



香港中文大學理學院

FACULTY OF SCIENCE

THE CHINESE UNIVERSITY OF HONG KONG



Earth and Environmental Sciences Programme

地球與環境科學課程

Programme Introduction

Tel: 3943 9624

Fax: 3942 0970

Email: eesc@cuhk.edu.hk

Why study Earth and Environmental Sciences?



如果你...

- ❖ 想瞭解地球與環境系統如何運作
- ❖ 想擁有良好數理基礎，又可應用科學知識參與解決21世紀的一些重大環境問題（如全球氣候變化、空氣及水污染、自然與地質災害、能源與糧食危機、生物多樣性減少等）



If you want to...

- ❖ Understand how **Earth and environmental systems operate**
- ❖ Acquire **good quantitative skills and apply scientific principles to solve some of the most pressing environmental problems** (e.g., climate change, air and water pollution, natural and geological hazards, energy and food crisis, biodiversity loss...)

EESC Curriculum | 課程大綱



學習和研究地球及環境系統中各圈層的運作過程，
以及它們之間的相互作用對地球環境所產生的影響。

To study the mechanisms of all “spheres” of the
Earth and environmental systems, and how their
interactions shape the Earth’s environment.



EESC Curriculum | 課程大綱



這些系統部份包括大氣圈、水圈、冰雪圈、岩石圈和生物圈等。透過學習這些部份的運作情況，可以瞭解及參與減輕自然和人為的環境威脅。

The system consists of the atmosphere, hydrosphere, cryosphere, geosphere and biosphere. Via studying their processes, we understand and help mitigate natural and manmade environmental threats.

Curriculum Design | 課程理念



Building upon traditional disciplines, including, e.g., **geology** (地質學), **meteorology** (氣象學), **oceanography** (海洋學), **environmental chemistry** (環境化學), and **ecology** (生態學), we aim to establish an exciting **interdisciplinary** programme in Earth and Environmental Sciences (地球與環境科學是一個**橫跨傳統學科**的嶄新課程). We aim to equip students with a solid foundation in **basic sciences** (physics, chemistry, biology), **quantitative skills** (statistics, computation), and **practical knowledge of the Earth environmental systems**, so that they are prepared to tackle the various environmental challenges facing us today.

Teaching Staff



Man Nin CHAN (陳文年), Associate Professor

Ph.D., Caltech; Postdoctoral Fellow, Lawrence Berkeley Nat. Lab.

Areas: Aerosol chemistry, composition, Formation and transformation of secondary organic aerosols, Aerosol instrument techniques



Amos Pui Kuen TAI (戴沛權), Associate Professor

Ph.D., Harvard; Croucher Postdoctoral Fellow, MIT

Areas: Atmospheric chemistry & physics, Air pollution and climate change, Agricultural and forest meteorology, Biosphere-atmosphere interactions, Ecosystem services and food security



Francis Chi Yung TAM (譚志勇), Associate Professor

Ph. D., Atmospheric and Oceanic Sciences, Princeton University

Areas: Climate dynamics, Global warming and extreme events, Dynamical downscaling



Joe Shing Yip LEE (李成業), Professor

Ph.D., HKU; Professor, Griffith University, Australia; Fellow, Royal Society of Biology

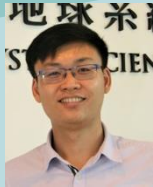
Areas: Ecosystem ecology of estuarine wetlands, Application of stable isotopes in marine environmental research, Marine ecosystem dynamics, Rehabilitation and restoration

Teaching Staff



Lin LIU (劉琳), Associate Professor

Ph.D., U. of Colorado, Boulder; George Thomson Postdoctoral Fellow, Stanford University
Areas: Remote sensing and deep learning applied to earth system science, Cryospheric Sciences, Space Geodesy, Deep Learning



Yen Joe TAN (陳衍佐), Assistant Professor

Ph.D., Columbia University; Postdoctoral Fellow, Stanford University
Areas: Volcano seismology, Earthquake seismology, Marine geophysics, Machine learning applications in geophysics



Teng-fong WONG (黃庭芳), Research Professor

Ph.D., MIT; Former Chair, Dept. of Geosciences, Stony Brook University; AGU Fellow
Areas: Earthquake mechanics, Rock physics applied to natural resources, Environmental hydrogeology.



Hongfeng YANG (楊宏峰), Associate Professor

Ph.D., Seismology, Saint Louis University
Areas: Earthquake Source Physics, Subduction zone dynamics, High-resolution imaging of crustal fault zones and subsurface structure, Deep learning

Teaching Staff



Tammy Pui Yuk TAM (譚佩玉), Lecturer

Ph.D., HKU; Postdoctoral Fellow, Assistant Lecturer, HKU

Areas: Metamorphic Petrology and Geochronology, Structural geology



Andie Yee Man AU-YEUNG (歐陽綺雯), Lecturer

Ph.D., City University of Hong Kong

Areas: Tropical meteorology, Seasonal climate prediction, Tropical cyclone activities



Ronald Kwan Kit LI (李鈞傑), Assistant Lecturer

D.Phil., University of Oxford

Areas: Climate dynamics, Seasonal predictions

Teaching Staff



Apple CHUI (崔佩怡), Research Assistant Professor

Ph.D., CUHK; Pew Fellow for Marine Conservation

Areas: Reproductive and larval ecology of corals, Coral recruitment dynamics, Reef restoration using sexually reared corals



Laura FALKENBERG, Assistant Professor

Ph.D., University of Adelaide, Australia

Areas: Global change biology; Marine ecosystem dynamics; Herbivore-autotroph interactions; Socio-economic consequences of environmental change



Haiwei LUO (羅海偉), Associate Professor

Ph.D., University of South Carolina, USA

Areas: Microbial evolution and ecology, Genomics, Bioinformatics



Michelle Man Suet LAW (羅文雪), Lecturer

Ph.D., CUHK

Areas: Earthworm ecology and biodiversity, Soils and the environment, Biogeochemistry and ecosystem functioning, Sustainability and environmental resources management

Teaching Staff



Ling Ming TSANG (曾令銘), Assistant Professor

Ph.D., CUHK

Areas: Biogeography and conservation genetics, Evolution and phylogeny of crustaceans, Molecular ecology of marine animals



Martin Tsz Ki TSUI (徐子祺), Associate Professor

Ph.D., University of Minnesota, USA

Areas: Environmental pollution, ecosystem biogeochemistry, stable isotope applications



Benoit THIBODEAU, Assistant Professor

Ph.D., University of Quebec at Montreal, Canada

Areas: Ocean biogeochemical dynamics, Stable isotope geochemistry, Anthropogenic impacts, Paleoceanography & paleoclimate

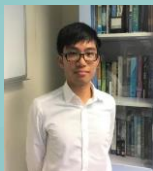


Hung Kay LEE (李鴻基), Associate Professor

Ph.D., CUHK

Areas: Synthesis, structural characterization, and reactivity studies of amidometal complexes, Design of structural and functional mimics to the active sites of various metalloproteins.

Teaching Staff



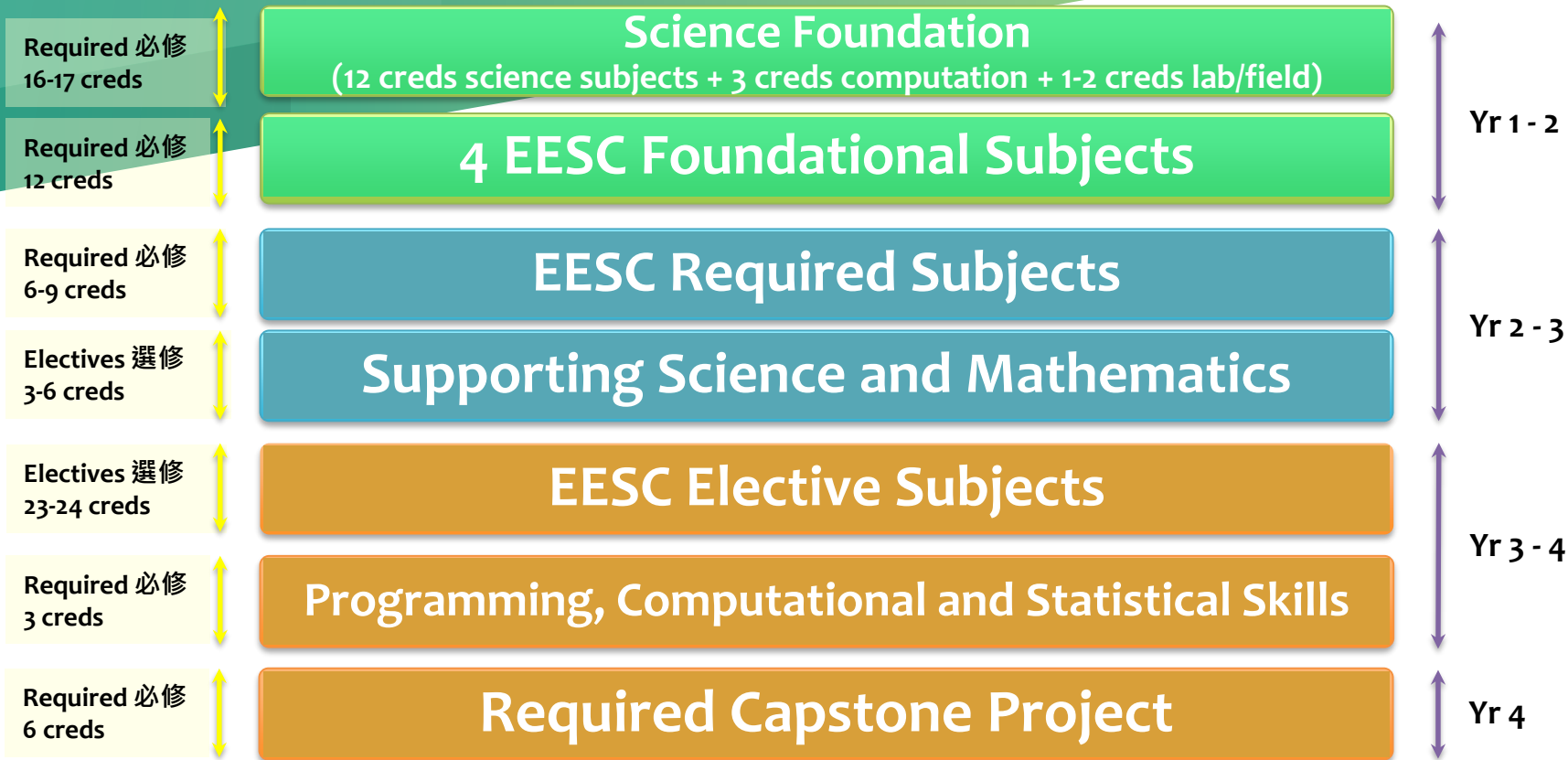
Donald Ka Long CHAN (陳家朗), Lecturer

Ph.D., CUHK

Areas: Environmental chemistry

EESC Major : 72 credits (minimum)

University : 123 credits



EESC Foundational Subjects (4 out of 6)

Climate System Dynamics
氣候系統動力學

Solid Earth Dynamics
固體地球動力學

Environmental Engineering
環境工程導論

Environmental Science
環境科學導論

Environmental Chemistry
環境化學

Ecology
生態學

Supporting Science and Mathematics Subjects

EESC Required/Elective Subjects

Advanced practical skills:

Remote Sensing 遙感原理與應用

Statistical Methods and Data Analysis
統計方法與數據分析

Numerical Methods and Modeling
數值方法與模擬

General study or specialization in 3 streams:

Atmospheric Science 大氣科學

Geophysics 地球物理學

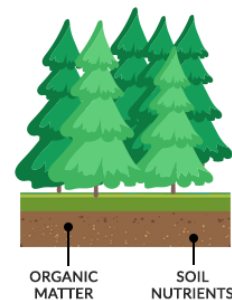
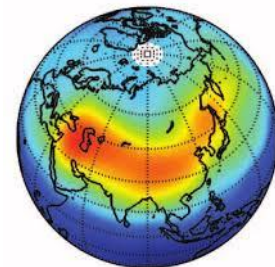
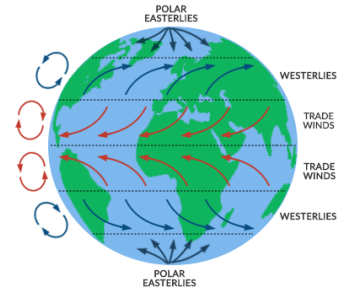
Environmental Science & Technology
環境科學與技術

Atmospheric Science Stream

(大氣科學組)

❖ **Atmospheric Science** is the study of the dynamics and chemistry of the atmosphere, and the mechanisms shaping the climate system.

❖ This encompasses the interactions between various parts of the atmosphere as well as interactions with the oceans and freshwater systems, biosphere and human activities.



PLANT GROWTH

PLANT/ANIMAL LITTER

DECOMPOSITION

ORGANIC MATTER
SOIL NUTRIENTS



TORNADOES



BLIZZARDS



Physics and Chemistry of Aerosol
氣溶膠物理與化學概述

Oceanography
海洋學

Tropical Meteorology 熱帶氣象學

Atmospheric Chemistry
大氣化學

Air Pollution and Engineering
大氣污染科學與工程

Ecosystems and Climate
生態系統與氣候

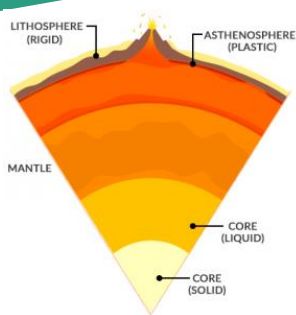
Land-Atmosphere Interactions and
Boundary-Layer Meteorology
地氣相互作用及邊界層氣象學

Atmospheric Dynamics
大氣動力學

Urban Climatology
都市氣候學

Geophysics Stream (地球物理組)

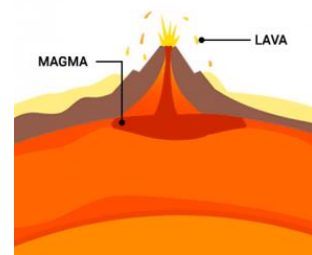
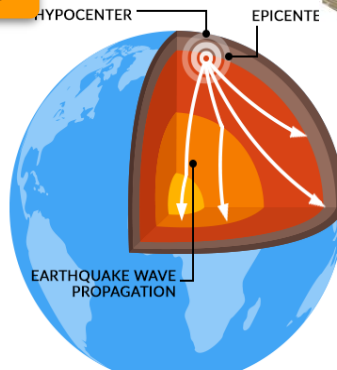
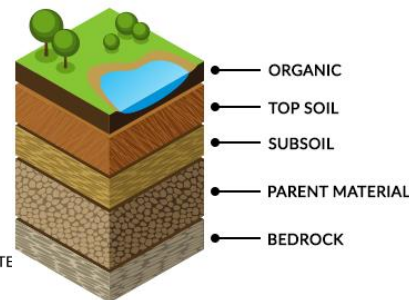
Geoscience Field Trip
地球科學野外考察 (神農架)
Integrated Geoscience Field Trip
地球科學野外綜合考察 (香港)
Fundamental Geoscience Fieldwork
地球科學野外綜合考察 (台灣)
Advance Geoscience Field Trip
野外地質考察 (五台山)
Marine Geology and Geophysics
海洋地質與地球物理學 (杭州)



❖ **Geophysics** focuses on studying the Earth using gravity (重力), electromagnetic (電磁力) and seismic (地震波) methods.

❖ Students will acquire **solid physical** and **mathematical foundations** and **quantitative understanding** of the solid Earth, including:

- surface and internal structures - geotechnical engineering
- geohazards and mitigation
- exploration of mineral and natural resources



Structural Geology 構造地質學

Soil & Rock Mechanics 泥土岩石動力學

Engineering Geology 工程地質學

Physics of the Earth 地球物理學

Geomorphology 地貌學

Seismology 地震學

Petrology 岩石學

Hydrogeology 水文地質學

Continuum Mechanics 連續介質力學

Marine Geophysics & Geology
海洋地質與地球物理學

Applied Geophysics
應用地球物理學

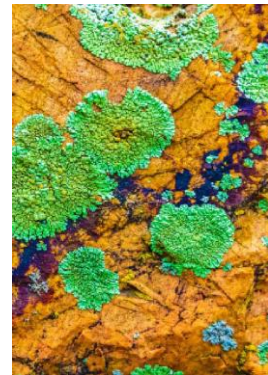
Volcanology
火山地質學

Environmental Science & Technology Stream (環境科學與技術組)



❖ **Environmental Science and Technology** focuses on the chemical and ecological processes shaping environmental and human health, and the technical methods used to monitor and mitigate pollution and ecological disasters.

❖ Students will also gain basic knowledge and practical skills in strategic planning, policy development, pollution control and waste treatment, biodiversity and environmental conservation.



Environmental Protection and
Pollution Control 環境保護與污染控制

Environmental Impact
Assessment 環境影響評估

Environmental Instrumentation
Techniques 環境儀器技術

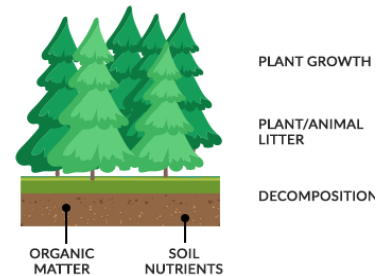
Chemical Treatment
Processes 化學處理過程

Ecotoxicology
生態毒物學

Biogeochemistry
生物地球化學

Advanced Environmental
Chemistry 進階環境化學

Environmental Health
環境健康



Various courses in Biology:
Field and Environmental Biology, Global
Change Biology, Conservation Biology,
Marine Biology, Marine Microbial Ecology

Admissions 入學要求

Two Paths to Join 兩種途徑選讀這個嶄新獨特的 本科主修課程



- 已有明確主修意向的同學，可以直接透過「地球與環境科學」收生計劃 (JS4648) 修讀EESC
- 同學亦可透過「理學」大類收生計劃 (JS4601) 主修EESC

Applicants could join us via:

- JUPAS 4648 Earth and Environmental Sciences Programme
- JUPAS 4601 CUHK Science Broad-based Admission Scheme - EESC Major

Admission Requirements for JUPAS Applicants - 2022 Entry

JS4601 SCIENCE						
Core Subjects				Elective Subjects		
C	E	M	L	1	2	Requirements
3	3	2	2	3	3	1st Elective: Any one from Biology / Chemistry / Physics / M1 or M2 / Combined Science or Integrated Science 2nd Elective: Any one subject in Category A

JS4648 Earth and Environmental Sciences						
Core Subjects				Elective Subjects		
C	E	M	L	1	2	Requirements
3	3	3	2	4	3	1st Elective: Any one from Biology / Chemistry / Physics / M1 or M2 / Geography / Combined Science 2nd Elective: Any one subject in Category A

Programme Selection Principle: Best 5



STEM人才培育

STEM Talent Scheme



- Obtained at least **THREE** stars in **THREE** STEM-related elective subjects in HKDSE (e.g. 5*5*5*/ 5**5*3 / 5**5**5**)
- STEM-related elective subjects:
 - Biology/Chemistry/Physics/Mathematics Extended Module I or II/Combined Science/Integrated Science/Information and Communication Technology/Design and Applied Technology
- Special consideration will be given to applicants who do not fulfill Programme's minimum requirement. Admission interview may be needed.

Admission Scholarships

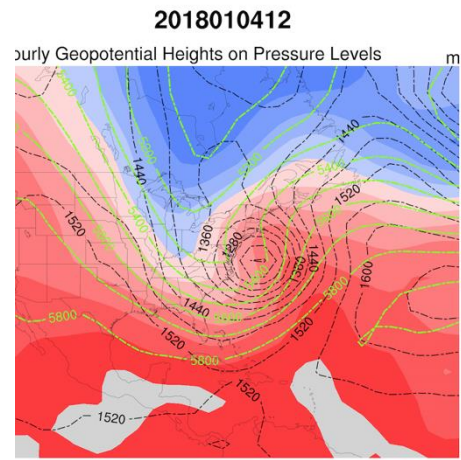
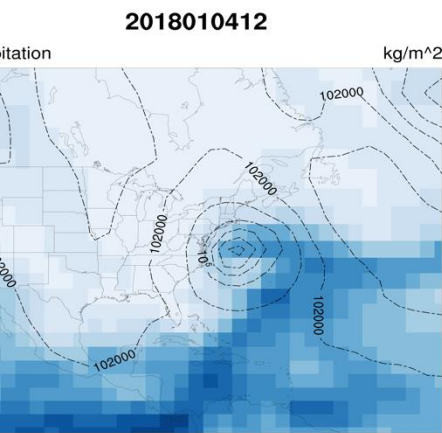
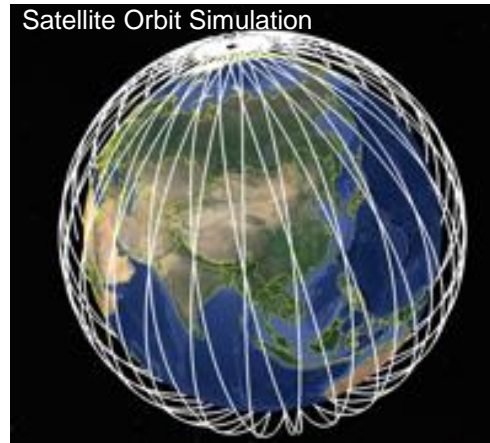
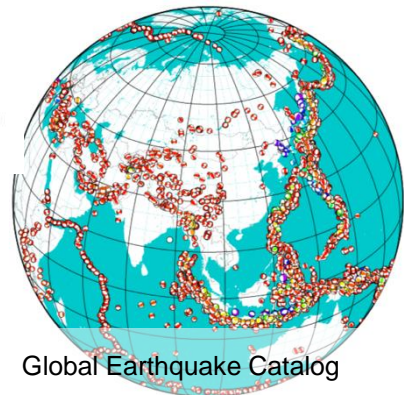
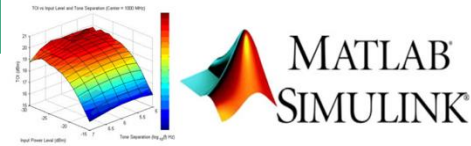
HKDSE Best 5 Score	Scholarships offered by the EESC Programme
≥ 33	\$25,000 (one-off)
≥ 31 or 29 (including one 5** in BIO/CHEM/PHY/M1 or M2)	\$10,000 (one-off)
≥ 29	\$5,000 (one-off)

The University and Colleges also offer admission scholarships for outstanding students.
大學及書院亦會為成績優異的學生提供入學獎學金。

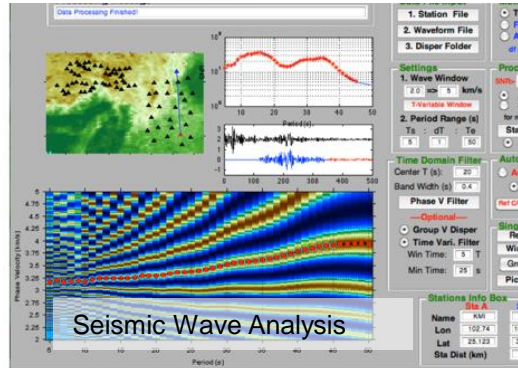
Diversified Teaching Modules | 多元教學

Diversified Teaching Modules | 多元教學

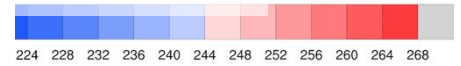
Computer Simulation & Visualization



Global Earthquake Catalog



Visualization of Extratropical Cyclone

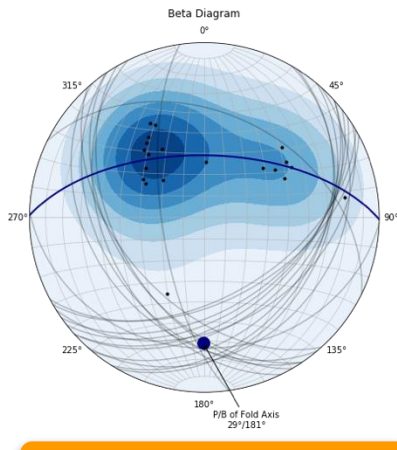
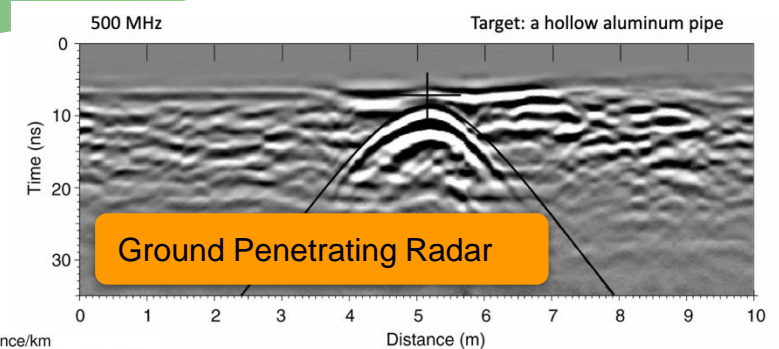
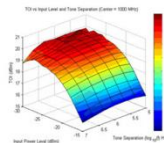


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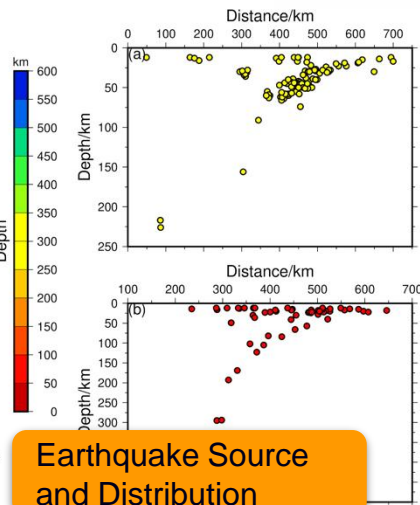
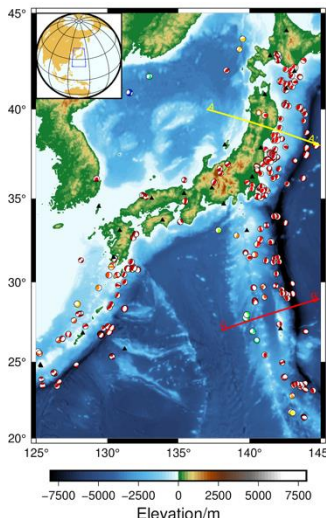
Applied Geophysics and Seismology



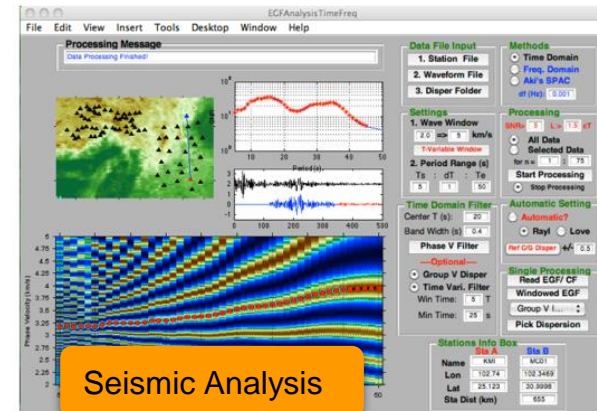
from field measurements



Geological Structure

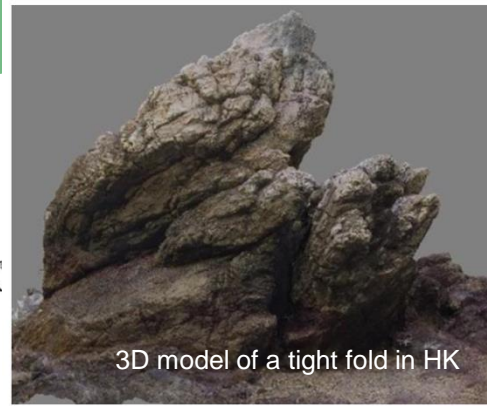
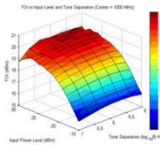


Earthquake Source and Distribution

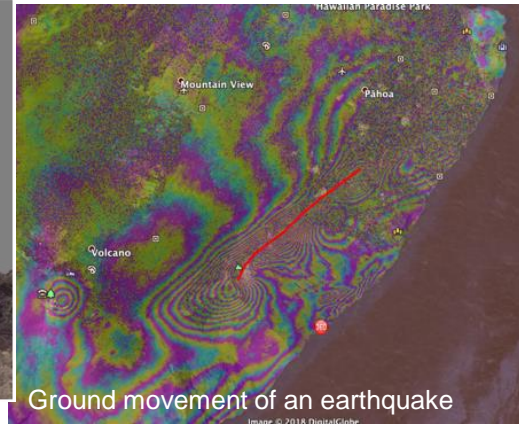


Diversified Teaching Modules | 多元教學

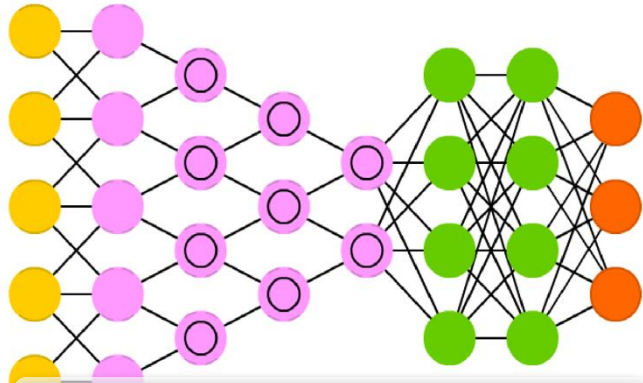
Remote Sensing



3D model of a tight fold in HK



Ground movement of an earthquake



Deep Learning and Artificial Intelligence



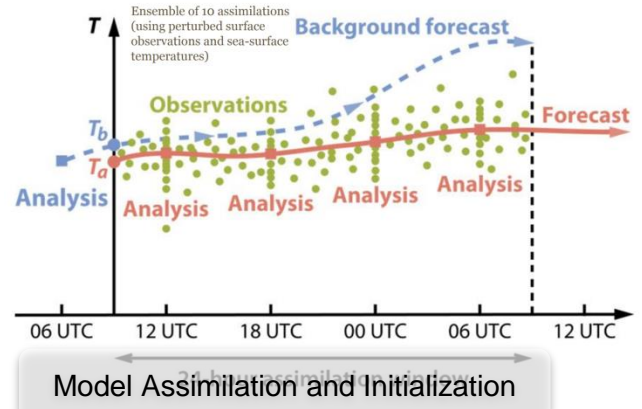
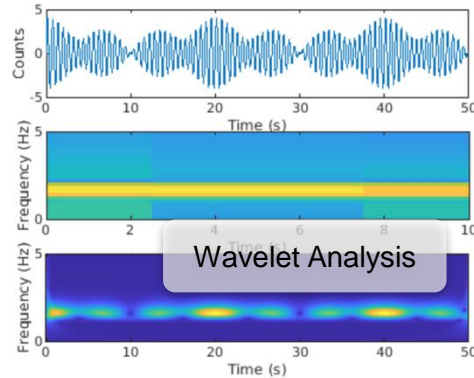
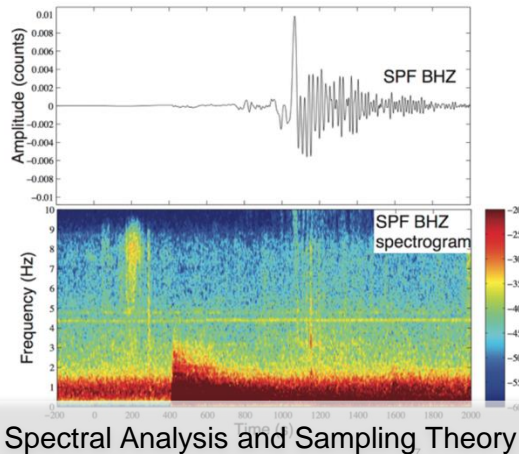
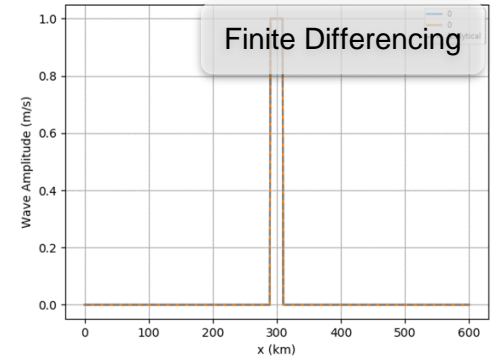
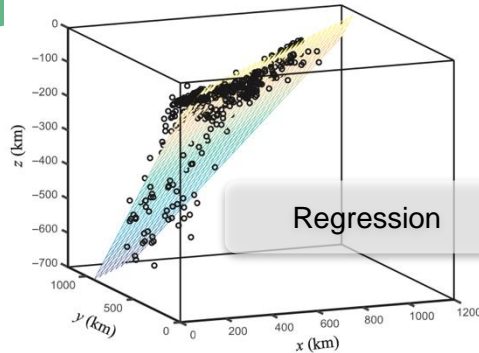
Infrared CUHK



UAV

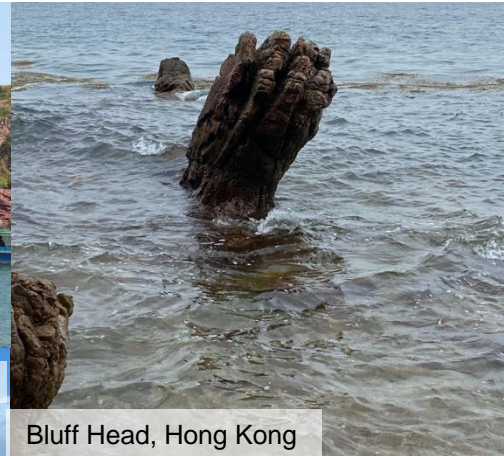
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Data Analysis and Numerical Modeling



Diversified Teaching Modules | 多元教學

Field Study



Diversified Teaching Modules | 多元教學

Field Study

Field Trip in Sabah studying pitcher plants and wetland mammals there

Snorkeling Training



Field Excursion at
Mount Kinabalu (4095.2 M)

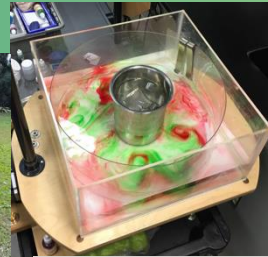
Sha Lo Tung Field Study in EIA Lab



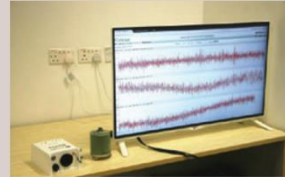
Tai O Field Trip
(ENSC2270)

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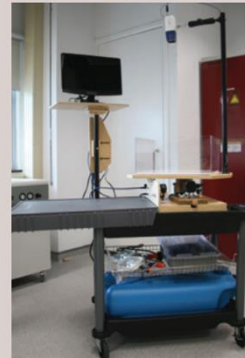
Laboratory & Experimental Study



Seismometer and a monitor showing real time ground velocities (ground movement) recorded



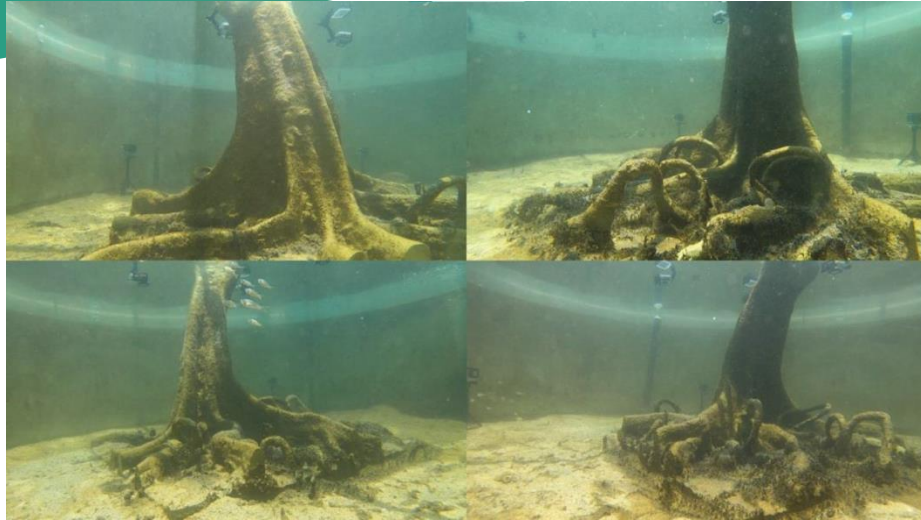
Weather in a Tank for geophysical fluid dynamics (GFD) experiment using a rotating tank



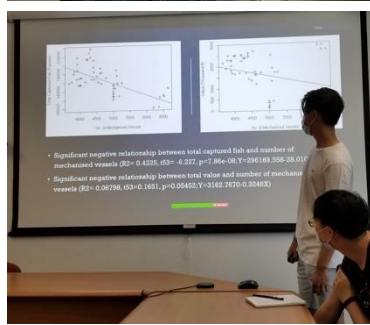
Petrographic Microscope for identifying rocks and minerals in thin sections

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Laboratory & Experimental Study



Laboratory mesocosm study using 3D printed mangrove models to investigate the value of mangrove forests as nursery site for juvenile fish in a Final Year Project



Diversified Teaching Modules | 多元教學

E-learning Module

<https://cuhkesscelearn.wixsite.com/home>



Earth System Science Programme

e-Learning Resource Pool

[Go to the Official Website of ESSC](#)

[Home](#) [Video Resource](#) [Rocks & Minerals Gallery](#) [KEEP Courses](#) [Interactive Modules](#) [About us](#)

Volcanoes [\(click here to start\)](#)



'Volcanoes' is one of the significant features on Earth. This module introduces volcanoes, with detailed explanations in their composition, formation, eruptive style, type, etc. We will also study some tectonic settings and magma. There will be interactive games and videos.
Course(s): ESSC2010

Petrology [\(click here to start\)](#)



This course will introduce you to the study of igneous, sedimentary and metamorphic rocks of the earth's crust and mantle. We will investigate the origin of the major groups of igneous, sedimentary and metamorphic rocks with an emphasis on the physical and chemical processes that give rise to these different rock types. In addition, corresponding tectonic settings and paleo-environments for these rocks will be studied. You will learn how to classify rocks based on rock-forming minerals in hand specimen and thin sections, as well as their textures and structures.
Course(s): ESSC4120

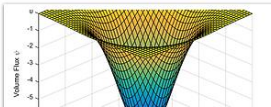
HK Geology [\(click here to start\)](#)



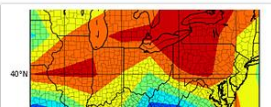
In this course, students can learn typical geological phenomenon in Hong Kong. A number of locations will be introduced, including the Bluff Head, Po Toi Island, Tung Ping Chau, High Island and Lai Chi Chong. The format is to watch the geological field trip videos and answer questions.
Course(s): ESSC1000, ESSC2010, ESSC3100

Geophysical Fluid Dynamics

[\(click here to start\)](#)



Getting Started with Python Programming in Earth System Science [\(click here to start\)](#)



Granite

A light-coloured, coarse-grained, igneous rock, consisting of essential quartz (at least 20%), alkali feldspar, mica (biotite and/or muscovite), with or more commonly without amphibole, and accessory apatite, magnetite, and sphene. Hypersolvus granites are characterized by one type of alkali feldspar, usually microperthite, whereas subsolvus granites are characterized by two types of alkali feldspar: microperthite and albite. Granite can be formed by partialmelting of old continental crust, on a local scale by in situ replacement of continental crust (granitization), by fractional crystallization of basaltic magma, or by a combination of these processes. — A Dictionary of Geology and Earth Sciences (4 ed.), Oxford University Press



size: around 8 cm



Extracurricular Activities Exchange



2017 ESSC x Physics US Study Tour



Arctic Geology
Arctic Geophysics

The University Center in Svalbard (UNIS)



Paul YEUNG
2020 University of Bergen Exchange



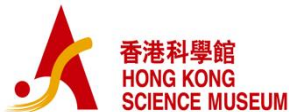
Student Exchange Programme

■ List of University that EESC (formerly ESSC and ENSC) students have been admitted though Student Exchange Programme:

- Univ. Centre in Svalbard (Norway)
- Univ. of Bergen (Norway)
- KTH Royal Institute of Technology (Sweden)
- Univ. of Gothburg (Sweden)
- Tecnologico de Monterrey (Mexico)
- Queen's Univ. (Canada)
- Univ. of Toronto (Canada)
- Univ. of British Columbia (Canada)
- Univ. of Waterloo (Canada)
- American Univ. (USA)
- Boston College (USA)
- Univ. of California, Irvine (USA)
- Pennsylvania State Univ. (USA)
- Ohio State Univ. (USA)
- Claremont McKenna College (USA)
- Univ. of Copenhagen (Denmark)
- Univ. College Utrecht (The Netherlands)
- Univ. of Lausanne (Switzerland)
- Leibniz Univ. Hannover (Germany)
- Australian National Univ. (Australia)
- Univ. of New South Wales (Australia)
- Univ. of Helsinki (Finland)
- Univ. of Hawaii, Manoa (Hawaii)
- Peking Univ. (China)
- Hanyang Univ. (Korea)
- Nagoya Univ. (Japan)
- Christian Univ. (Japan)
- Kyoto Sangyo Univ. (Japan)

and more...

Extracurricular Activities Internship Opportunities



2019 Hong Kong Observatory Internships
(9 ESSC students)



Extracurricular Activities Ambassadors



[Result] Team Award Application - Leung Hung Kee General Education Scholarship for Sustainable Development Goals 2020-21 收件箱

收件者: [Redacted]

Thank you and your team for a scholarship. After careful deliberation, I am writing to award the team scholarship for recognition of your contribution towards the SDGs. It is hoped that the

ment for your future SDGs in your daily the scholarship might be invited to achieved.

o you and your

Geoscience Ambassadors

Products by Geoscience Ambassadors

Online workshops

The screenshot shows a Zoom meeting interface. On the left, a slide titled "Hong Kong Geological Time Scale" is displayed. The slide includes a vertical timeline with an upward-pointing red arrow and a table of geological units. The table has columns for "Formation/Group", "Lithology", "Distribution", and "Notes".

Formation/Group	Lithology	Distribution	Notes
1. Tertiary			
1.1. Quaternary			
1.1.1. Holocene			
1.1.2. Pleistocene			
1.1.3. Pliocene			
1.1.4. Miocene			
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542 views · Liked by wingsum1031

geoguy_hk 我同你出field Vol.4 · 荔枝莊 · 微斷層 · 粒漸層理 · 負載構造 · Geoscience Ambassador · ESSC · CUHK · <https://youtu.be/48i2wx7tdeM...> more

31 July



Q&A 小測驗
地殼板塊運動
Plate tectonics



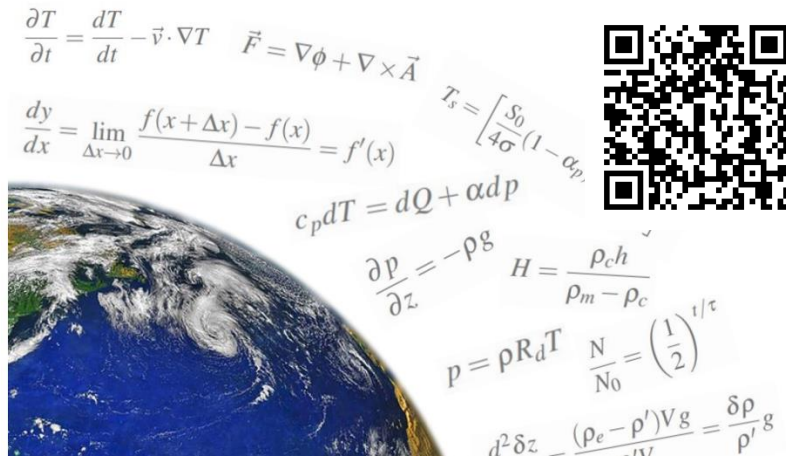
- 以下邊一個唔係大洋板塊 (OCEANIC PLATE)?
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 - 菲律賓板塊 Philippine Plate
 - 斯科舍板塊 Scotia Plate



Materials Developed by Students

Mathematical Handbook for Earth System Science

~ An introductory hands-on guide ~



ESSC Math Handbook by Benjamin Loi
<https://esscstudycenter.github.io/materials/Handbook.pdf>

ESSC Geoscience Study Info (*Unofficial*)

Last update: 2021/05

Geoscience and Relevant Course List

ESSC Geoscience Study Subfield

ESSC Math Training Pathway (Optional)

Tentative ESSC Geoscience Course Schedule 2020-2022

Course Introduction

- ESSC4020 Rock and Soil Mechanics
- ESSC4180 Earthquake Source Physics
- ESSC4601 Research Seminar in Earth System Science
- ESSC4602 Volcanoes: Formation, Unrest, and Eruption

Career Aspect

- Geotechnical Industry Requirement
- Internship Opportunities
 - ESSC Internal Internship/ Learning Opportunities:
 - Company Internship/ Job opportunities
- Postgraduate Study

Contact Dr Tammy or [Jeremy](#) for any enquiries

Geo- course selection guide by Jeremy Wong

https://drive.google.com/file/d/16q2B3QH7h2d1_RKWP_K17EvkmVym8sVj/view?usp=sharing



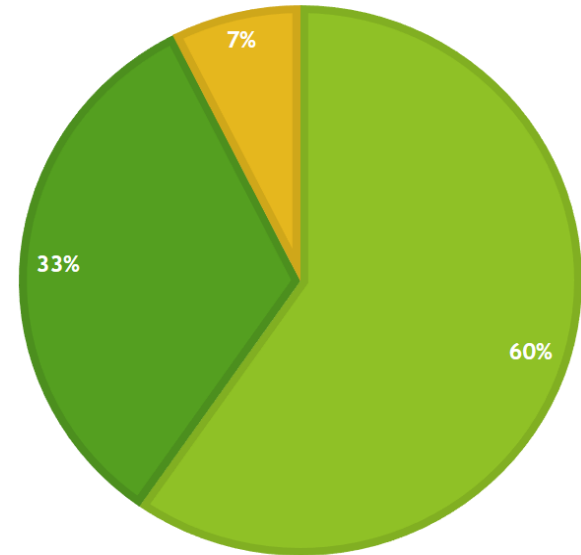
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EESC Graduate Employment Status

ENSC Career Path (2014 – 2019 Data):

- NGO 22%
- Environmental related industries 19%
- Government 8%
- Education 4%
- Further Study 4%
- Business 23%
- Others 20%

EESC (Response Rate: 73%)



■ Full-time employed ■ Further studies ■ Others

EESC Graduate Employment Status

(The survey below is for the former **ESSC** programme.)

- Hong Kong Government
 - Department such as Architectural Services, Environmental Protection, Hong Kong Observatory
 - Technical Officers Trainee, Experiment Officer, Outreaching Coordinator
- Company / Industry
 - Companies such as Arup, EGS, Fugro, Tysan, Ambit Geospatial Solution, BGCA 香港小童群益會, Cathay Pacific, CLP 中電, HKT 香港電訊, The Salvation Army 救世軍, Viu (PCCW)
 - Assistant Geologist, Project Engineer, Software Engineer, Data Scientist, Data Analyst, Editor
- Education
 - Junior Research Assistant in University
 - Teacher in Primary School and Secondary School
- Further Studies
 - MPhil or PhD Programme in Hong Kong or overseas such as UK, USA, Australia, Germany, Switzerland, Japan, etc.

and more...

“The Earth is what we all have in common.”



Thank you for listening!