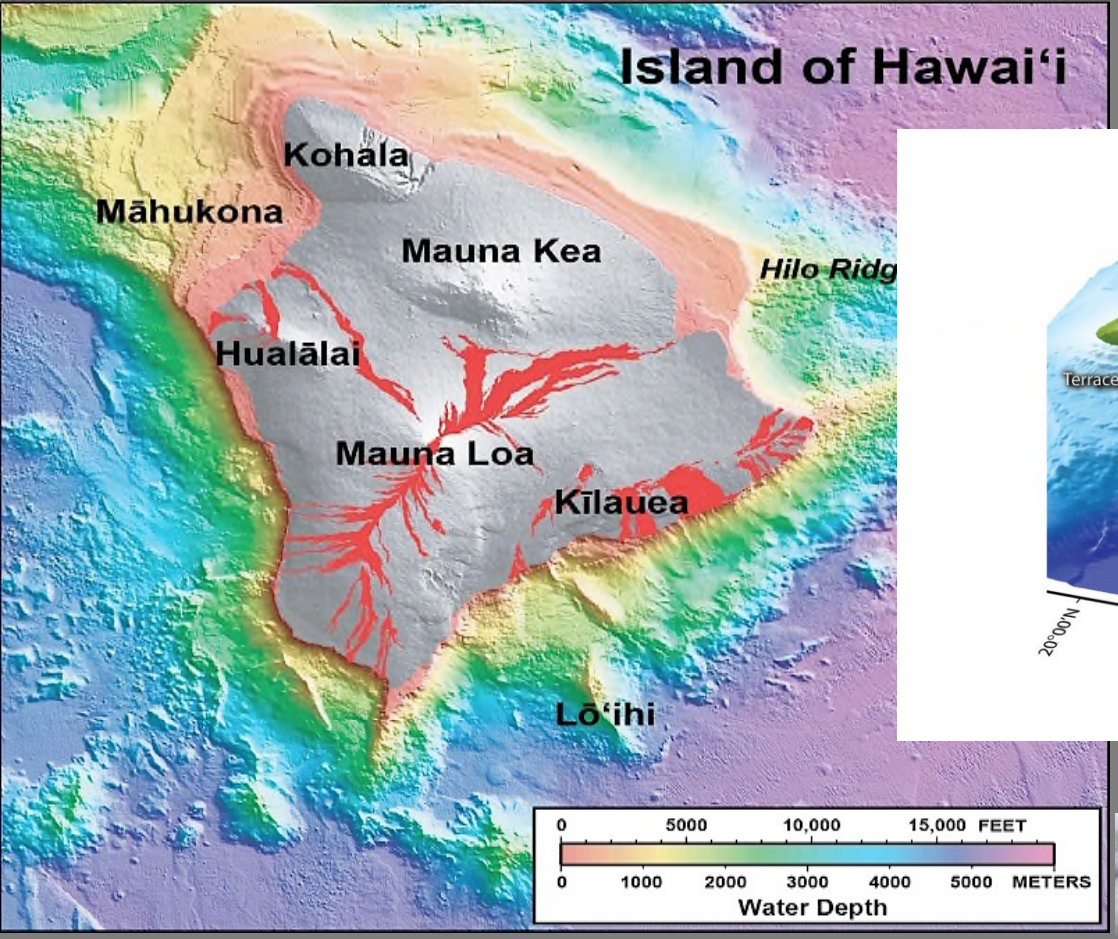

Ni'ihau
Kaua'i
O'ahu
Moloka'i
Lana'i
Maui
Kaho'olawe
Hawai'i
0 50 MILES
0 50 100 KM
0 5000 10,000 15,000 FEET
0 1000 2000 3000 4000 5000 METERS
Water Depth

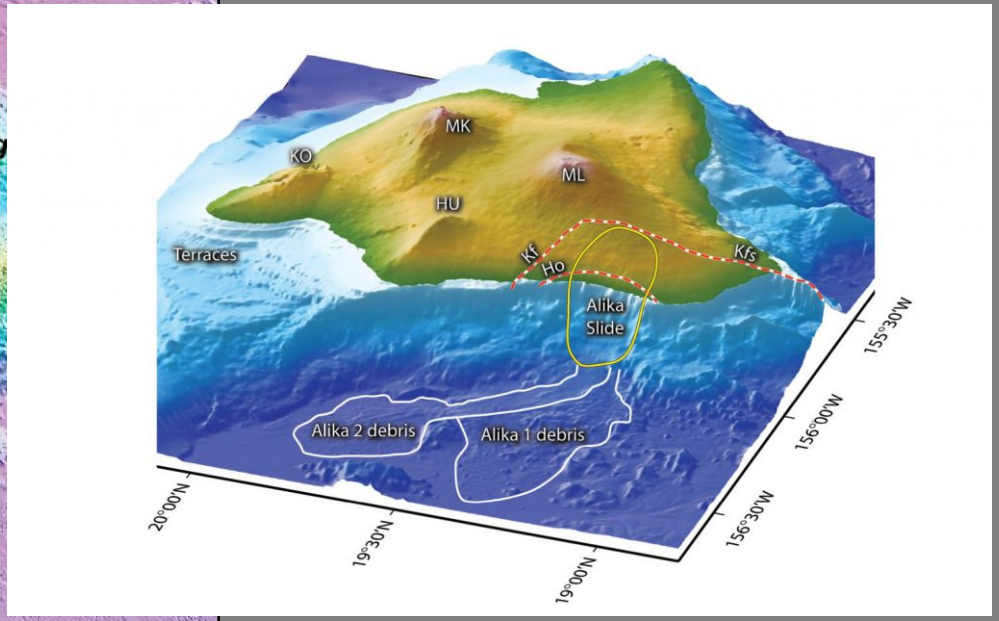




Slope failure
Initial sliding
Debris flow
Deposits
Turbidites

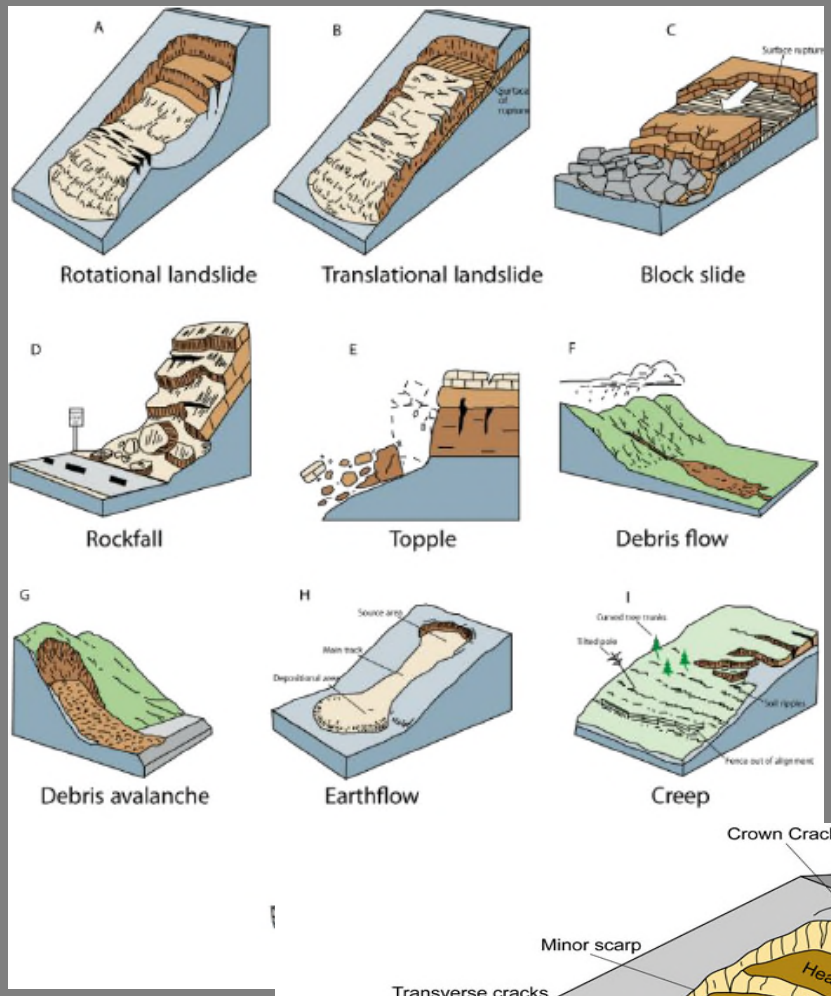
Cracks along outer shelf:
Hints of future,
large-scale failure?
40 km
Large-scale
submarine
landslide





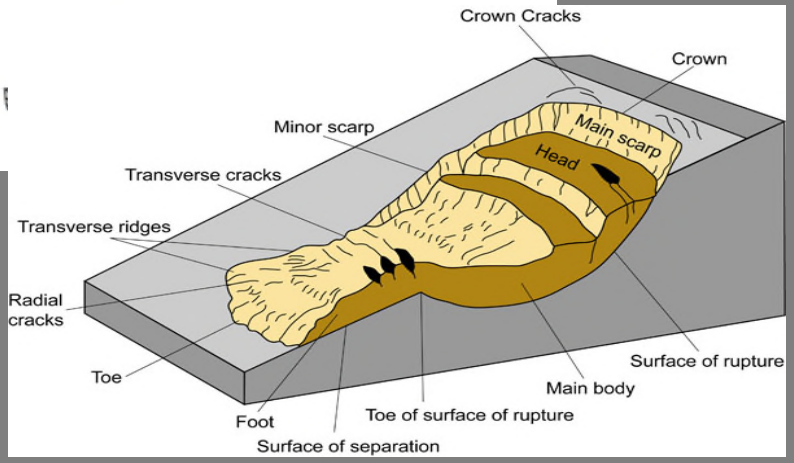
http://www.youtube.com/watch?v=RWbBiVxLzSs

Landslide Geomorphology



Landslide Scarp

Landslide Slump



RAINFALL IN HAWAII QUESTIONS:

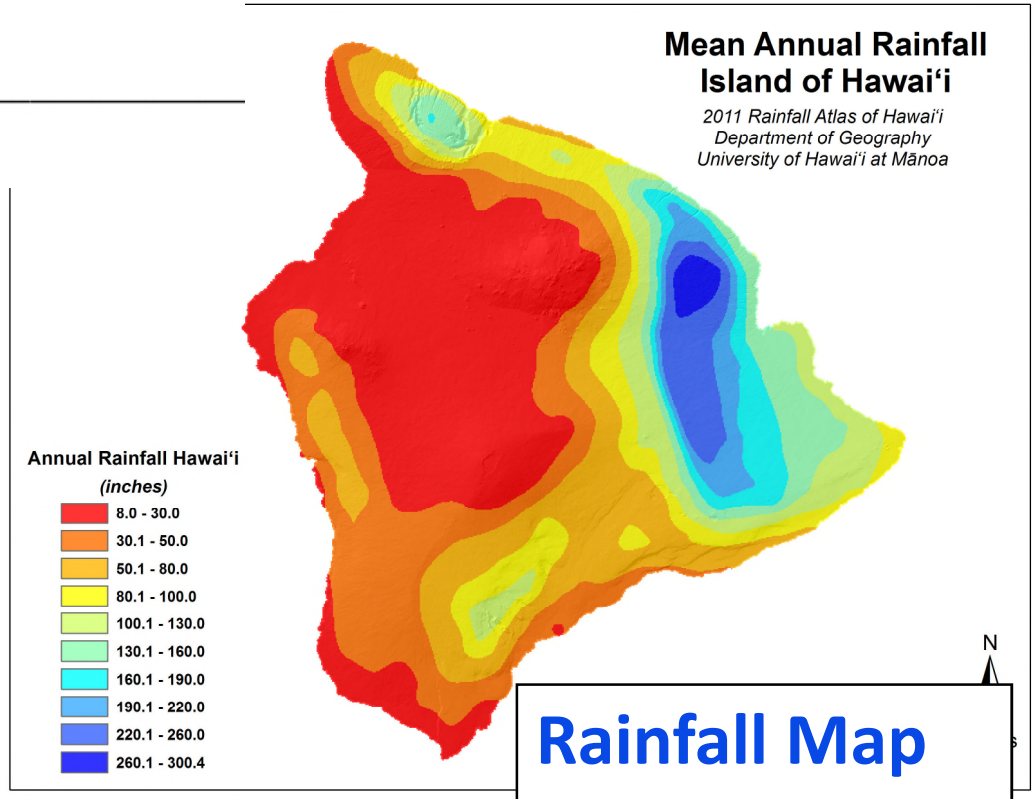
See figures on the lab table for the following questions:

1) Why is there an orographic effect on the Big Island of Hawaii (or any Hawaiian island)?

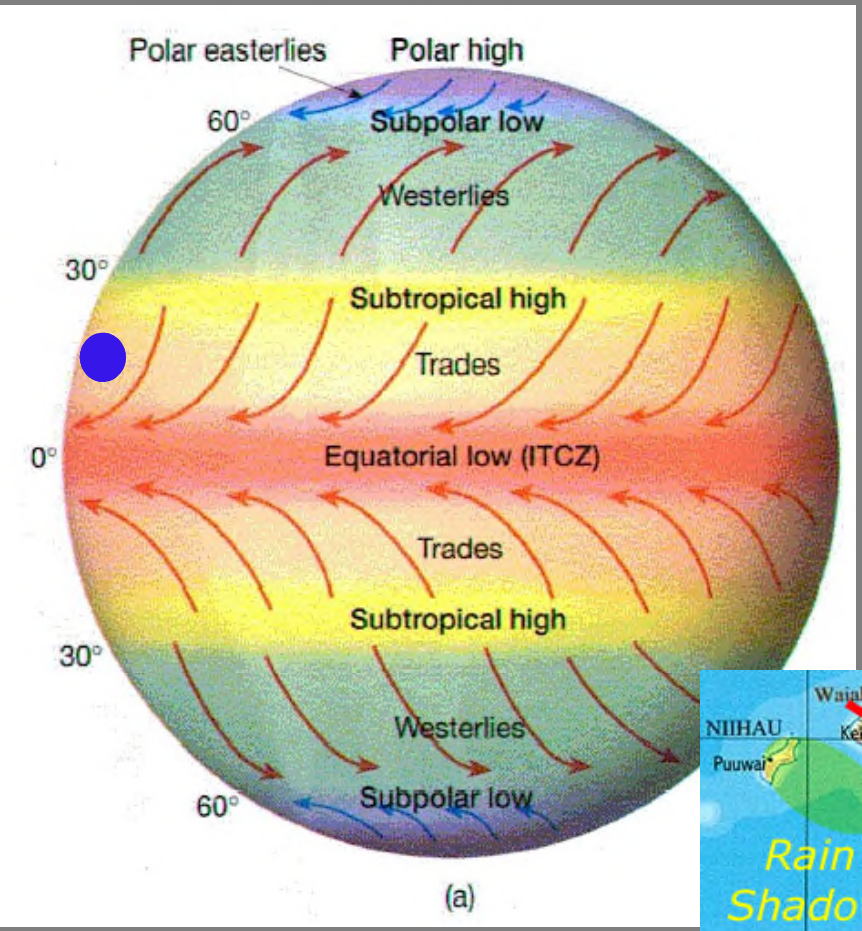
2) Which side of Hawaii is the "wet" side? _____

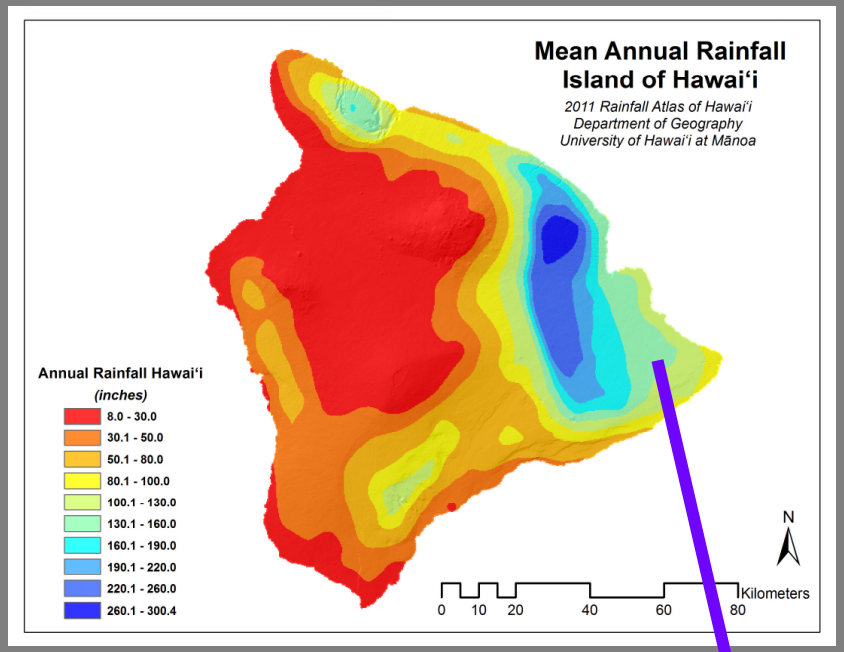
3) What is the range (in mm) of the mean annual rainfall on the east side of the island?

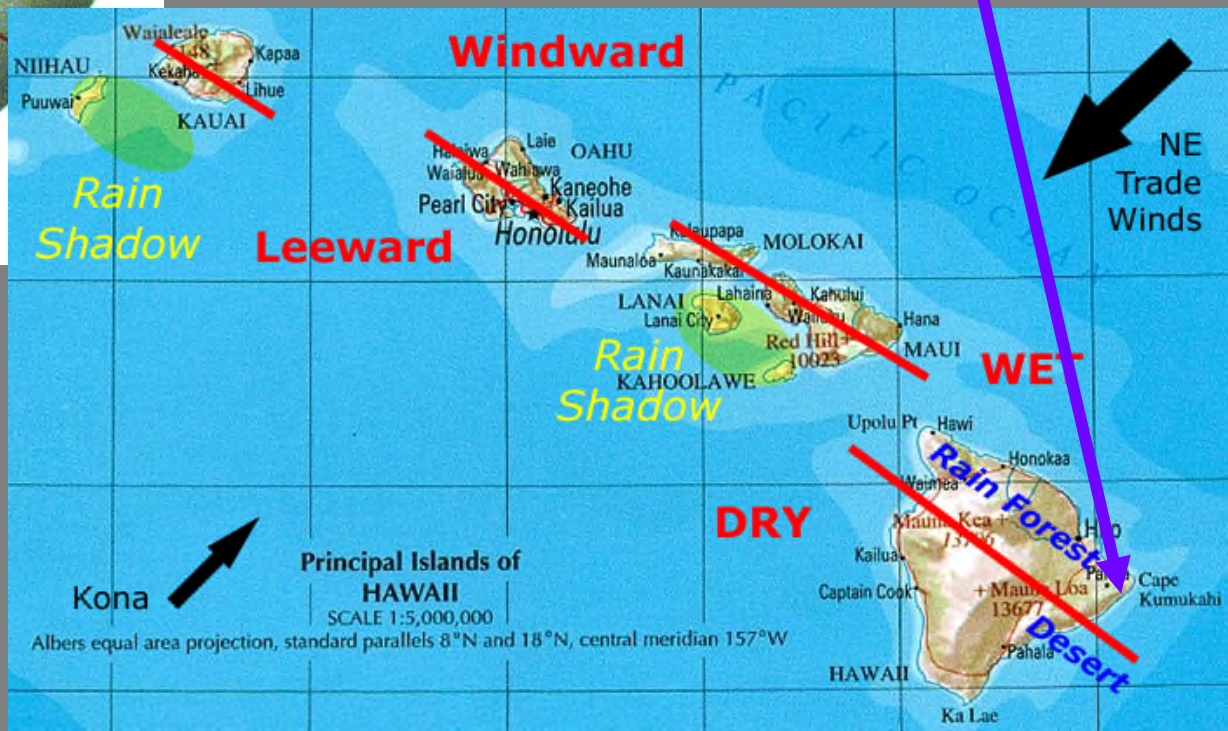
4) What are the names of the winds that affect Hawaii? _____

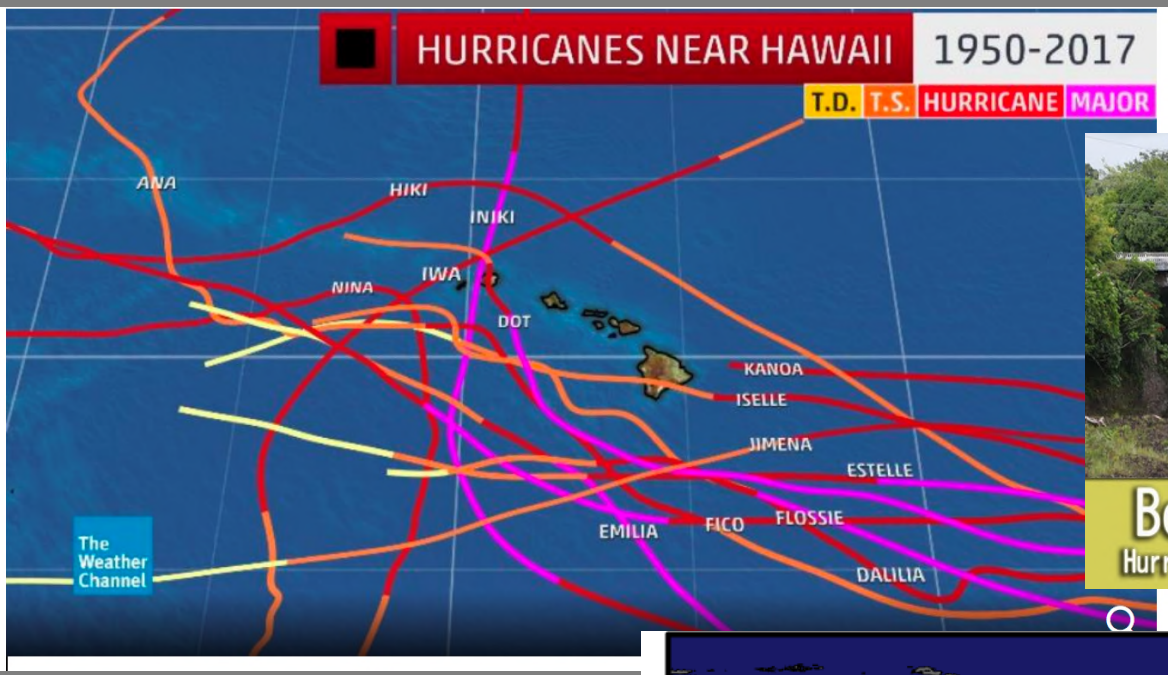


Rainfall Map
- on table -

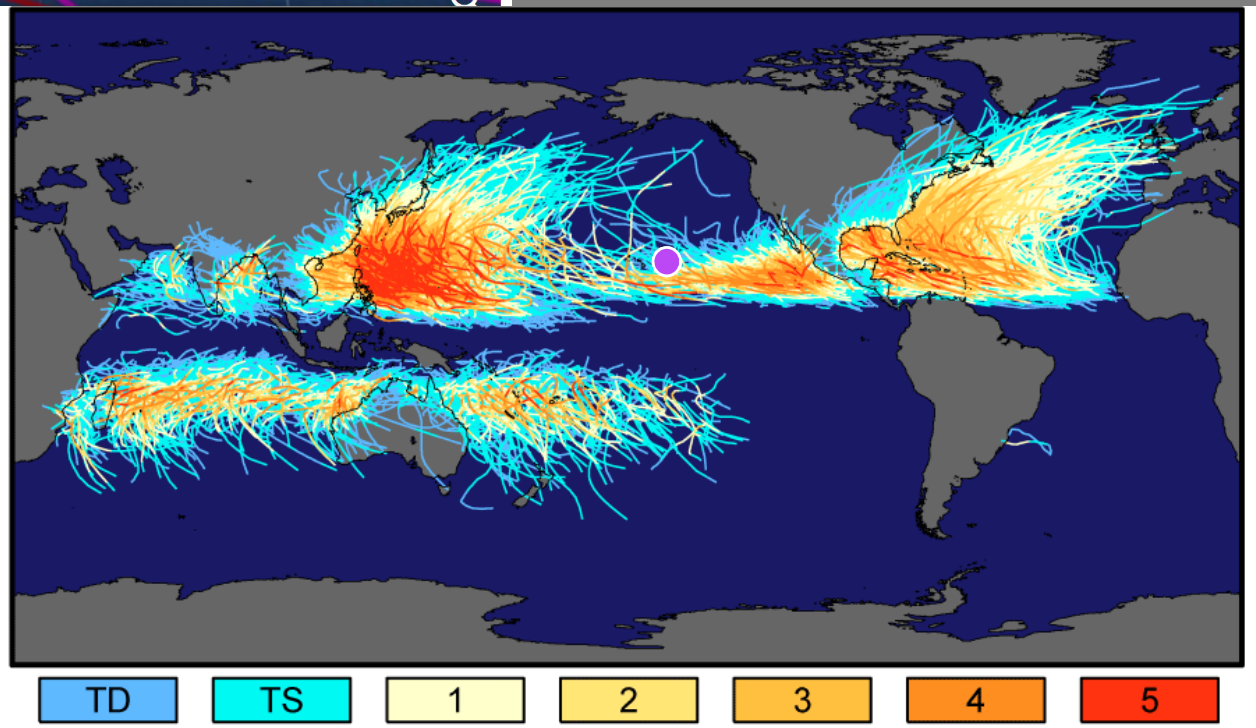

Polar easterlies
Polar high
60°
Subpolar low
Westerlies
30°
Subtropical high
Trades
0°
Equatorial low (ITCZ)
Trades
Subtropical high
30°
Westerlies
60°
Subpolar low
(a)


Mean Annual Rainfall
Island of Hawai'i
2011 Rainfall Atlas of Hawai'i
Department of Geography
University of Hawai'i at Mānoa
Annual Rainfall Hawai'i
(inches)
8.0 - 30.0
30.1 - 50.0
50.1 - 80.0
80.1 - 100.0
100.1 - 130.0
130.1 - 160.0
160.1 - 190.0
190.1 - 220.0
220.1 - 260.0
260.1 - 300.4
N
0 10 20 40 60 80
Kilometers

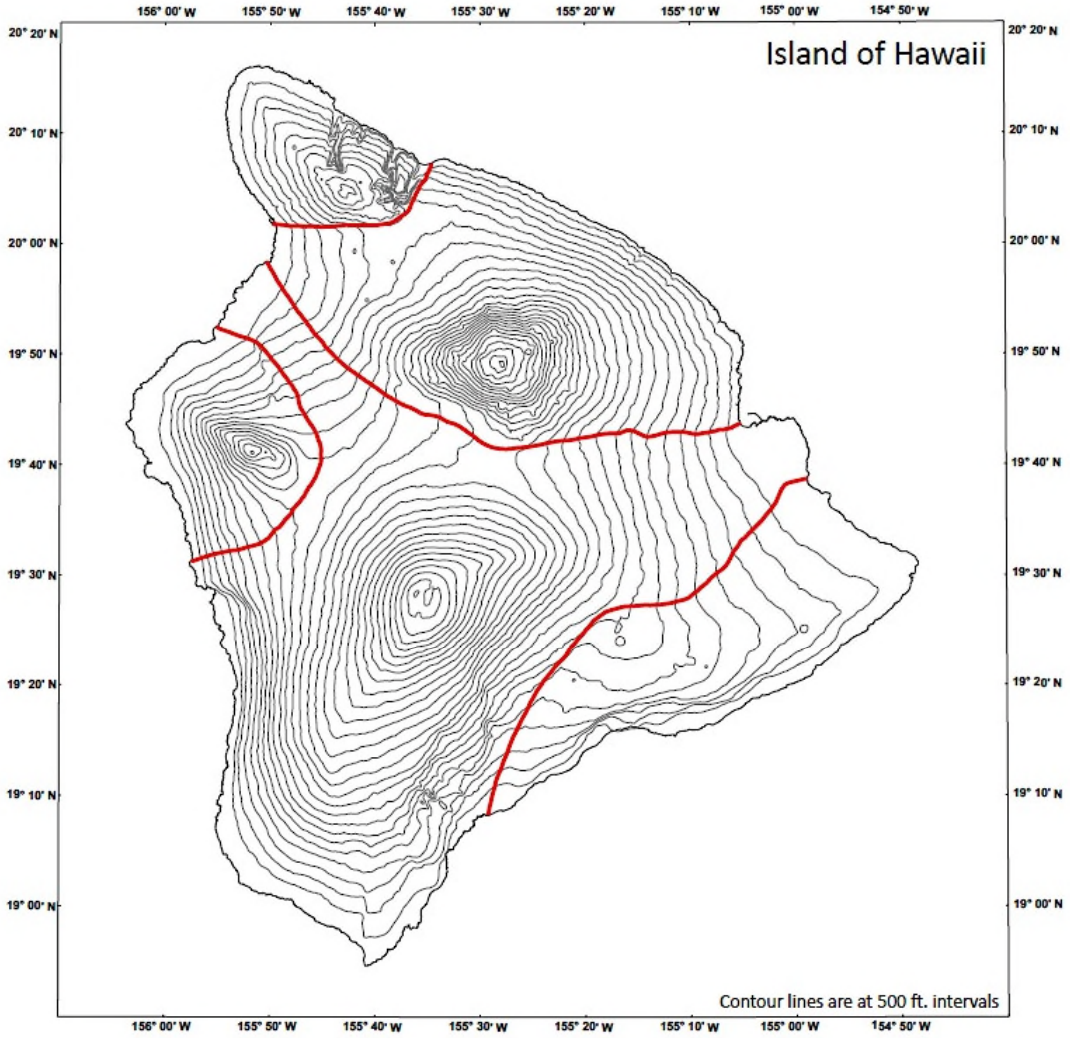

Windward
NE
Trade
Winds
Rain
Shadow
Leeward
Rain
Shadow
WET
DRY
Rain Forest
Desert
NIIHAU
Puuwai
KAUAI
Waialeale
Kapaa
Lihue
OAHU
Laie
Kaneohe
Kailua
Honolulu
Pearl City
MOLOKAI
Maunaloa
LANAI
Lanai City
Lahaina
Kahului
Hana
MAUI
Red Hill
KAHOOLAWE
Upolu Pt
Hawi
Honokaa
Kailua
Captain Cook
Cape
Kumukahi
Pahala
HAWAII
Ka Lae
Kona
Principal Islands of
HAWAII
SCALE 1:5,000,000
Albers equal area projection, standard parallels 8°N and 18°N, central meridian 157°W



Do many Hurricanes make landfall in Hawaii?




All lava flows since 1800 are accurately represented on the map to give you a visual idea of the scale and level of activity of the volcanoes.
Pay attention to cities, airports, and roads, and steep cliffs.
On table
Kamehameha I Birthplace
Hawi
Kapa'au
Pololu Beach
Lapakahi State Historical Park
Wapi'o Valley
Kukuihaele
Kohala (5,505)
Kohala Mtn Rd
Honoka'a
Kawaihae
Spencer Beach Park
Kauna'oa (Mauna Kea) Beach
Hapuna Beach
Puako
Waikoloa Village
Waimea (Kamuela)
Hawaii Belt Rd/ Mamalahoa Hwy
Laupahoehoe Point
Laupahoehoe
Anaeho'omalo Beach
Kiholo Bay
Kua Bay
Makalawena Beach
Kona Coast State Park
Kona Airport
Queen Kaahumanu Hwy
Mana Road (4WD)
Mauna Kea (13,796)
Honomu
Akaka Falls
Hawai'i Tropical Botanical Gardens
Hawaii Belt Rd/ Mamalahoa Hwy
Hualalai (8,271)
Saddle Road
Rainbow Falls
Hilo Bay
Hilo
Hilo Airport
Honokohau Bay
Kailua-Kona
White Sands Beach Park
Kahalu'u Beach Park
Keauhou
Holualoa
Honalo
Kainaliu
Kealakekua
Captain Cook
Mountain View
Kea'au
Puna
Pahoa
Glenwood
Mauna Loa (13,677)
Volcano Village
Pu'u 'O'o—The heart of the current eruption
Kapoho
Abalanui
Issac Hale Beach Park
Kahena Black Sand Beach
Kealakekua Bay
Pu'uhonua O Honaunau
Honaunau
Ho'okena Beach Park
Kilauea Crater
Pebble Beach
Kona Paradise
Ka'u
Hawaii Belt Rd
This entire stretch of Chain of Craters Road has been eaten up by the current eruption.
Hawai'i Volcanoes National Park
Miloli'i Beach Park
Pahala
H.O.V.E.
Punalu'u Black Sand Beach
Na'alehu
Road to the Sea Beach
H.O.V.R.
Mark Twain Estates & Discovery Harbor
Green Sand Beach
South Point



This map in your Reader

[Kilauea update USGS]

Due before you leave:
Each team will turn in:
Start working on your hazard report no later than 4:30

1) **This map (put all your names) with all hazards clearly marked with a legend**
2) **Brief, but thorough, summary on a separate piece of paper explaining why you placed a college campus with affordable housing at the selected location. Clearly indicate on this map.**
3) **ONE full set of the lab exercise. Must be NEAT!**