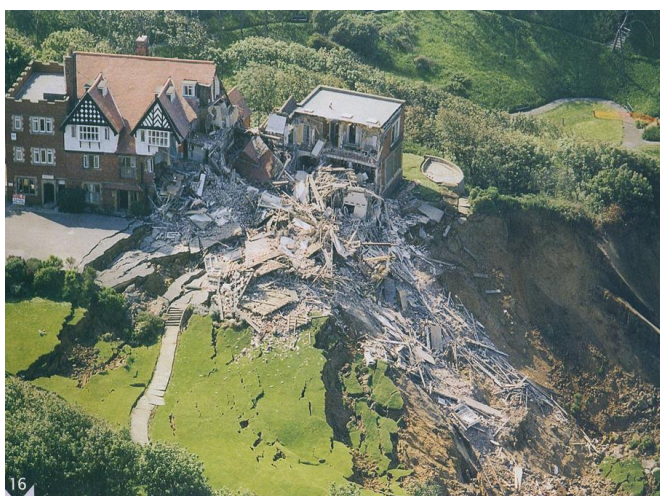


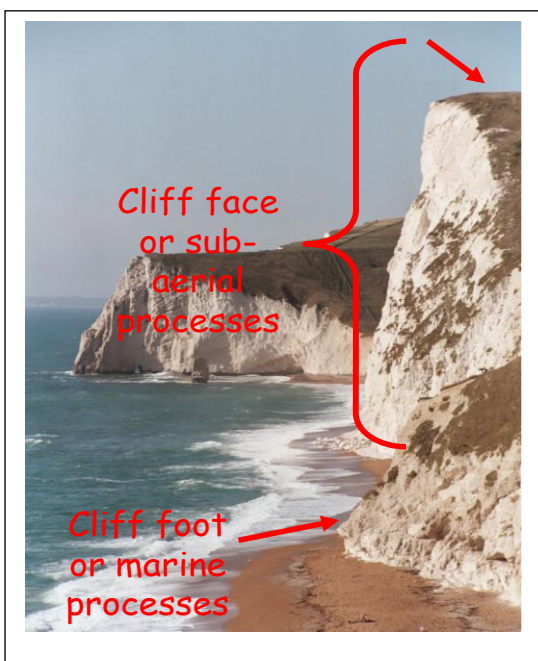
### 3.1.3.4: Weathering, mass movement and runoff

#### Learning Objectives

- To understand that coastlines are affected by marine processes and sub-aerial processes
- To identify the sub-aerial processes of weathering, mass movement and run-off



Suggest possible reasons why Holbeck Hall has collapsed?



- Marine processes
- Sub-aerial processes

The processes work together, marine erosion works at the base of the cliff, weathering weakens the rock and gravity and run off causes the material to move downhill.

Sub-arial Process Definitions		
Weathering	Mass movement	Run-off

### **Types of weathering**

#### **Mechanical (Physical)**

- Frost shattering (freeze thaw)
- Wetting and drying
- Pressure release
- Salt crystallisation
- Exfoliation

#### **Biological**

- Plants and animals

#### **Chemical**

- Oxidation
- Hydrolysis
- Hydration
- Carbonation
- Solution
- Acid rain

**Flip learning task - Use the Hodder, Cambridge and Oxford textbooks to create notes on the different types of weathering.**

**You should have notes on this already. Make sure that they are attached to this booklet.**

**Use mini whiteboards to test the learning of the students for each type of weathering**

**What factors might affect the rate of weathering?**

Use your research to answer the following questions:-

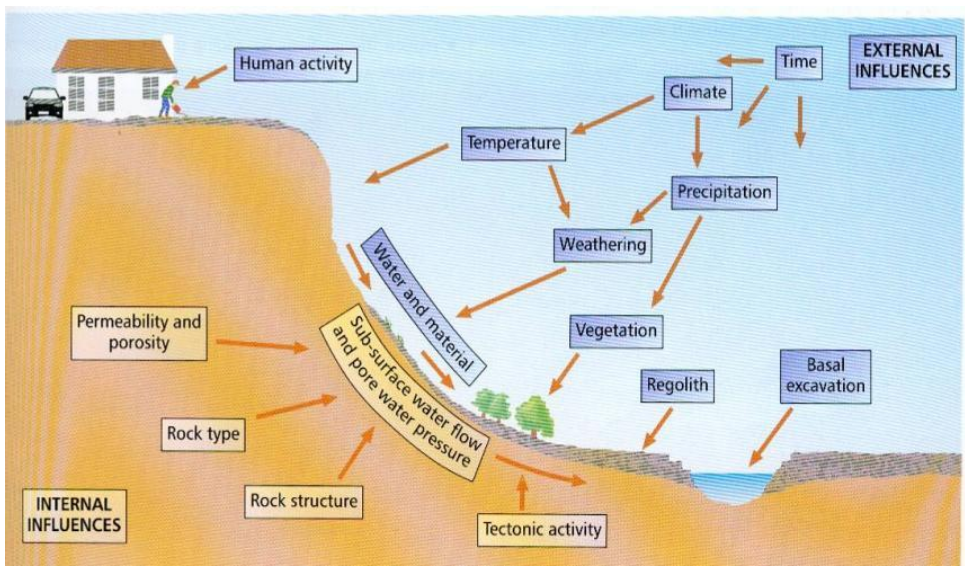
**Hint - think about the following:-  
Heat, cold, rain, rock type, rock structure, exposure to salt spray, vegetation cover etc**

- 1) Where/when might the rate of chemical weathering be fastest?
  
- 2) Where/ when might the rate of mechanical weathering be fastest?
  
- 3) Where/when might the rate of biological weathering be fastest?

**Mass movement** – the downward movement of material (regolith) due to gravity

What is the nature of mass movement dependent on?

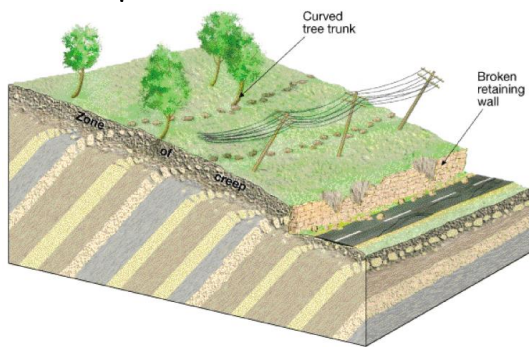
- The cohesion of sediment
- The height and angle of the slope
- The grain size within the sediment



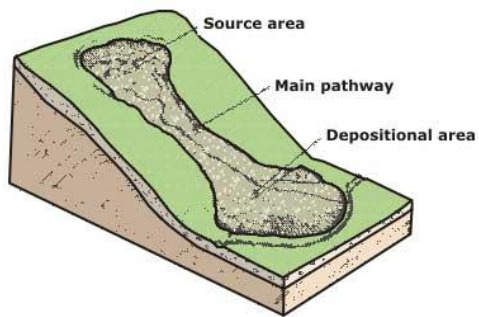
Use this diagram to list the **causes** of mass movement

Types of mass movement p116-117 Oxford Textbook (or <https://www.alevelgeography.com/sub-aerial-processes/>)

### Soil creep



### Mud flows

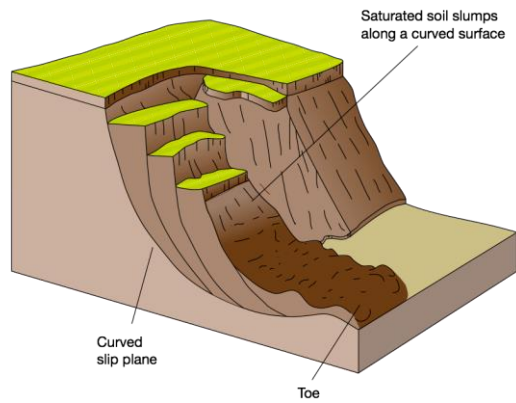


### Rockfall

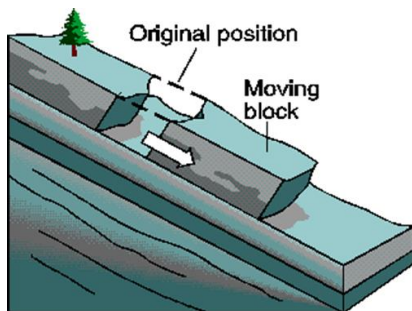


## Slumping

### Slumping



## Landslide



What role does run-off have in sub-aerial processes?

See p117 Oxford textbook



On the following pages there are images of mass movement processes at these locations:

- Holbeck Hall
- Barton-on-sea
- Holderness
- Norfolk
- Beachy Head

5. Using the textbooks and internet, complete the two tasks below:

Task 1: Locate the case studies, listed below, on the map

Task 2: Next to each image:

- a. Annotate the image to highlight evidence that shows mass movement has occurred in each photo
- b. Detail the processes at work



Holbeck Hall



Barton on Sea

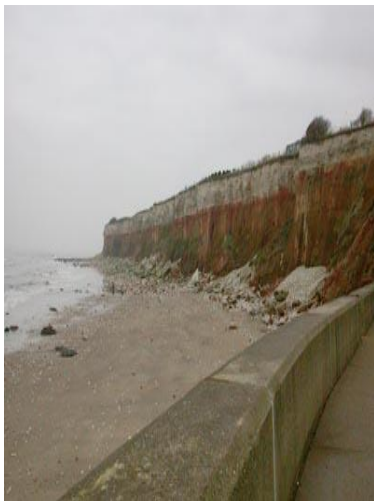


Holderness Coast



Beachy Head

Norfolk





Use the diagrams below to explain how slumping occurs.

Mass movement, the movement of rocks under the influence of gravity, occurs on coastlines.

One of the most common is rotational slumping.

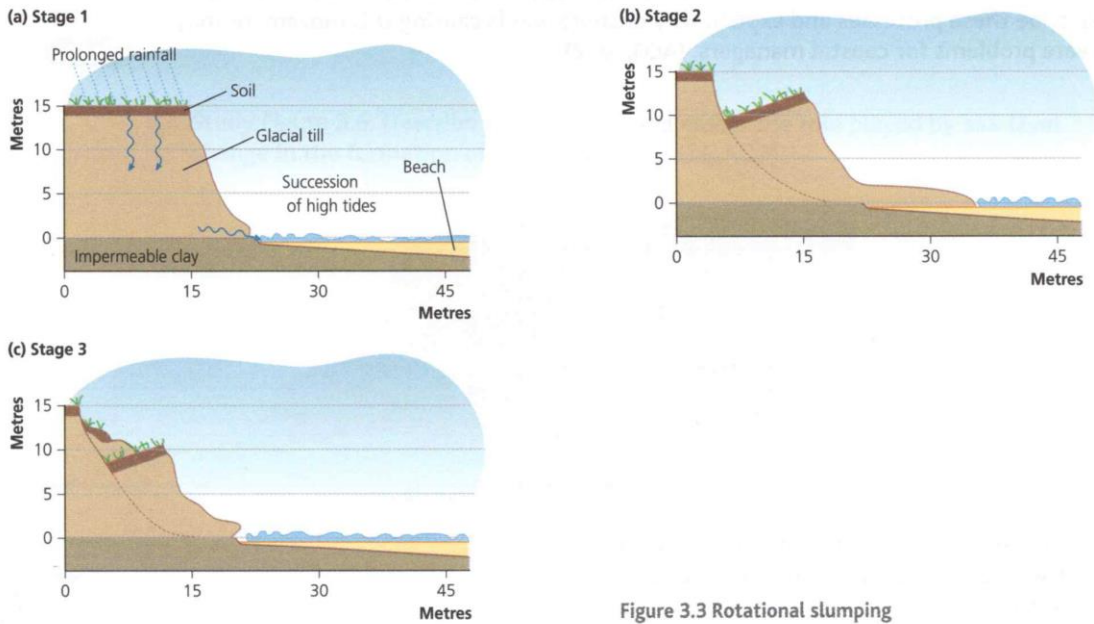
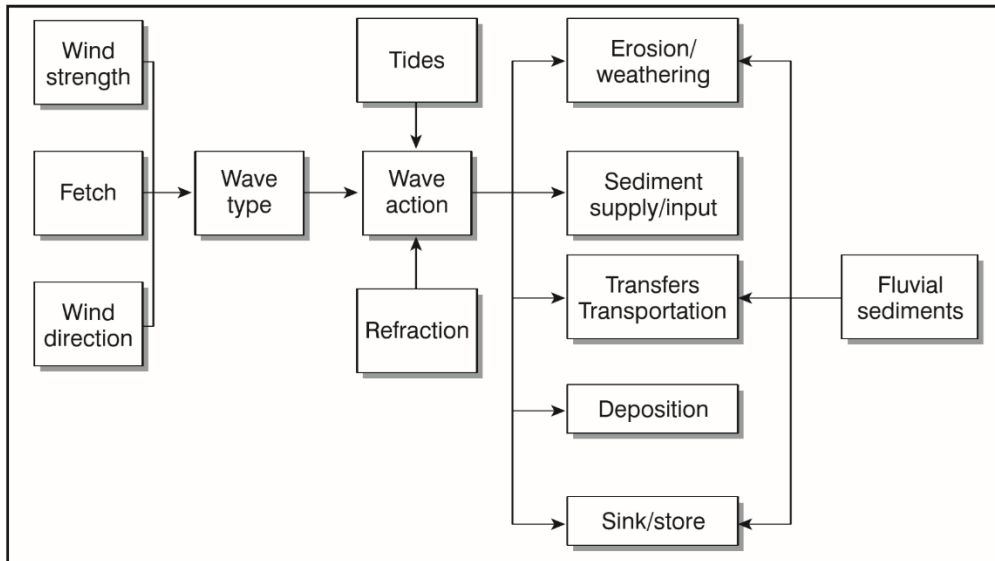


Figure 3.3 Rotational slumping

Figure 1: The coastal system



Outline the links between different parts of the coastal system shown in Figure 1 [4 marks]

Q1	<b>Match the terms with their process description</b>	
A	Repeated heating & cooling of rock leading to expansion & contraction	
B	Tree roots widening fissures at the top of a cliff	
C	Cliff faces being chipped as storm waves fling material at rock faces	
D	Smoothing, rounding & reducing of beach material by swash/backwash	
E	Powerful effervescence of compressed air as waves recede from joints	
<b>Corrasion/abrasion    cavitation    attrition    exfoliation    biological action</b>		

Q2	<b>Tick whether these involve Erosion or Weathering processes</b>	<b>Erosion</b>	<b>Weathering</b>
A	Freeze thaw action		
B	Hydraulic action		
C	Dissolving action by acid rain		
D	Quarrying		
E	Attrition		
F	Corrasion		
G	Oxidation of ferrous minerals within coastal rocks		

Q3	<b>Tick the 2 factors out of each trio that will be most influential in the following processes</b>			
A	Freeze-thaw action	<b>Diurnal temp. range</b>	<b>Predominant wave direction</b>	<b>Degree of jointing of rock</b>
B	Cliff slumping	<b>Offshore currents</b>	<b>Nature of cliff material</b>	<b>Intensity of rainfall</b>
C	Spit formation	<b>Change in angle of coastline</b>	<b>Longshore drift</b>	<b>Concordant coast</b>
D	Longshore drift	<b>Predominant wave direction</b>	<b>Predominant wind direction</b>	<b>Tidal range</b>
E	Cliff retreat	<b>Nature of cliff material</b>	<b>High energy coast</b>	<b>Length of ocean fetch</b>

## Booklet 5: Weathering, mass movement and run-off (2022)

### FURTHER READING / RESOURCES

The following sources are for you to complete further reading:

#### Internet:

Summary information and video clips of [sub-aerial weathering and mass movement](http://www.alevelgeography.com/sub-aerial-processes/) (<http://www.alevelgeography.com/sub-aerial-processes/>)

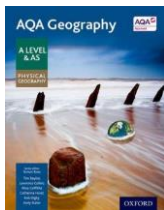
news article <http://www.dailymail.co.uk/news/article-2303412/Why-buy-house-blind-auction-Torquay-landslide-takes-154k-home-it.html> (has good pictures for students to interpret and limited text).

<http://thebritishgeographer.weebly.com/coastal-processes.html> - a recap with summaries of what you have studied so far including sub-aerial weathering

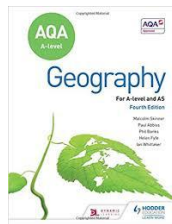
<http://pubs.usgs.gov/fs/2004/3072/fs-2004-3072.html> – though not coastal, has good informative links and information on reasons for landslides and mass movement

#### Textbooks:

Pages 114 to 117



Pages 101 to 103



#### Other:

See Godalming Online for additional resources:

Geography Y1 – 3.1.3 Coastal Systems and Landscapes – 5 Weathering and Mass Movement

### **HOMEWORK / FLIPPED LEARNING:**

Go to Godalming Online/ Geography Y1 (As and Linear)/3.1.3Coastal Systems and Landscapes / 5 Weathering and Mass Movement

- Complete questions 1 and 2 from GF\_388\_-\_L1\_HW\_Coastal\_Erosion\_-\_Back\_to\_Nature.pdf:
  1. Why is Mappleton threatened by coastal erosion?
  2. How have human actions contributed to the erosion that destroyed Sue Earle's home? Include in your answer mention of the effect human actions have had on the coastal system at Mappleton.