



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**地球系統**以及**內裡環境**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**(如全球環境變化、氣候轉變、空氣及水污染、自然與地質災害、能源開發等)

If you want to...

- ❖ Understand how the **Earth system and the environment within operate**
- ❖ Acquire **good quantitative skills and apply scientific principles to solve some of the most pressing environmental problems** (e.g. global and environmental climate changes, air and water pollution, natural and geological hazards, energy/ resources exploration...)



Typhoon Mangkut



Landslides triggered by earthquake



Global Warming



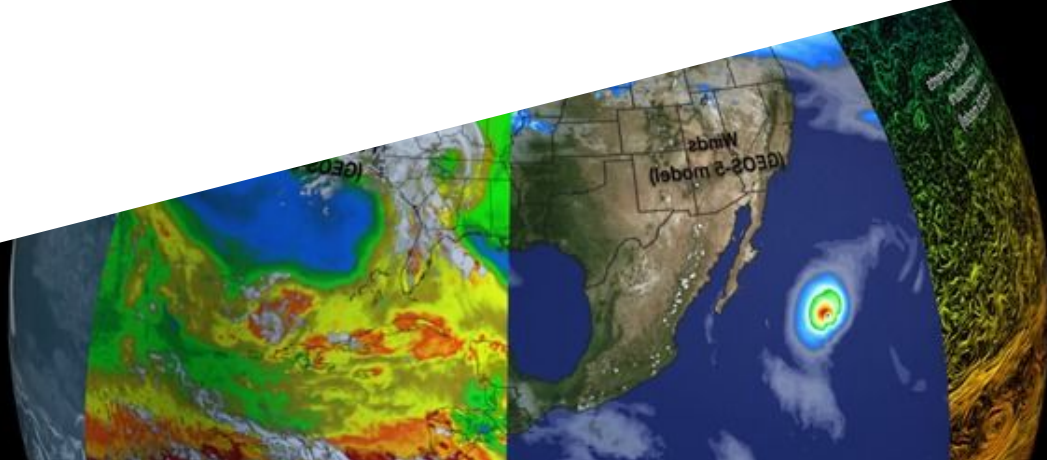
Biodiversity Loss

EESC Curriculum | 課程大綱



學習和研究地球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。

Study mechanisms of all “spheres” of the Earth system,
and their interactions shaping the Earth’s environment.



Curriculum Design | 課程理念



Building upon traditional science disciplines, including but not limited to, e.g., **geophysics (地球物理學)**, **geology (地質學)**, **meteorology (氣象學)**, **oceanography (海洋學)**, **environmental chemistry (環境化學)**, **biogeochemistry (生物地球化學)**, **ecotoxicology (生態毒理學)**, and **environmental impact assessment (環境影響評估)**, 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 and Environmental Sciences**, so that they are prepared to participate in tackling the various environmental challenges facing us today.

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



Professor Chunshan SONG (宋春山教授),

Dean of Science

Director of Earth and Environmental Sciences Programme (EESC)

Wei Lun Professor of Chemistry

Fellow of the American Chemical Society (ACS)

Ph.D., Osaka University, Japan

Teaching Staff



Man Nin CHAN (陳文年), Associate Professor

Ph.D., Caltech

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



Francis Chi Yung TAM (譚志勇), Associate Professor

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

Areas: Earth system modeling, Atmospheric and climate dynamics, Tropical and monsoon variability, Extreme weather



Amos Pui Kuen TAI (戴沛權), Associate Professor

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

Areas: Atmospheric chemistry & physics, Climate-chemistry-biosphere interactions, Impacts of global environmental change



Teng-fong WONG (黃庭芳), Research Professor

Ph.D., MIT; Former Chair, Dept. of Geosciences, Stony Brook University; AGU Fellow

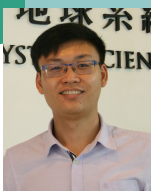
Areas: Earthquake mechanics, Rock physics applied to natural resources, Environmental hydrogeology.

Teaching Staff



Lin LIU (劉琳), Associate Professor

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



Yen Joe TAN (陳衍佐), Assistant Professor

Ph.D., Geophysics, Columbia University
Areas: Volcanic eruption dynamics, Seismic imaging and monitoring with ambient noise, Machine learning and data science, Induced and triggered earthquakes



Hongfeng YANG (楊宏峰), Associate Professor

Ph.D., Seismology, Saint Louis University
Areas: Subduction zone dynamics and megathrust earthquakes, High-resolution imaging of crustal fault zones and subsurface structure, Earthquake detection and location, Earthquake source mechanics



ZHAN Yan (詹彦), Ng Yin Ying Assistant Professor of Geophysics Professor

Ph.D., Geology, University of Illinois at Urbana-Champaign
Areas: Lithospheric Deformation, Volcano Geophysics, Dynamics of Magma, Numerical Modeling of Crustal Processes and Data Assimilation in Geoscience

Teaching Staff



Martin Tsz Ki TSUI (徐子祺), Associate Professor

Ph.D., University of Minnesota

Areas: Environmental pollution, Ecosystem biogeochemistry, Stable isotope applications



Haiwei LUO (羅海偉), Associate Professor

Ph.D., Molecular Evolution, University of South Carolina

Areas: Geobiology and Environmental Microbiology



Benoit THIBODEAU, Assistant Professor

Ph.D., Environmental Sciences, University of Quebec at Montreal, Canada (GEOTOP)

Areas: Ocean Biogeochemical Dynamics, Stable Isotope Geochemistry, Anthropogenic impacts, Paleocyanography & paleoclimate



Laura Jane FALKENBERG, Assistant Professor

Ph.D., University of Adelaide

Areas: Global change biology, Marine ecosystem dynamics, shifts, and resilience, Herbivore-autotroph ecophysiology, behaviour, and interactions, Socio-economic consequences of environmental change

Teaching Staff



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

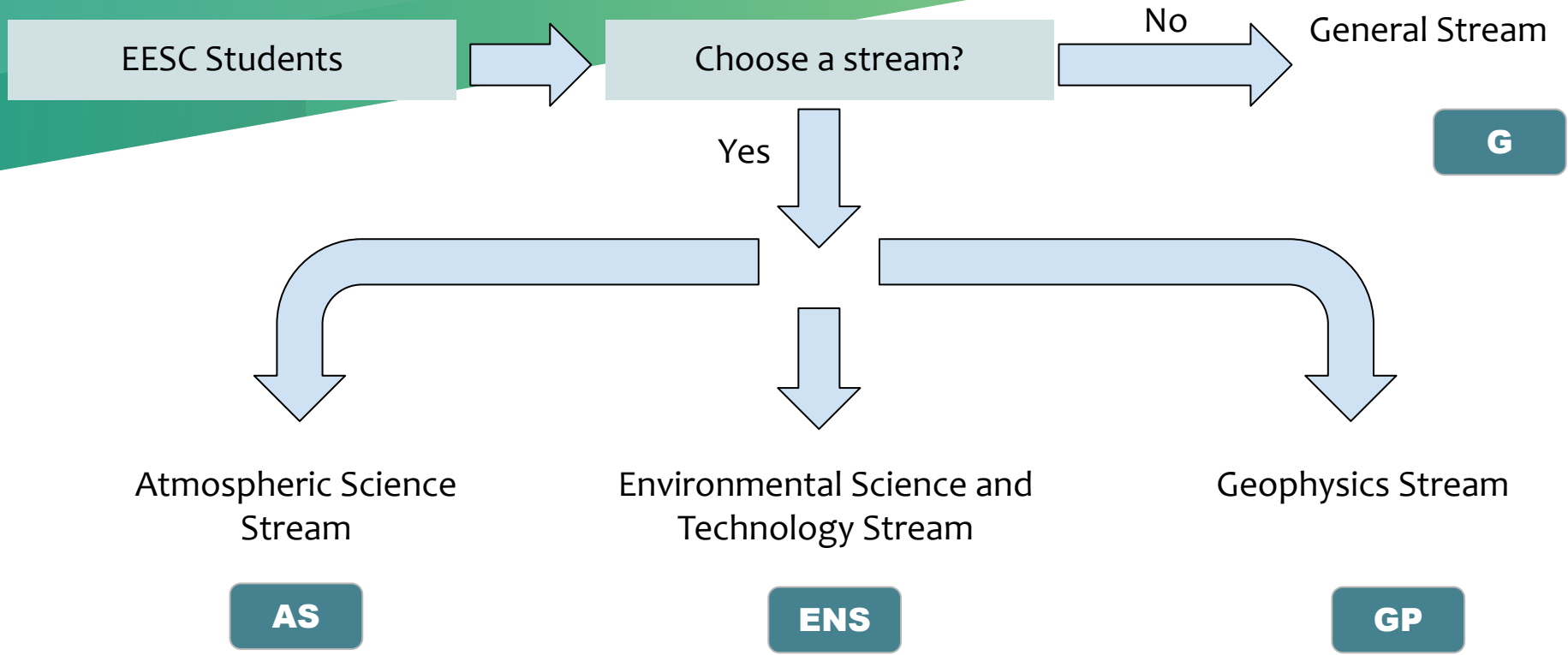
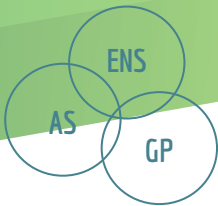


Tammy Pui Yuk TAM (譚佩玉), Lecturer

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

Areas: Metamorphic Petrology and Geochronology, Structural geology

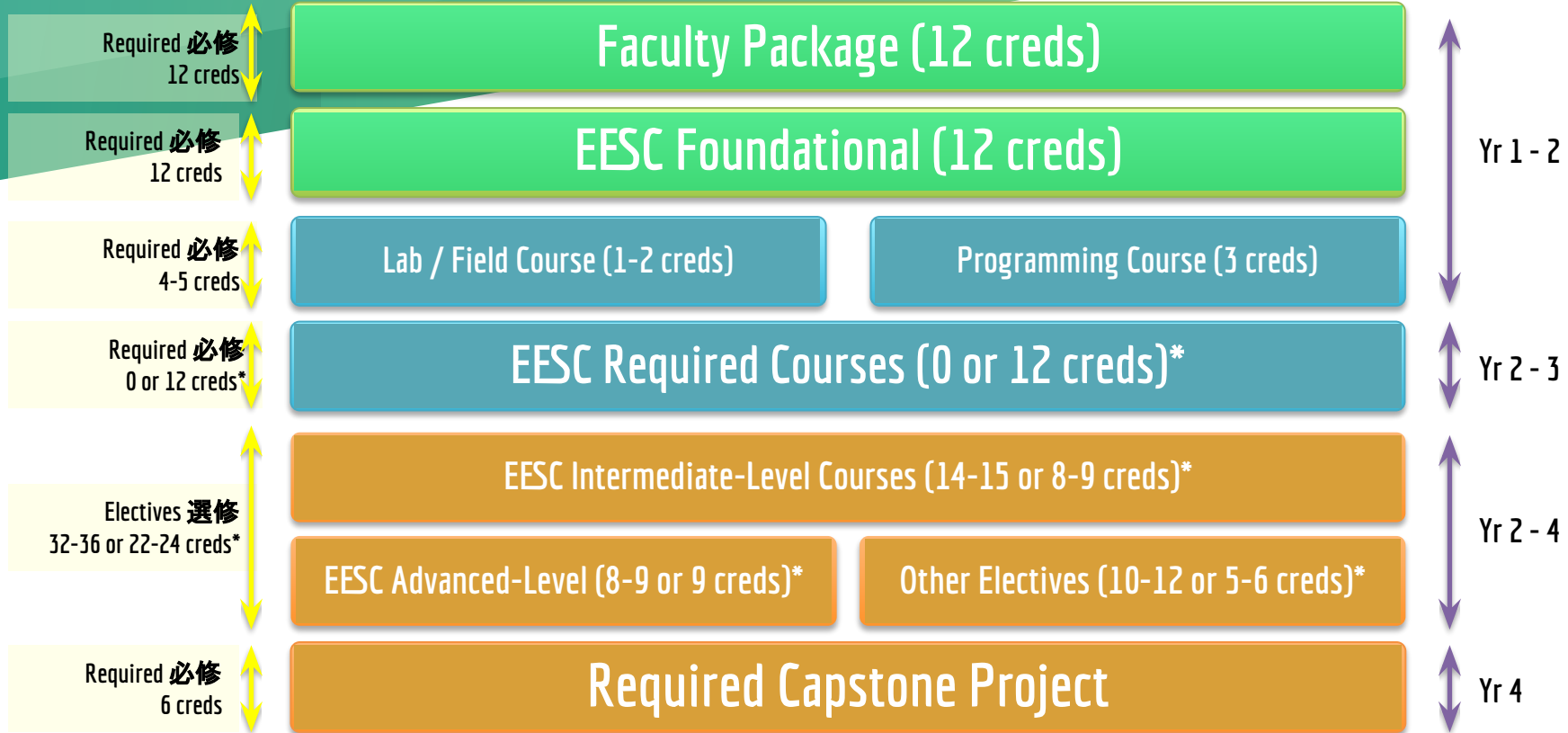
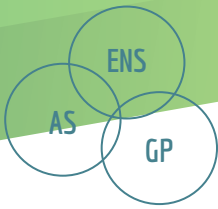
Three Streams in EESC



EESC Major : 72 credits

University : 123 credits

*Credits depending on the Stream



Year 1-2

Faculty Package (4 courses)

EESC Foundational Courses (4 courses out of 6)

Ecology 生態學

Climate System Dynamics 氣候系統動力學

Environmental Chemistry 環境化學

Solid Earth Dynamics 固體地球動力學

Intro to Environmental Sci 環境科學導論

Environmental Engineering 環境工程導論

Lab/Field Courses... (1 Course)

Environmental Chemistry Lab 環境化學實驗

Integrated Geoscience Field Study
綜合地球科學野外考察

(Courses offered by LSCI, BIOL and PHYS)

Programming (1 course)

Computational Earth And Enviromental Sci
地球與環境科學的基礎計算

Basic Computational Physics
基礎計算物理學

Year 2-4

EESC Required / Elective Subjects

Atmospheric Science



Geophysics and Geology



Environmental Sciences



Numerical Method and Modelling
數值系統模型

Required Course (1 out of 3)

Time Series & Statistical Analysis
時間序列與統計分析



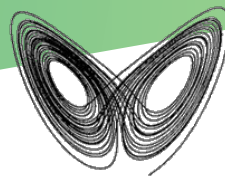
Remote Sensing
遙感原理與應用



and more ...

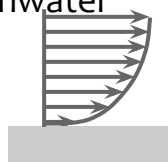
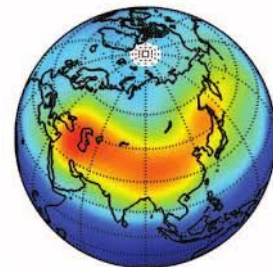
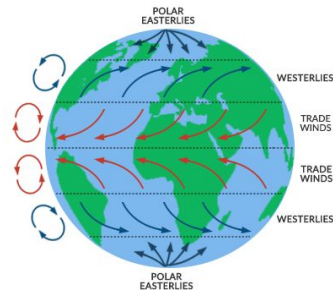
Atmospheric Science Stream

(大氣科學組)



◆ **Atmospheric science** is the study of the dynamics 大氣動力 and chemistry 大氣化學 of the atmosphere, hydrosphere 水圈 and biosphere 生物圈 that surround the Earth.

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



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

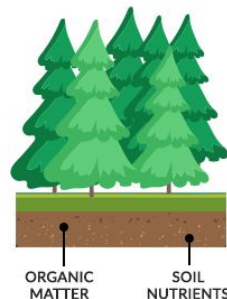
Atmospheric Chemistry
大氣化學

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

Ecosystem 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



PLANT GROWTH

PLANT/ANIMAL LITTER

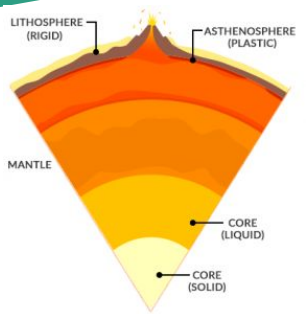
DECOMPOSITION



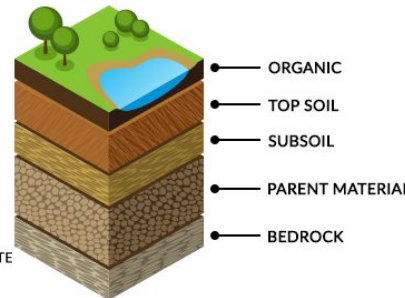
Geophysics Stream (地球物理組)



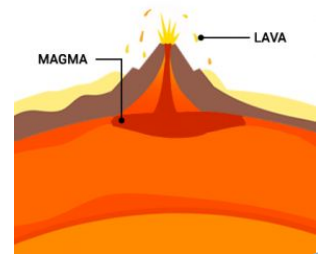
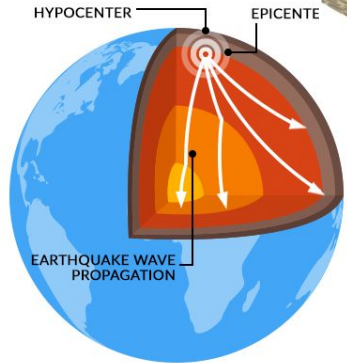
4 Field-based courses 野外考察



- ◆ **Geophysics** focuses on studying the Earth using gravity - 重力, electromagnetic - 電磁力 & seismic methods - 地震波
- ◆ 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



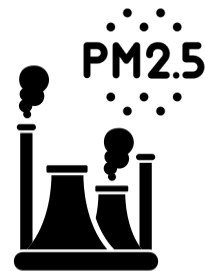
Structural Geology 構造地質學	Rock Mechanics and Its Applications 岩石動力學及應用	Volcanology 火山地質學
Engineering Geology 工程地質學	Soil Mechanics and Its Applications 泥土動力學及應用	Seismology 地震學
Geomorphology 地貌學	Solid and Fluid Mechanics 固體與流體力學	Physics of the Earth 地球物理學
Hydrogeology 水文地質學	Applied Geophysics 應用地球物理學	Petrology 岩石學
Marine Geophysics & Geology 海洋地質與地球物理學		



Environmental Science and Technology Stream

(環境科學與技術組)

Environmental science is an integrated science using the basic knowledge and skills of applied biochemistry, biology and chemistry to assess and resolve environmental problems.



- Students will receive multi-disciplinary training in ecology, environmental chemistry, instrumentation, pollution control, environmental management, biodiversity, conservation biology, toxicology and health, environmental impact assessment, and policy research.

Environmental Chemistry
環境化學

Environmental Impact Assessment
環境影響評估

Environmental Protection & Pollution Control
環境保護與污染管制導論

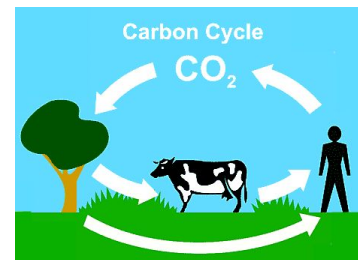
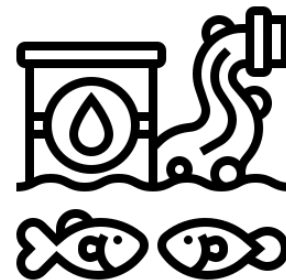
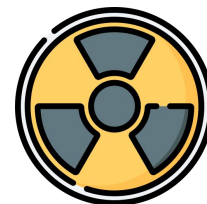
Biogeochemistry
生物地球化學

Environmental Instrumentation Techniques
環境儀器分析技術

Environmental Health
環境衛生學

Environmental & Biochemical Toxicology
環境及生化毒理學

Chemical Treatment Processes
化學處理程序



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(S4648)修讀 EESC 大氣科學 / 地球物理學 / 環境科學與技術 (學額: 35)
- 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 - Atmospheric Science / Geophysics / Environmental Science and Technology Stream (Quota: 35)
- JUPAS 4601 CUHK Science Broad-based Admission Scheme - EESC Major

Admission Requirements for JUPAS Applicants - 2023 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 Weightings: 2.0 for English, Mathematics, Biology, Chemistry, Physics, M1 or M2, Geography, Combined Science

Programme Selection Principle: Best 5



Admission Statistics 2022 Entry

- JS4648 Earth and Environmental Sciences
- Median of Score of Best 5 HKDSE Subjects 23
- Admission Grades

Subject	CHI	ENG	MATH	LS	M1/M2	Best Elective	2 nd Best Elective	3 rd Best Elective
Median	4	4	5	4	-	5	5	4
Lower Quartile	5*	5	4	4	3	4	3	-

- 1st Elective: Any one from Biology / Chemistry / Physics / M1 or M2 / Geography / Combined Science
- 2nd Elective: Any one subject in Category A

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
≥ 29	\$5,000 - \$25,000 (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

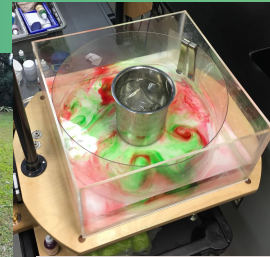
Diversified Teaching Modules | 多元教學

Local and Overseas Field Study



Diversified Teaching Modules | 多元教學

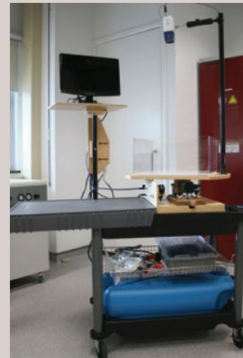
Laboratory & Experimental Study



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



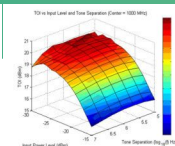
Weather in a Tank for geophysical fluid dynamics (GFD) experiment using a rotating tank



Petrographic Microscope for identifying rocks and minerals in thin sections

Diversified Teaching Modules | 多元教學

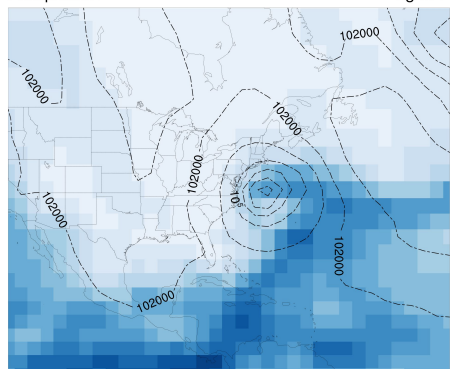
Computer Simulation & Visualization



2018010412

Precipitation

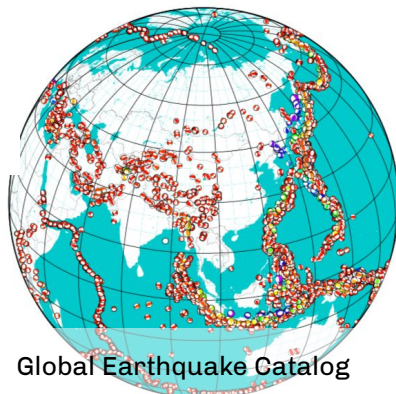
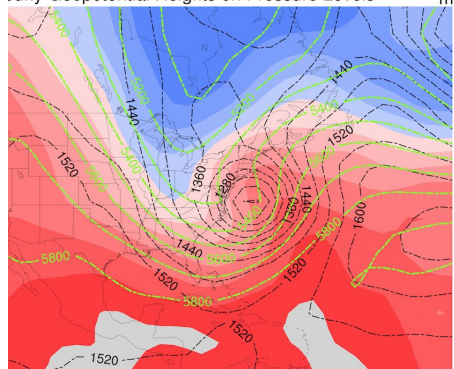
kg/m²



2018010412

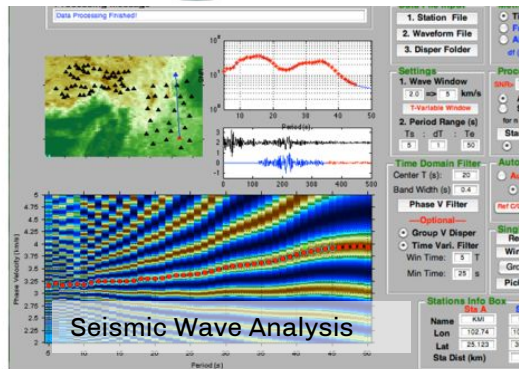
Geopotential Heights on Pressure Levels

m



Global Earthquake Catalog

Satellite Orbit Simulation

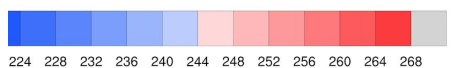
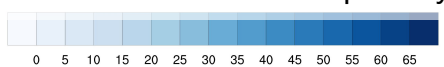


Seismic Wave Analysis



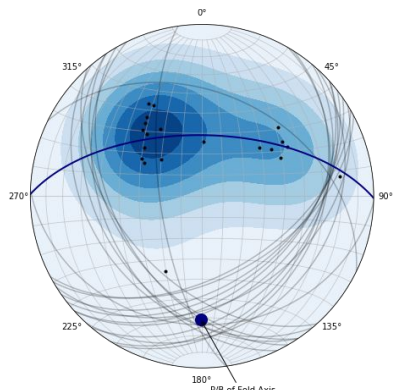
3D Model of The Gate 27

Visualization of Extratropical Cyclone

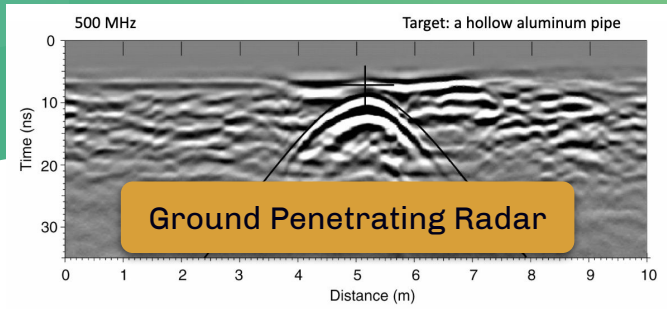


Diversified Teaching Modules | 多元教學

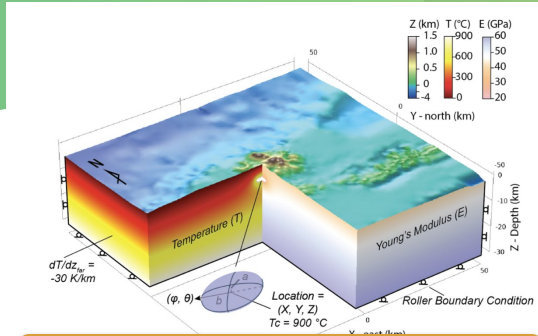
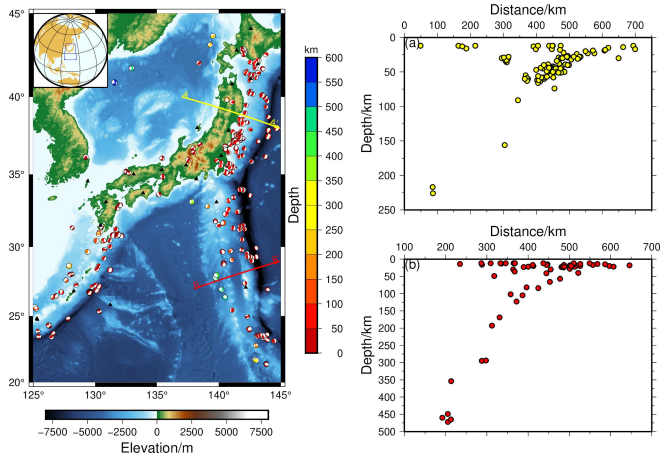
Applied Geophysics and Seismology



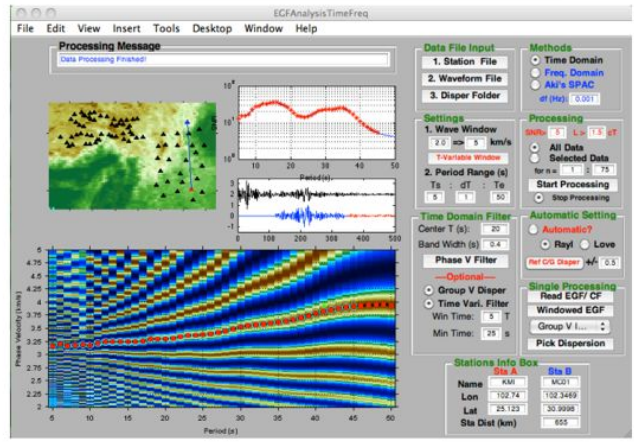
Geological Structure



Earthquake Source and Distribution



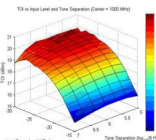
Volcano structure imaging



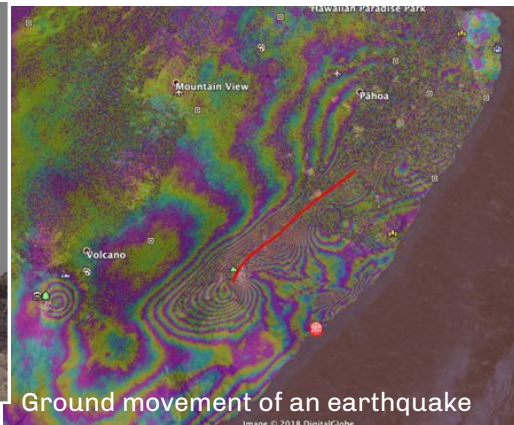
Seismic Analysis

Diversified Teaching Modules | 多元教學

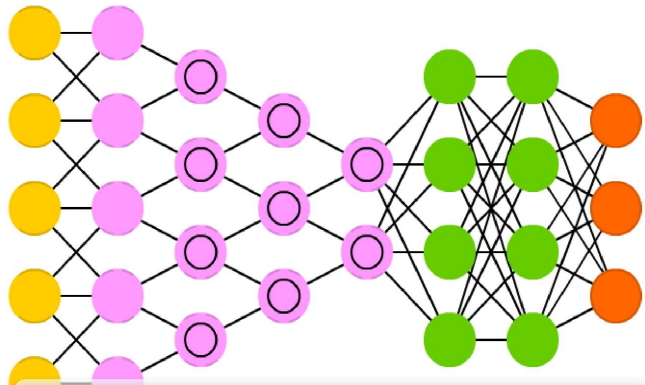
Remote Sensing



3D model of a tight fold in HK



Ground movement of an earthquake



Deep Learning and Artificial Intelligence



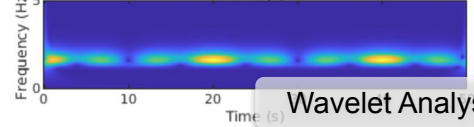
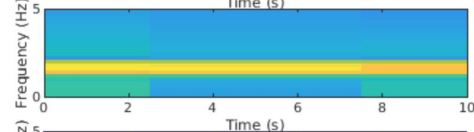
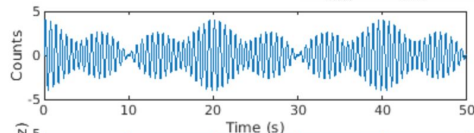
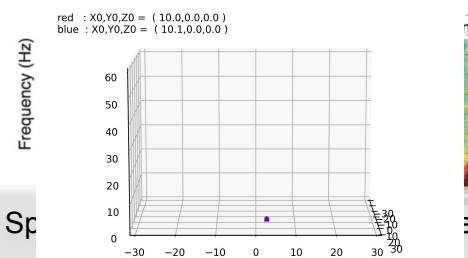
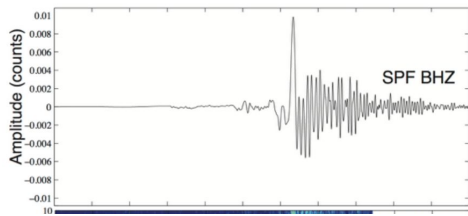
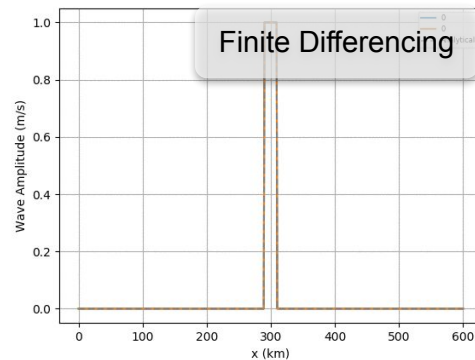
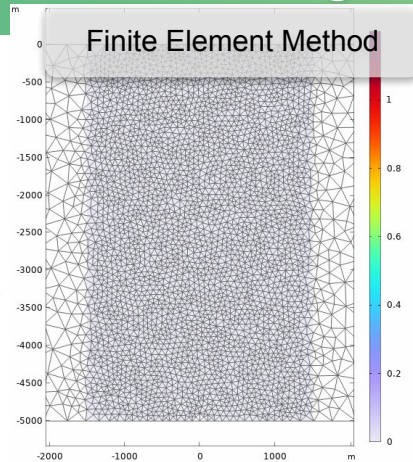
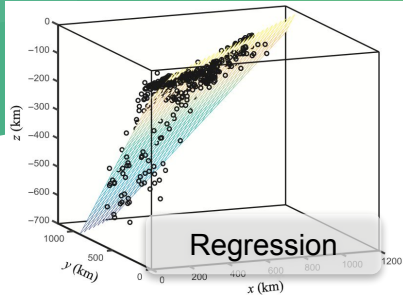
Infrared CUHK



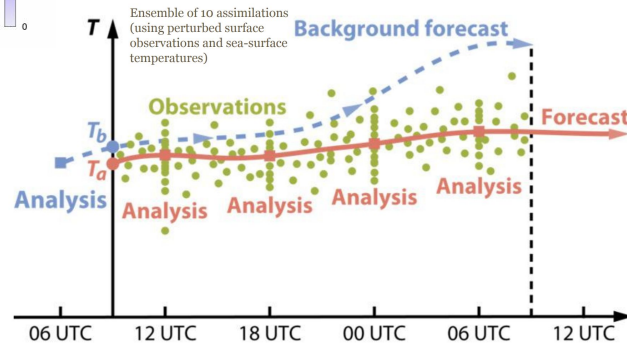
UAV

Diversified Teaching Modules | 多元教學

Data Analysis and Numerical Modeling



Wavelet Analysis



Model Assimilation and Initialization

Diversified Teaching Modules | 多元教學

Elearning Module

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



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

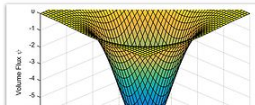
HK Geology [\(click here to start\)](#)



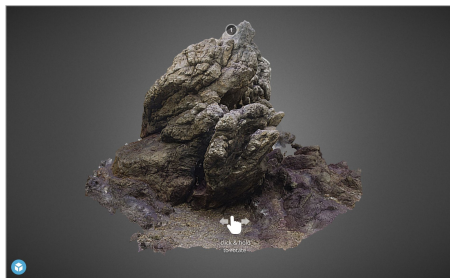
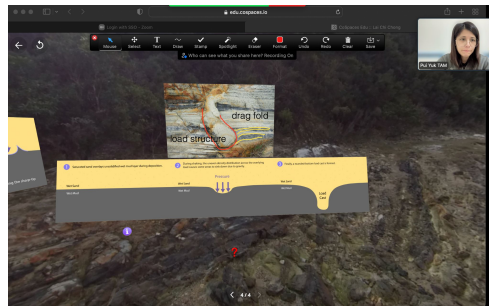
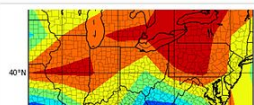
In this course, students can learn typical geological phenomenon in Hong Kong. A number of locations will be introduced, including the Bluff Head, Po Toi Island, Tung Ping Chau, High Island and Lai Chi Chong. The format is to watch the geological field trip videos and answer questions.
Course(s): ESSC1000,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

Geophysical Fluid Dynamics

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



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



Extracurricular Activities Exchange



Arctic Geology
Arctic Geophysics

The University Center in Svalbard (UNIS)



2017 ESSC x Physics US Study Tour



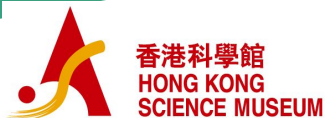
Paul YEUNG
2020 University of Bergen Exchange

Student Exchange Programme

- List of University that EESC (formerly ESSC and ENSC) students have been admitted through 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 EESC students)



HKO, EPD, ClusterTech Limited

- Geophysical Research, Weather Forecast, Pollution Chemistry Modeling, Measuring Equipment Operations
- Model Simulation, Data Mining, AI

CEDD, Jacobs, CM Wong & Associated Limited, CH2M, ESRI

- Geotechnical and geoscience

Incorporated Research Institutions for Seismology

- Research Institute

Hong Kong Science Museum

Jockey Club Museum of Climate Change - 賽馬會氣候變化博物館

Extracurricular Activities

Internship Opportunities

List of companies offering internship to ESSC students:

- Geotechnical Engineering Office
- EGS (Asia) Limited
- Meinhardt
- AECOM
- Aurecon
- CH2M
- CM Wong & Associate Limited
- Georisks
- LAM Geotechnics Limited
- Esri
- Hong Kong Observatory
- Environmental Protection Department
- Hong Kong Science Museum
- ELITE, CUHK

List of companies collaborating Final-Year Projects with ESSC:

- Geotechnical Engineering Office
- Ove Arup & Partners Hong Kong Limited
- Fugro (Hong Kong) Limited
- Georisks
- Hong Kong Observatory
- Environmental Protection Department

Extracurricular Activities

Undergraduate Research Programme

Students are always welcome to join
Summer or Year Long Research Internships



Prof. CHAN Man Nin 陳文年
Ph.D., Environmental Science and Engineering, California Institute of Technology

Research Fields

- Aerosol physics and chemistry
- Chemical ageing of organic aerosol
- Multiphase, heterogeneous oxidative chemistry and kinetics
- Ambient pressure soft ionization (Direct Analysis in Real Time, DART)

Email mchan@cuhk.edu.hk



Prof. LIU Lin 劉琳
Ph.D., Geophysics, University of Colorado at Boulder

Research Fields

- Cryosphere geophysics
- Deep learning applications in Earth system science
- Geodesy and near surface geophysics
- Remote sensing

Email liulin@cuhk.edu.hk



Prof. Amos P. K. TAI 戴沛程
Ph.D., Engineering Sciences (Environmental Science and Engineering), Harvard University

Research Fields

- Atmosphere chemistry and physics
- Interactions between climate, ecosystems, and atmospheric composition
- Impacts of global environmental change on public health, agriculture and poverty
- Air pollution, climate change, and land use change

Email amostai@cuhk.edu.hk

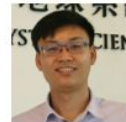


Prof. Francis, C Y TAM 譚志勇
Ph.D., Atmospheric and Oceanic Sciences, Princeton University

Research Fields

- Climate dynamics, tropical meteorology
- Impact of climate change
- Seasonal climate prediction
- Statistical and dynamical downscaling

Email Francis.Tam@cuhk.edu.hk



Prof. Yen Joe TAN 陳衍佐
Ph.D., Geophysics, Columbia University

Research Fields

- Volcanic eruption dynamics
- Induced and triggered earthquakes
- Seismic imaging and monitoring with ambient noise
- Machine learning and data science

Email yitan@cuhk.edu.hk



Prof. Hong-feng YANG 楊宏峰
Ph.D., Seismology, Saint Louis University

Research Fields

- Subduction zone dynamics and megathrust earthquakes
- High-resolution imaging of crustal fault zones and subsurface structure
- Earthquake detection and location
- Earthquake source mechanics

Email hvyang@cuhk.edu.hk



Prof. Yan ZHAN 詹彦 (starting in Aug 2022)
Ph.D. Geology, University of Illinois at Urbana-Champaign

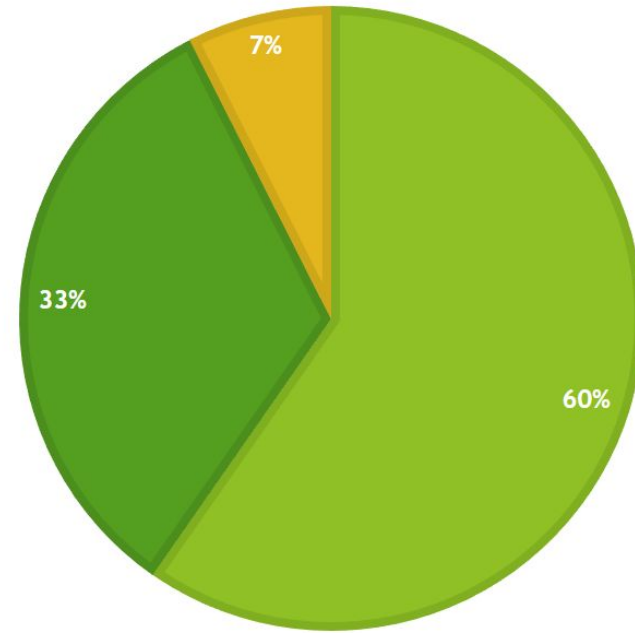
Research Fields

- Data Assimilation in Geoscience
- Dynamics of Magma
- Lithospheric Deformation
- Numerical Modelling of Crustal Processes
- Volcano Geophysics

Email yanzhan@cuhk.edu.hk

ESSC Graduate Employment Status

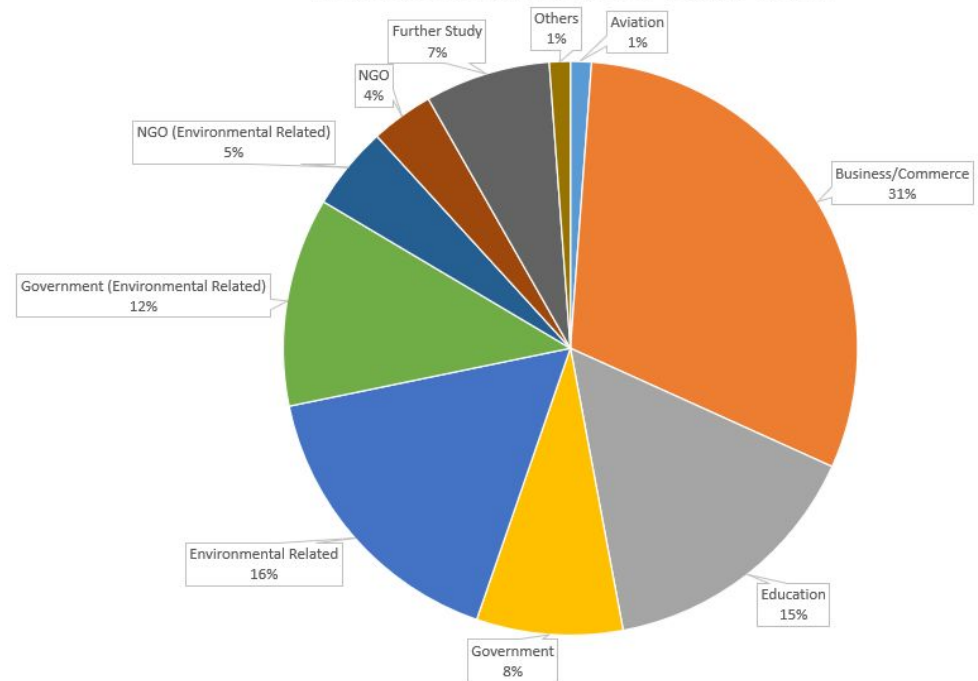
■ Response Rate: 73%



■ Full-time employed ■ Further studies ■ Others

ENSC Graduate Employment Status

Career Field of Full-time First Degree in
Environmental Science 2015-2020



EESC Graduate Employment Status

- 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, Georisk, Gammon, Tysan, Ambit Geospatial Solution, BGCA 香港小童群益會, Cathay Pacific, CLP 中電, Fugro, 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!