Field Trip to Nam Chung

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Caution

Slippery rock surface is often encountered along the Nam Chung Stream. Make sure your hiking boots are of good condition.

Introduction

The current landform of Hong Kong is a combined result of many geological factors and processes that operate and interact with each other continuously. Processes shaping our Earth's surface operate at scales ranging from the smallest rock outcrop to the largest continents. Small-scale features at an outcrop or hand specimen are often eye-catching and readily observable. However, attention should also be paid to the importance of geology in landscape evolution on a larger scale. The overall topographic expressions of the landscape are essentially controlled by the distribution of rock types and geological structures. At Nam Chung, we can see some interesting morphological features and examples of how geological factors control the development of landform.

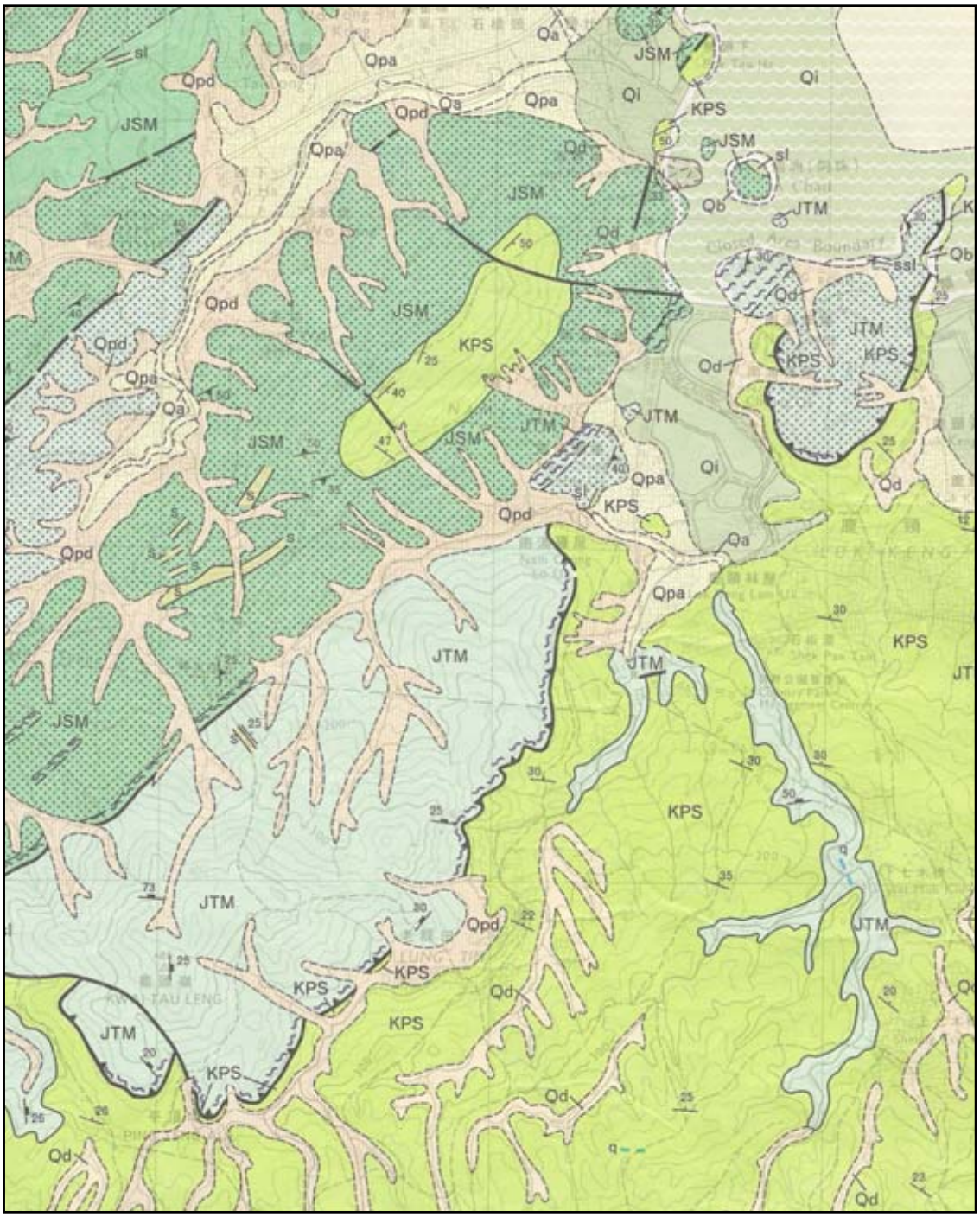
Nam Chung is one of the few areas in Hong Kong with a readily accessible coastal tidal environment (Stop 1). The low-lying area is located in a supratidal-intertidal zone, where salt marshes and an extensive tidal flat are present. Although much of the marshland has given way to fish farming and more recently recreational pond fishing activities, the site is still a suitable locality for observing and instruction of coastal morphology and biological habitats.

Several rivers cut through a series of sedimentary layers in the area, carving out a series of waterfalls and plunge pools in the hillslope. Along the Nam Chung Stream, we can observe the role of lithology in the morphological development. Rock types influence landform development to such an extent that particular landform could be associated with specific rocks. How a particular rock type controls the development of landform depends on its rock strength, texture, and composition. The ability of rock to resist external erosion or weathering depends on its mineral composition and texture. Quartz is a relatively hard and stable mineral and therefore rocks enriched in quartz are generally more resistant, whereas poorly consolidated rocks and rocks containing a large amount of easily weathered minerals can be decomposed readily. Natural hillslopes often possess distinctive slope angles that represent the equilibrium angles for the materials. A visual examination of slope angles can enable us to delineate the contact between different geological materials. A break in slope with an abrupt change in the slope gradient can be seen along the hill slopes at Stop 2, where a more resistant volcanic rock rests on top of the softer sedimentary formation, causing a flattening of the slope along the line of contact.

Geological structures include geological contacts, faults, joints, and folds. In the stream segment between Stops 3 and 4 intensely sheared sedimentary rocks can be seen. These rocks were deformed in a ductile manner, at very high temperature and pressure. At several localities, pebbles in the conglomerates have been completely flattened. This is a great locality for the more advanced learners in geology to study microstructures and fault kinematics.

Rivers tend to follow the course of least resistant material. An abrupt change in the direction of the river course often reflects a change in geological characteristics. Morphological systems often interact with each other in a manner such that changes occurring to one often affect the other. The relationship between the river and the hillslope system is a good example of such interacting systems. Along the course of Nam Chung Stream, we can observe the close relationship among the river, slope and geological features. The upper stretch of the river is characterized by a series of waterfalls.

(Texts are extracted from the field handout prepared by GSHK for Education Bureau, HKSAR)



Part print of Hong Kong Geological Survey 1:20,000-scale Geological Map

Discussion of this trip includes
(1) Tidal environments;
(2) River processes and features;
(3) Sedimentary processes;
(4) Features formed by ductile deformation;
(5) Faults: characteristics and significance and
(6) Geological control on landform development

Route

The group first gets off the chartered coach at Luk Keng and walks to the Nam Chung Temple. From the temple, we will ascend following the Nam Chung Country Trail to the junction with the Nam Chung Stream. Afterwards, the group will climb upstream through a number of waterfalls until another junction with the country trail. We will return to Nam Chung and walk back to Luk Keng for the coach.

The entire field trip takes about 3 to 4 hours including lunch break and field discussion at various field stops.

Field Stops

Stop 1 Luk Keng

At this stop we can observe the morphology and environment of the intertidal and the supratidal zone. In this area, the supratidal zone was once occupied by salt marshes, which have been developed into a number of fishing ponds. The salt marshes generally lie above the mean tidal level and are protected from the wave actions. The area was characterized by grassy vegetation before it was modified by fish farming and recreational fishing activities. The development of salt marshes goes through several stages. An old salt marsh, like the one seen here, has few open tidal channels and is occasionally flooded by sea water during storms. The intertidal zone, located between the high and low tidal lines, is characterized by an extensive mud flat which extends for almost 100m seaward. The sediments on the tidal flats are mostly terrigenous mud with intense biogenic activities, including worm burrows. Both salt marshes and tidal flats are significant habitats for many species of flora and fauna.

Stop 2 Nam Chung Valley

Here you can attain a good view of the Pat Sin Ling ridge. The ridge represents an escarpment with a dip slope on the northern side which develops on bedding planes of tilted sedimentary rock layers. Looking southward, the hillslope consists of a steeper segment overlying a gentler segment, with a different equilibrium angle in each segment. The break in the slope coincides with the contact of two different rock types. The upper slope is a volcanic tuff that formed during the Jurassic time, while the rocks forming the lower slope are relatively younger sedimentary rocks. The two formations are separated by a fault that had placed older rocks on top of younger ones. This fault is in fact a low-angle normal fault that formed in a time when the crust was undergoing extension.

Stop 3 River crossing

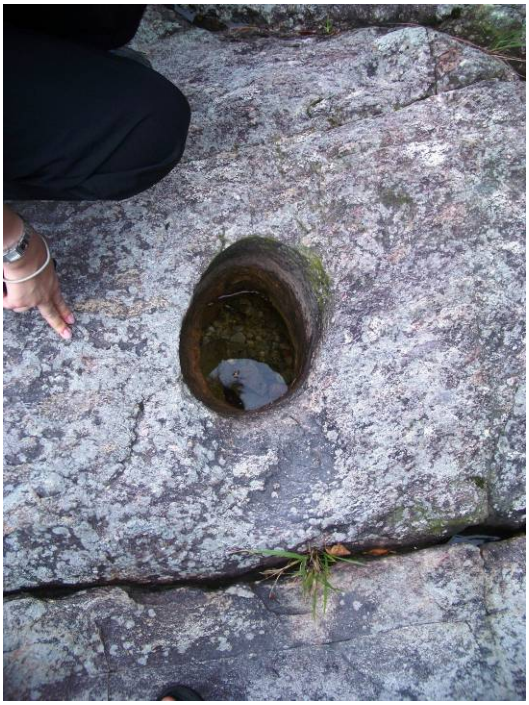
The rocks exposed around here are conglomeratic sandstone that contains rounded pebbles. Sheared and flattened pebbles are found in particular bands within the conglomeratic layers. Beneath the river crossing, a 5-cm thick quartz vein is found to have been offset. Some pebbles were cut and sheared. We will leave it as an exercise for you to determine the sense of motion on the faults. This is a great locality for the advanced learners to observe faults, shear features and brittle and ductile deformation.

Stop 4 Right angle turn in river course

When a river course makes a sharp bend, it often signifies a structural control such as an abrupt change in rock type or a fault. At this particular location here, the river course is intersected by a vertical fault. Note the fault is represented by a fault zone of crushed and brecciated rock. Repeated shearing motion on the fault has ground the rock into a very fine, clay-sized material known as fault gouge. Examine the fault gouge carefully and describe the properties. What are the engineering implications of such a fault gouge?

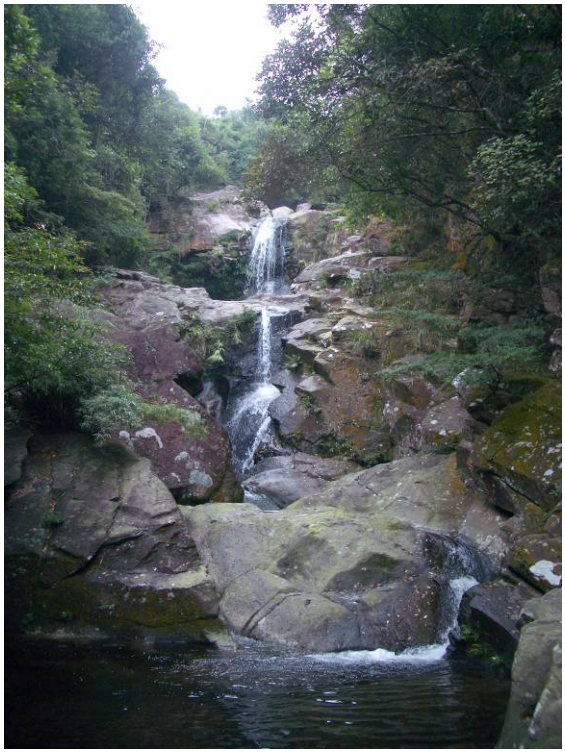
Stop 5 River features

This stretch of the river is characterized by river features such as potholes and scour marks from river erosion. Note at many locations, individual river channels follow the joints in the bedrock, indicating the importance of structural control on river channel development. Potholes are formed by the scouring action of rock pebbles, called grindstones, carried by turbulent river currents. The river may not carry much water presently. But at peak flows, the water can attain a great velocity.



Stop 6 Ping Nam Cascades

A series of waterfalls is present in this stretch of the river. As an exercise, describe the rock types that form the caprock of the waterfall and those on the vertical rock faces and explain how the waterfalls were formed. A simple exercise is to sketch a longitudinal profile of the river (use 1:1000 map). An example of a longitudinal profile of the cascades is shown below. Mark the position of the waterfalls and plunge pools. Label the rock types on the profile. For simplicity, you may only need to know about two kinds of rocks: conglomerate and siltstone.



Stop 7 View of Landslide

The landslide is best viewed from the trail on the other side of the river. See if you can identify the position of the crown and toe of the landslide and outline the geometry of the landslide lobe. Pay attention to the detachment surface and the vegetation.