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SCI S122
A Foundation Course In Biology And Earth Science
(Free courseware)

香港公開大學
THE OPEN UNIVERSITY OF HONG KONG

Contents

Chapter 1 Geology and Geomorphology of Hong Kong

1.1 About this module

Welcome to this free courseware module 'Geology and Geomorphology of Hong Kong'!

This module is taken from the OUHK course *SCI S122 A Foundation Course in Biology and Earth Science (http://www.ouhk.edu.hk/wcsprd/Satellite?pagename=OUHK/tcGenericPage2010&c=C_ETPU&cid=191154062000&lang=eng)*, a 10-credit, foundation level course that is part of the Bachelor of Science or Bachelor of Science with Honors degree in the Environmental studies programme offered by the School of Science and Technology (http://www.ouhk.edu.hk/wcsprd/Satellite?pagename=OUHK/tcSubWeb&l=C_ST&lid=191133000200&lang=eng) of the OUHK. This course provides you with a sound foundation in the concepts of modern biology and earth science and will be based on the local environment.

SCI S122 is mainly presented in printed format and comprises ten study units. Each unit contains study content, activities, self-tests, textbook readings, etc for students' self-learning. This module (The materials for this module, taken from Unit 5 of the print-based course SCI S122, have been specially adapted to make them more suitable for studying online. In addition to this topic on 'Geology and Geomorphology of Hong Kong'), the original unit also includes the topics 'links between earth science and ecology' and 'geology and geomorphology of Hong Kong' retains most of these elements, so you can have a taste of what an OUHK course is like. Please note that no credits can be earned on completion of this module. If you would like to pursue it further, you are welcome to enrol in *SCI S122 A Foundation Course in Biology and Earth Science (http://www.ouhk.edu.hk/wcsprd/Satellite?pagename=OUHK/tcGenericPage2010&c=C_ETPU&cid=191154062000&lang=eng)*.

This module will take you about **eight hours** to complete, including the time for completing the activities and self-tests (but not including the time for assigned readings).

Good luck, and enjoy your study!

1.2 Introduction

In this module, you'll be introduced to the landscape of Hong Kong by learning some of the basics of geology and geomorphology.

This is a fascinating topic, since it combines the rigors of science with the chance to do fieldwork in some of the most beautiful landscapes on Earth.

You'll learn that Hong Kong is remarkably blessed in its varieties of landscapes. You'll use maps, diagrams and video to better appreciate these landscapes, and to do your own analysis of them.

1.3 Defining geology and geomorphology

Let's begin by considering some definitions. At secondary school, one definition of geology and one definition of geomorphology each would be enough. For us at university, however, one of each is not enough. The following activity helps you to see why several definitions need to be considered and debated.

1.3.1 Activity 1

Please inspect and analyse the definitions of geology and geomorphology provided below and then select the definitions you think are best. Give reasons for your selection.

Geology

Different dictionaries define the science of geology in slightly different ways. Here are three definitions:

1. Lapidus (1990): geology is the study of the earth in terms of its development as a planet since its origin. This includes the history of its life forms, the materials of which it is made, processes that affect these materials, and products that are formed from them.
2. Kearey (1996): the study of the solid earth. (Yes, that's the whole definition - it's definitely short and sweet!)
3. Whittow (1984): the study of the origin, structure, composition, and history of the earth, together with the processes which have led to its present state.

What is your preference? You do not need to decide now. Read the definitions of geomorphology first, and then we will think about all of the definitions, and choose the best for each term.

Geomorphology

Let's take three definitions of geomorphology from the same three sources:

1. Lapidus (1990): the scientific discipline concerned with the surface features of the earth, including landforms and forms under the oceans, and the chemical, physical and biological factors which act on them, e.g. weathering, streams, groundwater, glaciers, waves, gravity and wind.

2. Kearey (1996): the study of the form of the ground surface and the processes which shape it.
3. Whittow (1984): the scientific study of the origin of landforms based on a cause-and-effect relationship. Geomorphorlogical processes comprise physical and chemical interactions between the earth's surface and the natural forces acting upon it to produce landforms.

Please look at my feedback *after* you've thought about the definitions.

1.3.1.1 Feedback

Definition work

Geology

I like Whittow's (1984) definition the best. Here are my reasons:

1. It covers the:
   - origin
   - structure
   - history

   of planet earth *and*
2. the many processes which have made earth the way it is.

The others are good too. But Kearey's definition lacks explanation. It is too short.

Geomorphology

The selection here is not so easy. I like Kearey's definition this time because it is concise *and* mentions form (shape) plus the shaping processes. However, Lapidus adds new ideas and goes deeper to mention landforms beneath the sea. This is a good idea too!

1.4 An introduction to Hong Kong's geology and geomorphology

Having given thought to the key definitions of geology and geomorphology, it's now time to take a concise overview of the shape and geology and geomorphology of Hong Kong.

Reading

Read the very good summary and introduction that was prepared by experts from the Hong Kong Geological Survey for a recent Year Book (Hong Kong 2006). You can find it here:

http://www.yearbook.gov.hk/2006/en/14_17.htm

If you are interested in knowing more, the GEO is located in Homantin, very near the OUHK. The GEO is part of the Civil Engineering Department. You might like to seek more or alternative information of the geomorphology of Hong Kong from the Civil Engineering Department's website (http://www.cedd.gov.hk).

You may like to refer to this introductory account again from time-to-time as you interact with the other readings provided in this section.

Our next reading introduces you to the landscape of Hong Kong from a more scientific point of view. The reading, from the CEDD's interactive website, focuses on Hong Kong's regional geological setting.

Reading

Hong Kong Civil Engineering and Development Department, 'The Geology of Hong Kong (Interactive Online): Regional Geological Setting'.

http://www.cedd.gov.hk/eng/about/organisation/reg.htm

This excellent site provides a wealth of information about Hong Kong's landscape. You can read and explore as much of it as you wish, but for now you should definitely read the section at the URL above. Please note that it's divided into a number of subsections; you can just click on the blue subheadings, and the relevant text will appear.

As you read, I would like you to notice the following points in particular:

1. Hong Kong's landscapes contain, on display for a walker to inspect, all the major rock types e.g.
    - volcanic
    - igneous (granitic)
    - sedimentary.
2. The diverse geology (rock types and structure) and geomorphology (landforms) have led to the creation (evolution and development) of many different habitats. This landform diversity supports, in turn, a diverse (biodiverse) plant and animal life. This point is important. In other words, there are close links between geology, geomorphology, and biology, i.e. the interactions between physical and biotic environments. This idea is very important in environmental studies.
3. The present landscape picture is our key to understanding the past (in geological time). Hong Kong has a strong volcanic history.

1.4.1 Features of Hong Kong's coastal geomorphology

Hong Kong is also blessed with some fascinating coastal geomorphology.

Below is a brief glossary of terms that are used to describe the features of Hong Kong's coastal geomorphology.

- Cliffs -- a sharp steep distinct slope between land and sea.
- Geos -- a narrow, linear cleft (bend) running inland from a sea cliff.
- Sea caves -- an opening beneath a sea cliff caused by coastal erosion into which seawater may penetrate.
- Wave-cut platforms -- a shore platform is a low gradient rock surface located between the tides (intertidal) and probably caused by the recession of a sea cliff.
- Stacks -- a coastal pillar of rock above the mean high tide (HT) level. A stack stands out, like the tor of To Kwa Wan.
- Beaches and raised beaches -- a beach is the site (location) of accumulation of sediment deposited by waves and sea currents around the edge of the sea i.e. coastal margin.
- Sand dunes -- a build-up of coastal deposits, often by wind to make a small loose, sandy hill above mean HT mark.
- Sand spits -- a long narrow accumulation of beach deposits with one end attached to the shore and the other (seaward) end projecting out into the sea.
- Tombolos -- these are sand spits or sand bars which link an island to the mainland or to another island.
- Boulder beaches -- beaches where large rock blocks cover most of the shore.
- Rocky shores -- shorelines, which are composed mainly of solid rock as a sloping or flat platform (also called hard shores).
- Mangrove estuaries and sediment bays -- coastal areas where fine sediments such as mud accumulate to make soft shores. Such a habitat is favourable for the development of intertidal tree and shrub ecosystems called mangroves.

Video activity 1

You can see many of these coastal geomorphological form in the following video clip:

Click this link to watch the video:
http://www.opentextbooks.org.hk/system/files/resource/3/3369/3376/media/Video%20Activity%201.mp4

1.5 Geomorphology: the big picture

Let's now turn our attention beyond Hong Kong and look at some 'big picture' principles of geomorphology. Our next reading is a simple, broad introduction to the science of geomorphology. It is short and is not specifically about Hong Kong, it helps you to connect your growing ideas to other places. This is most important in earth science, which is, after all, about planet earth.

Reading

http://www.answers.com/topic/geomorphology?cat=technology

There are several short introductions to geomorphology collected at this URL, but I want you to read the first one, from *The Science of Everyday Things*.

Geomorphology is about the shape of the earth's surface. Interactions between global systems of atmosphere and the earth's surface (lithosphere) are what make the shape of our planet.

I hope you noticed the following points in particular:

1. How the science of geomorphology is defined and explained. Note the emphasis on a study of the earth's surface features.
2. How the geomorphology has developed as a science over the years.

3. How geomorphology is related to many other branches of science such as oceanography, geophysics and volcanology.
4. In the section titled 'Shaping the Earth', the article identifies some key process that shape landforms. Four of these feature strongly in Hong Kong:
    - weathering
    - slopes
    - water flows
    - coasts.
5. The article also notes that humans can be big factors in the earth's geomorphological system. This is strongly evident in Hong Kong. But humans must (and do) try to work within the geomorphological system.

1.6 Map work

It is now time to do some map work. Map use and interpretation is an important objective of this unit. Maps, and other tools of geomorphology such as aerial photographs, satellite images, field work and photo interpretation, are an important part of the learning process. They are also important sources of information.

In this online version of this course, we will make use of come very good online maps. This is convenient - and cheap, as access to some very good Internet-based maps is free. But there is nothing quite like a large tablecloth-size real map to give you a mental picture of a place. Real maps that you can physically touch, handle, hold, and manipulate cannot be put on a computer monitor. They do not fit, nor can they be handled or easily studied with simple hand-held tools like a metric ruler, set square, protractor, or compass. Such a map can be your friend as well as a tool in the field. The Hong Kong Government's Geotechnical Engineering Office of the Civil Engineering Department has produced a range of excellent maps covering the physical environment of Hong Kong.

1.6.1 Map activity

Let our map work begin! The CEDD provides a very good online map of Hong Kong's solid geology. You should study it at this point. The maps are:

www.cedd.gov.hk/eng/about/organisation/geo_map_2.htm

When you inspect this map, think about what it tells you about Hong Kong. What can you immediately see about Hong Kong's terrain?

1.7 The structure and shape of Hong Kong's landscape

Hong Kong consists of 1,097 km^2 of the earth's surface. Of this only ~10% is natural flat land, and around 40 km^2 is human made (reclamations). Most of Hong Kong's landscape is described as 'upland'.

To study Hong Kong's landscape in more detail, I'd like you to read a very up-to-date and attractively written summary that describes Hong Kong's landscape in a way than can give life to maps. As you read this slightly-edited extract from *Exploring Hong Kong's Countryside* by Edward Stokes (1999), have a map of Hong Kong, or a map/satellite image open beside you (there's a good one at http://geology.com/world/hong-kong-satellite-image.shtml, or perhaps you can use Google Maps). This will help you to see the big picture of Hong Kong!

1.7.1 The landscape

Click this link to watch the video:
http://www.opentextbooks.org.hk/system/files/resource/3/3369/4077/media/The%20structure%20and%20shape%20of%20Hong%20Kong%27s%20landscape.mp4

Despite its small area Hong Kong has a remarkable array of landforms: precipitous peaks, deep valleys, indented coasts and numerous islands. This natural setting, one of the most striking in all of South China, has a geological story that begins in the Devonian Period some 360 million years ago.

A rocky outcrop, set in an upland hollow, glistens in the morning light. The depression, enclosed by steep slopes, hides the wider setting. But just a stone's throw away is a

wide open, exhilarating scene. Beyond a ridge landscapes and seascapes spread out: the vista reveals hills and ridges, ravines and valleys, bays and islands, cliffs and long promontories.

Exploring Hong Kong walkers delight in its complex, surprising topography. There are rugged uplands, sheltered lowlands, and a coastline of extraordinary intricacy. Amidst this beauty are hiking trails that, reflecting the land itself, vary from pleasant to challenging. Yet few people appreciate how beautiful is the landscape - or how long ago the natural setting was formed.

Geologically and climatically, Hong Kong is part of South China. Situated just east of the Pearl River estuary, its landforms are an extension of Guangdong's - with the province's most indented coastline. Including reclamations, Hong Kong's land covers about 1,090 square kilometres; and within this small area there are numerous landforms and great natural diversity.

The summits rise to over 500 metres, and the highest peaks reach over 900 metres. There are only a few small upland plateaus, and the mountains mostly drop down steeply to confined valleys. Countless hillside streams plunge through ravines. In the wet summers they can be torrents, but during winters most of them barely run. There are few major lowland streams and Hong Kong has no proper river.

Isolated lowlands lie scattered between the ranges. Most are small valleys that nestle beneath steep slopes or lie behind coastal bays. Only in the northwest is there any extensive flat land: there a wide alluvial plain spreads out between Hong Kong's highest mountain and the sea. Around the coastline there is generally very little flat land - and often there is none at all.

The coastline, including some 260 islands and islets, extends for about 800 kilometres. In the east there are numerous cliffs and caves, coves and inlets; while in the west the coast is generally gentler, with long beaches and wide bays. An arc of islands, some 60 kilometres long, adds to the coastal charms - with treacherous crags, tiny islets and precipitous islands.

The geology of Hong Kong is varied. Volcanic rocks underlie almost half the area, granite rocks underlie a third, and sedimentary rocks make up only a small fraction. The main ridges and valleys are aligned northeast to southwest, while some lesser features lie northwest to southeast along the geological grain. The eastern half of the territory has the steepest, most rugged landscapes, with narrow valleys and a cliffed coastline. The western half has more rounded slopes, large areas of flat land, and a lower-lying coastline. How and when did these features originate?

Hong Kong's oldest rocks were laid down in the Devonian Period, 400 to 360 million years ago. First deposited as sands on the flood plain and in the channels below an ancient mountain range, the material was later compressed into sedimentary conglomerates, sandstones and mudstones.

Standing on the coast today it is hard to comprehend the massive fluctuations in sea levels that have been part of the story of land formation. But the fact is - from the early Carboniferous Period through to the early Jurassic, no less than 170 million years, the Hong Kong region was submerged beneath the sea.

In early Carboniferous times (some 340 million years ago) the local seas were shallow, and coastal swamps later replaced them. Limestone formed under the seas, coal in the swamps - which were later transformed into, respectively, marble and schists. Still deeper seas covered the area in the early Jurassic. Silts settled to form siltstones and sandstones, which held the fossils of ammonites, primitive life forms.

For some 20 million years, from the Jurassic to the early Cretaceous (165 to 142 million years ago), Hong Kong was located on a chain of volcanoes along the coast of China. Molten rock erupted explosively. Minute ash particles settled to form a rock called tuff. Other magma, cooling slowly below the surface, formed today's granite.

From 100 to 80 million years ago there were bare rocky mountains, wide flat valleys, seasonal streams, and sparse vegetation. The subsequent 30 million years were wetter, with the beginnings of a seasonal climate and shallow lakes. In the first period conglomerates and sandstones formed; and in the latter silts that held the remains of early plants.

A gradual wearing down of the earlier rocks occurred during the last 60 million years. Slowly our modern landscape appeared: mountains took on distinct shapes, valleys widened, and limited alluvial plains formed. By the start of the Quaternary Period, two million years ago, the topography was largely as we see it today - though the seas were lower.

In the last two million years sea levels have varied by as much as 150 metres, during the glacial periods. At the height of the last glacial period, about 16,000 BC, the sea level was 130 metres lower than today, and the regions' streams joined to form rivers which flowed southwards for about 120 kilometres to the ocean. Then, from about 15,000 to 5000 BC, the climate warmed. As the ice sheets melted the sea rose. Valleys became bays, ridges became headlands, and peaks became islands. Gradually, beaches formed along the new shoreline.

The global climate stabilised about 5000 BC. Even before then, the alternate heating and cooling of the Asian continent was the main force controlling Hong Kong's climate. Today, as for past millennia, in winter the continental northeast monsoon brings dry, chilly and even cold weather to Hong Kong; and in summer the oceanic southwest monsoon brings tropical heat, humidity and intense rainfall. Warm temperatures, heavy rain and typhoons contribute to weathering, landslips and coastal erosion.

Unweathered granite has joints that allow penetration by water, together with the natural acids that rain absorbs. The penetrating water gradually weathers the granite - then loose surface material slowly erodes away, leaving large boulders or corestones on the slopes. The water saturation of weathered rocks on steep hillsides can lead to instability, and landslides occur when this happens.

Around the coast the primary erosive force is the explosive power of storm-driven waves. Along the eastern coastline crashing swells have cut the rock into cliffs, platforms, caverns and sea arches. Around the western coasts the Pearl River estuary is the main influence. There, over countless centuries, the river has deposited vast volumes of silt, steadily rounding off the coastline and making the bays and channels ever more shallow.

The story of Hong Kong's land formation and its geology is best told 'in the field'. Take a copy of Hong Kong Rocks, a well-illustrated field guide, and go exploring. Study the rock faces in the country parks; examine the hillside boulders with their joints. And explore the coast, where almost everywhere wonderfully coloured and textured rocks lie waiting.

The next activity allows you to integrate your map reading skills with information from the Stokes reading in order to summarize and analyse the key landscape features in Hong Kong.

1.7.2 Activity 2

Linking maps with words

In this activity you will link your map work on geology with the extract on Hong Kong's landscape you've just read.

1. Do you agree with Stokes' estimate that 'volcanic rocks underlie almost half the area, granite rocks underlie a third, and sedimentary rocks make up only a small fraction' of Hong Kong?
2. The Pat Sin Leng mountain range is a distinctive geomorphological (topographic) feature of the northeast New Territories. What does Stokes say about the alignment (orientation) of the main ridges in Hong Kong? Does his description fit the Pat Sin Leng range?

Video activity 1

Before you answer this question, you can also watch a short video introduction to the Pat Sing Leng area: Before you answer this question, you can also watch a short video introduction to the Pat Sing Leng area:

Click this link to watch the video:
http://www.opentextbooks.org.hk/system/files/resource/3/3369/3382/media/Video%20Activity%201.mp4

3. Now take a look at the satellite image you can find here:
   http://geology.com/world/hong-kong-satellite-image.shtml
   Can you confirm (or deny) the claim by Stokes that 'the eastern half of the HKSAR has the steepest, most rugged landscapes, with narrow valleys and a cliffed coastline'?
4. Looking at both maps and the satellite image especially, is there any evidence that the sea level about 16,000BC was 130 m lower than today, and that between ~15,000 to 5,000BC the sea rose around Hong Kong, and many peaks on the southern coast of the region became islands?

As always, there is feedback to this activity. Please remember and believe that feedback is not equal to answers. Also, feedback does not have maximum impact on your learning if you have nothing to feedback to i.e. your efforts!

1.7.2.1 Feedback

1. Yes, in terms of both volcanic and granite rocks, Stokes' estimate was good i.e. ~50% and 33% respectively. In terms of sedimentary rocks, I think that the phrase 'only a small fraction' conveys the idea of next to nothing. Indeed, sedimentary rocks are almost the same size as low-lying recent sediment in terms of area. Perhaps the revised amounts (areas) should be
   volcanic: 48%
   granite: 30%
   sedimentary: ~10%
   recent sediment: ~10%
   reclaimed: ~2% and growing!
2. Yes, the Pat Sin Leng mountain range fits into the described pattern of northeast to southwest. Broadly, the range runs northeast.
3. This is not so easy to confirm. If Lantau was left out (but it cannot) it may be easy to generalize that the east is highest i.e. most rugged and steep. Lantau is in the west and Lantau is certainly a steep and rugged island. The closely packed contours on the Chek Lap Kok side (north coast) of Lantau are evidence of some spectacular and steep slopes. But if we draw a hypothetical line north-south down from say Lo Wu to Lamma Island, and then look at the east versus the western 'half' of Hong Kong, we could say that the east is more hilly than the west. Most of the northwest NT is between 0-100 m elevation according to the topo map.
   As for valley narrowness, this requires careful analysis. Using a metric rule and taking notice of the scale (1:100,000) and the compactness of the contour lines, some calculations can be made, e.g. around the High Island and Clear Water Bay

areas, the contour pattern indicates steep cliff faces adjoining the South China Sea. A similar pattern can be seen in the contours in inland areas. These indicate steep narrow valleys. I conclude, therefore, that the Stokes' description is a reasonable generalization about the relief or topography of Hong Kong.

4. Yes, there is topographic evidence for this. A close inspection of map 2 (quaternary geology topography map by HKGS) suggests that islands are an outstanding coastal feature of Hong Kong. Some are large and steep, like Kau Sai Kau. Others are small but still steep (like the tops of former uplands!) like Wang Chau or Tai Chau. It is not too hard to imagine that these steep islands were once hilltops, like say, Nam She Tsim (Sharp Peak) in Sai Kung East country park today!

1.8 The development of landforms in Hong Kong

The importance of geological structure on how landscapes develop is a key concept in geology. Rock type has a big influence on the nature and speed of change at the surface of the earth. The meeting between atmosphere and lithosphere takes place on the surface of the earth. It is at this interface (the earth's surface) where the two huge systems of atmosphere and lithosphere interact.

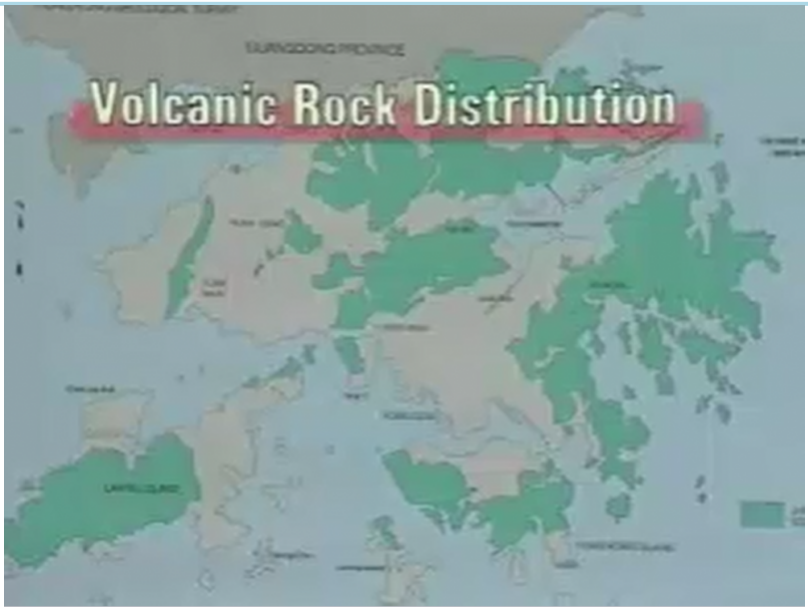
The following list introduces you to some of the key features of Hong Kong's landforms:

- There is a strong volcanic and igneous history behind many of Hong Kong's landforms. What does igneous mean? An igneous rock is a rock that has solidified from molten or partly-molten material (magma). Magma is rock that melted. Beneath the earth's crust is magma or molten rock. Magma contains suspended crystals and dissolved gases, formed by total or partial meeting of solid crustal or mantle rocks (Kearey 1996).
  Granite contains quartz. This is resistant to weathering, but granite also contains more soluble (easily weathered) material such as potassium feldspar and micas. Thus granite can crumble, especially at its joints.

Video activity 2

You can find out more about Hong Kong's volcanic and igneous history by watching the following two clips:

History 1:



Click this link to watch the video:
http://www.opentextbooks.org.hk/system/files/resource/3/3369/3383/media/Video%20activity%202%20-%20History%201.mp4

History 2:

Click this link to watch the video:
http://www.opentextbooks.org.hk/system/files/resource/3/3369/3383/media/Video%20activity%202%20-%20History%202.mp4

- Over 80% of the bedrock (rock below the surface) in Hong Kong is either granitic or volcanic. Does the map from the CEDD you used in the earlier activity confirm this? Go back and take a look.
- Sedimentary rocks are located in the northeast New Territories (again, check this claim against the geological map from the CEDD).

Video activity 3

You can find out more about Hong Kong's sedimentary rocks by watching the following clip:

Click this link to watch the video:
http://www.opentextbooks.org.hk/system/files/resource/3/3369/3383/media/sedimentary_rock.mp4

- Water is of outstanding importance in the story of Hong Kong's landform evolution. Water penetration (movement) into rock depends on geochemical features.
- Time and the dynamics of the earth's crust are two other outstandingly important factors in the story of Hong Kong's landform evolution.

1.9 Towards a geomorphological model

Does a model of landform evolution exist? Can we propose a schematic diagram that captures most of the main ideas of geomorphology so far?

Let's propose a model that could be entitled 'a landform evolution model' or 'a summary diagram of how landforms develop'. The landforms of Hong Kong, like those at any other place on earth, are the product of interactions over (much) time between two sets of forces:

1. Driving forces; and
2. Resisting forces.

1.9.1 Driving forces (DF)

The driving forces for change in earth's materials include:

- Gravity
- Climate
- Internal heat of the earth.

1.9.2 Resisting forces (RF)

The resisting forces include:

- Rock chemistry (lithology ... you remember this word I hope)
- Rock structure (mineralogy and rock types).

The resisting forces provide the geological framework against which the driving forces react (and interact).

Figure 1.1 below presents the driving forces acting on the earth.

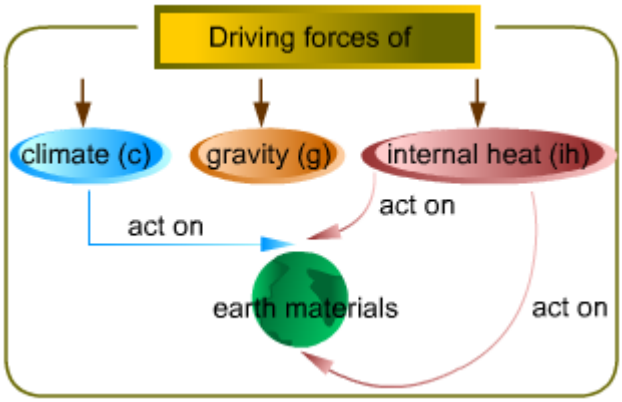


Fig. 1.1: Driving forces acting on the earth.

So the system is expanded into our model thus:

Figure 1.2 Expanded model of forces interacting over time

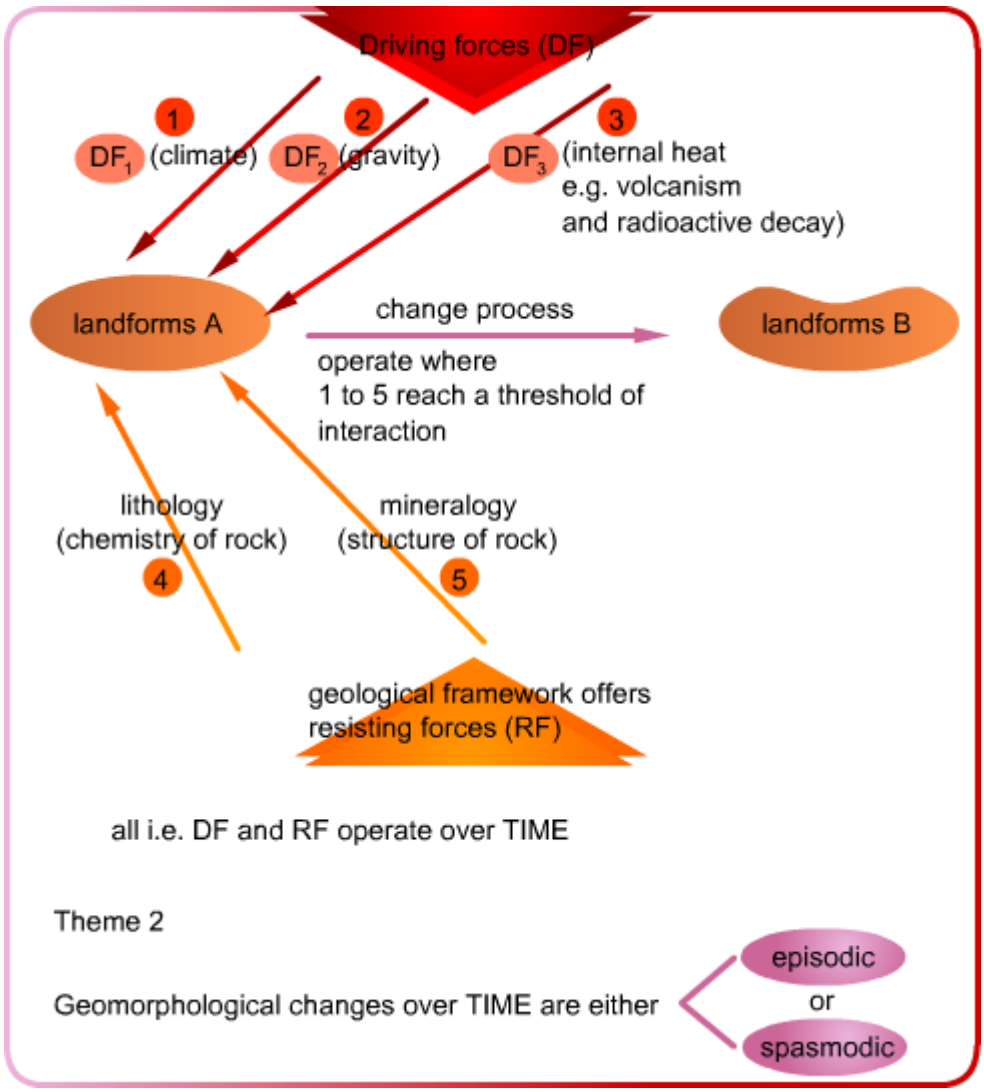


Fig. 1.2: Expanded model of forces interacting over time

Figure 1.2 illustrates how the various forces interact over a long period of time to produce the landforms that we see in Hong Kong, i.e. forces act on landform A which over time produces landform B.

What do I mean by episodic and spasmodic?

- *Episodic* means taking place in episodes e.g. episodes of volcanism during the Jurassic period of earth's history.
- *Spasmodic* is linked to episodic, but means in occasional, more irregular bursts of activity e.g. that terrible Taiwan earthquake of 1999, a spasmodic (unpredictable) burst of crustal dynamics.

The aim of this model is thought. It is not a perfect model. It is given to help you visualize in a sort of mental map, a picture of the processes which create landforms.

1.10 A case study in Hong Kong's geomorphology

Let's now visit our final reading. This reading is aimed at fieldwork, and it is about enjoying and doing geomorphology in Hong Kong. It's co-written by Raynor Shaw, who was the presenter in some of the video clips you've watched already.

This reading a sample chapter from a book title Hong Kong Landscapes. The authors use a combination of text, images, maps and diagrams to highlight the geomophological features of Hong Kong. This chapter takes us out on Stage 1 of the Maclehose Trail.

Reading

Owen, Bernie and Raynor Shaw

http://geotrails.tripod.com/images/Geotrail.pdf

This reading shows that the country parks of Hong Kong provide outdoor labs and classrooms in which to do hands-on geology and geomorphology. In addition, the interactions between geology, ecology and geomorphology can be studied. As you might expect, the biogeochemical cycles such as the water cycle can be visualized here too.

1.11 References

Below are the resources referred to or cited by the developer(s) of the *original unit*:

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1.12 Conclusion

I hope you have enjoyed this introduction to Hong Kong's geology and geomorphology. Just remember that there is still so much more to learn, and to see for yourself. I encourage you to keep on studying the science, but also to get out into the landscape and see it for yourself.

If you would like to learn more on this subject, you are welcome to enroll in *SCI S122 A Foundation Course in Biology and Earth Science (http://www.ouhk.edu.hk/wcsprd/Satellite?pagename=OUHK/tcGenericPage2010&c=C_ETPU&cid=191154062000&lang=eng)* offered by the School of Science and Technology (http://www.ouhk.edu.hk/wcsprd/Satellite?pagename=OUHK/tcSubWeb&l=C_ST&lid=191133000200&lang=eng) of the OUHK.