**MODULE 14: WEATHERING AND MASS WASTING**

**Note:** Please refer to the GETTING STARTEDmodule to learn how to maneuver through, and how to answer the lab questions, in the Google Earth (GE.gif) component.

**KEY TERMS**

You should know and understand the following terms:

|  |  |  |
| --- | --- | --- |
| Avalanche | Frost wedging | Rockslide |
| Carbonation | Hydrolysis | Root wedging |
| Chemical Weathering | Landslide | Salt crystal growth |
| Debris flow | Mass wasting | Soil creep |
| Earthflow | Mechanical (Physical)Weathering | Solifluction |
| Exfoliation | Mudflow | Slump |
| Frost heaving | Oxidation |  |

**LAB MODULE LEARNING OBJECTIVES**

After successfully completing this module, you should be able to the following tasks:

* Identify erosional processes and features created by weathering and mass wasting
* Identify depositional processes and features created by weathering and mass wasting
* Examine the processes that create mass wasting landforms
* Distinguish different weathering and mass wasting types
* Calculate slope
* Interpret the topographic profile of a landscape

**INTRODUCTION**

This module examines weathering and mass wasting. Topics include physical weathering, chemical weathering, and mass wasting. While these topics may appear to be disparate, you will learn how they are inherently related. The modules start with four opening topics, or vignettes, which are found in the accompanying Google Earth file. These vignettes introduce basic concepts of the weathering and mass wasting. Some of the vignettes have animations, videos, or short articles that will provide another perspective or visual explanation for the topic at hand. After reading the vignette and associated links, answer the following questions. Please note that some links might take a while to download based on your Internet speed.

GE.gifExpandthe **INTRODUCTION** folder and then check **Topic 1: Introduction**.

GE.gif Read **Topic 1**: **Introduction**

GE.gif Read **Topic 2: Weathering**

**Question 1:** Other than the rock material, what are the two most important factors in weathering?

GE.gif Read **Topic 3: Mass Wasting**

**Question 2:** What does the presence of lichen on boulders tell scientists?

GE.gif Read **Topic 4: Human Interaction**

**Question 3:** What are the characteristics of areas generally considered to be safe from landslides?

Description: GE.gifCollapse and uncheck the **INTRODUCTION** folder.

**GLOBAL PERSPECTIVE**

GE.gif Double-click and select **GLOBAL PERSPECTIVE**.

Figure . The geography of weathering (Arbogast 2nd Ed.).

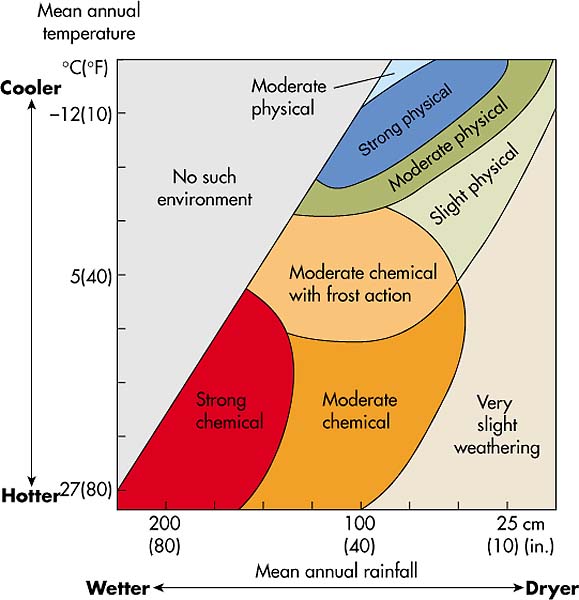


Figure 1 is a graph showing the dominant type of weathering based on annual precipitation and temperature. If a location has a mean annual temperature of 20°C and receives 190cm of precipitation yearly, you can plot these values (as denoted by the start)to see this location’s dominant weathering is strong chemical.

For Questions 4 to 7, type the location information provided into the **Search** tab in Google Earth and press Enter. When you arrive at your destination, use the chart in Figure 1, in conjunction with Google Earth, to answer each question. The mean annual temperature and precipitation are provided respectively, in the parentheses.

**Question 4:** Bangkok, Thailand (28°C, 145cm)

Latitude/Longitude: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Dominant weathering: \_\_\_\_\_\_\_

**Question 5:** New Delhi, India (25°C, 80cm)

Latitude/Longitude: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Dominant weathering: \_\_\_\_\_\_\_

**Question 6:**  19°10'21.78"N, 96° 7'59.77"W (25°C, 236cm)

City: \_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Dominant weathering: \_\_\_\_\_\_\_

**Question 7:** 58°18'7.00"N, 134°25'11.00"W (5°C, 140cm)

City: \_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Dominant weathering: \_\_\_\_\_\_\_

Description: GE.gifCollapse and uncheck the **GLOBAL PERSPECTIVE** folder.

**Weathering**

GE.gif Double-click **WEATHERING**, and then double‑click **Mechanical Weathering**.

Identify the dominant type of mechanical weathering at the following locations. Use the photo links in Google Earth to help you identify the type.

Double-click **Feature A**.



Description: GE.gif Select **Feature A photo**.

**Question 8:** Identify mechanical weathering at Feature A: \_\_\_\_\_\_\_

Description: GE.gif Double-click **Feature B**.

Description: GE.gif Select **Feature B photo**.

**Question 9:** Identify mechanical weathering at Feature B: \_\_\_\_\_\_\_

Description: GE.gif Double-click **Feature C**.

Description: GE.gif Select **Feature C photo**.

**Question 10:** Identify mechanical weathering at Feature C: \_\_\_\_\_\_\_

Description: GE.gif Collapse **Mechanical Weathering** folder.

GE.gif Select and double-click **Chemical Weathering**.

Description: GE.gif Double-click **Feature D**.

Description: GE.gif Select **Feature D photo**.

**Question 11:** Identify chemical weathering at Feature D: \_\_\_\_\_\_\_

Description: GE.gif Double-click **Feature E**.

Description: GE.gif Select **Feature E photo**.

**Question 12:** Identify chemical weathering at Feature E: \_\_\_\_\_\_\_

Description: GE.gif Double-click **Feature F**.

Description: GE.gif Select **Feature F photo**.

**Question 13:** Identify chemical weathering at Feature F: \_\_\_\_\_\_\_

Description: GE.gif Collapse **Chemical Weathering** folder.

**MASS WASTING**

Expand and double-click the **MASS WASTING** folder.



GE.gif Select and double-click **Feature G**.

Select the dominant type of mass wasting at Feature G.

**Question 14:** Feature G: \_\_\_\_\_\_\_\_

1. Slump
2. Solifluction
3. Landslide
4. Rockfall

**Question 15:** why did you pick the answer you did in Question 14

GE.gif Select and double-click **Feature H**.

Select the dominant type of mass wasting at Feature H.

**Question 16:** Feature H: \_\_\_\_\_\_\_

1. Slump
2. Solifluction
3. Landslide
4. Rockfall

**Question 17:** Why did you pick the answer you did in Question 16

Description: GE.gif Double-click **Feature I** and examine the area in September 1998. Use the historical imagery slider and advance the timeline to March 2007.

Select the dominant type of mass wasting at Feature I.

**Question 18:** Feature I: \_\_\_\_\_\_

1. Slump
2. Solifluction
3. Landslide
4. Rockfall

**Question 19:** Why did you pick the answer you did in Question 18

GE.gif Double-click and select **Slope 1**. Right click the title **Slope 1**, and then select **Show Elevation Profile.**

Place your cursor over the elevation profile chart and compute the slope of the lines. Recall that the equation for slope is RISE/RUN and that the units must be the same when dividing (that is, both in meters).

**Question 20:** What is the RISE (Elevation gain) in meters? \_\_\_\_\_\_\_\_

**Question 21:** What is the RUN of the line (Distance) in meters? \_\_\_\_\_\_\_\_\_

**Question 22:** Based on the answers in Questions 20 and 21, what is the average slope of the line? \_\_\_\_\_\_\_\_

Description: GE.gif Double-click and select **Feature J**. Examine the area in July 1998. Use the historical imagery slider and advance the timeline to September 2010.

Select the dominant type of mass wasting at Feature J.

**Question 23:** Feature J: \_\_\_\_\_\_

1. Slump
2. Debris flow
3. Mudflow
4. Soil Creep

**Question 24:** Why did you pick the answer you did in Question 23?

GE.gif Select and double-click **Feature K**.

Select the dominant type of mass wasting at Feature K.

**Question 25:** Feature K: \_\_\_\_\_\_\_\_

1. Slump
2. Debris flow
3. Mudflow
4. Soil Creep

**Question 26:** Why did you pick the answer you did in Question 25

GE.gif Double-click and select **Slope 2**. Right click the title **Slope 2**, and then select **Show Elevation Profile.**

Place your cursor over the elevation profile chart and compute the slope of the lines. Recall that the equation for slope is RISE / RUN and that the units must be the same when dividing (that is, both in meters).

**Question 27:** What is the RISE (Elevation gain) in meters? \_\_\_\_\_\_\_\_

**Question 28:** What is the RUN of the line (Distance) in meters? \_\_\_\_\_\_\_\_\_

**Question 29:** Based on the answers in Questions 27 and 28, what is the average slope of the line? \_\_\_\_\_\_\_\_

**Question 30:** Which mass wasting event do you expect to travel faster (Feature I or K)? Why?