IES INSTITUTE OF EARTH SCIENCES Academia Sinica
中央研究院地球科學研究所

Join Us!

招生中

IES SUMMER INTERNSHIP 2024

地球所暑期研習

研習期間｜2024/7/1－8/31
申請期限｜2024/4/8

2024 IES Summer Internship - Now accepting applications! (deadline: Apr. 8, 2024)

Academia Sinica Institute of Earth Sciences 2024 "Summer Study Program for College Students"

Selection method

1. In order to reserve outstanding research talents for the future, the Institute encourages students from public and private universities at home and abroad to participate in the Institute's special research projects, receive research guidance and learn research methods, and strengthen their experimental and practical capabilities.

2. Application qualifications: Students studying in earth sciences and science and engineering related departments at public and private universities and interested in research.

3. Application deadline: Applications must be submitted to the Exchange before April 8, 2019 (Monday). Applications will not be accepted after the deadline. The application results will be announced on our website at the end of April.

4. Research period: from July 1 (Monday) to August 31 (Saturday), 113 years of the Republic of China, a total of 2 months. The research time is mainly full-time work. If you are unable to participate fully during the research period, please explain it in the application documents (for example: the required course time arranged by the school overlaps with the research period). It will be evaluated when the application materials are reviewed. There are still Admission opportunities.

5. Participate in special research projects:

1. Exploring NISAR: Early Adopter Initiative (Moderator: Assistant Researcher Lin Yunong)

Abstract: The synthetic aperture radar satellite NISAR, jointly designed by the United States and the Indian Space Agency, is about to be launched this year. Are you as excited and excited as we are? Want to be an early adopter of this satellite data? Please join us and contribute to the calibration/validation of NISAR!

A joint venture by NASA (USA) and ISRO (India), the synthetic aperture radar satellite NISAR will soon be launched this year. Have you already sensed the excitement in the air? Do you want to become an early adopter of the data from this satellite? Join us to make contribution to NISAR's post-launch calibration and validation!

2. Using seismic waveforms to track debris flows and turbiditic currents onshore and offshore Taiwan (主持人：戚務正 研究員)

摘要：**Onshore debris flows** and **offshore turbidity currents** can cause large damages to our society. For example, >90% of trans pacific internet communication is done using submarine cable that can sometimes be broken by offshore turbidity currents triggered by earthquakes and typhoons. Here we want to remotely monitor these events using broadband and short period seismic waveforms onshore and offshore Taiwan to study these hazardous events. Array methods will be used to study seismic source processes of these events. We wish to work with students who are interested in seismic waveform studies using computational techniques. The students will learn seismic signal processing and passive source seismology.

3. Applications of stable isotopes for probing changing Earth (主持人：梁茂昌 研究員)

摘要：Stable isotopes have been used widely to constrain fundamental aspects of changing Earth, including changing climate and environments. The opportunity is provided for those who are interested in the applications of conventional (such as δD, $\delta^{13}C$, $\delta^{18}O$) and unconventional (such as $\Delta^{17}O$, Δ_{47}) isotope techniques for various scientific problems. Changing climate and environments due to human alterations at various ways are topics of public interest. The changes modulated with water and greenhouse gases are driven by and reflected in their cycles in the atmosphere, biosphere, hydrosphere, and geosphere. The program contains two components. First one is to measure the major greenhouse gases such as CO_2, N_2O, and water in the troposphere and/or from volcanic emissions, and also feedbacks from those to the biosphere. One specific component related to this is to understand the sources and processes that affect water resources in Taipei, such as the changes of moisture and atmospheric transport due to climatic variabilities such as ENSO. The second part is to decode climate signals encoded in geological archives such as well-preserved mollusks. Applicable students are advised to choose to work on one, but not limited to, of the problems.

4. Processing of numerical elevation data and application of 3D structural geological mapping (Moderator: Researcher Zhan Yuzhang)

Abstract: Students participating in this project will learn how to plan UAV aerial photography and gain an in-depth understanding of the characteristics of UAV LiDAR point clouds and numerical terrain models. , and use numerical aerial survey methods to produce high-precision numerical terrain models. At the same time, students will learn how to input the acquired data into the 3D information system and use the 3D analysis module to conduct detailed stratigraphic and geological structure analysis. This program welcomes students with basic or high interest in field geology, structural geology, geographic information systems, basic programming, drone operation, various computer software operations, and three-dimensional spatial information analysis to sign up.

5. Crustal tectonics under the western Central Taiwan (主持人：梁文宗 研究技師, 吳大銘通信研究員)

摘要：It is well-established that Taiwan is largely the product of ongoing collision between the Eurasian and Philippine Sea plates, but the resulting physical processes at depth that led to create the mountains to rise and faults to move to create earthquakes are not yet totally deciphered. With high quality data and advances in seismology, the associated faults, their possible orientations as well as motions during the earthquakes can be determined and locations of earthquakes can be post-processed and improved to determine the nature of the “blind-faults”. This project will be centered on the relocation of small earthquakes in the western Central Range, in association with the more than 200 M>3 events for which BATS moment-tensor solutions are available. These earthquakes range in depth from a few kilometers to nearly 30 km. By relocating the hypocenters, we expect to be able to determine the distribution and geometry of subsurface faults, the directions of motion along these faults and the directions of the associated stresses as well as their variations in the region.

The student will conduct research with Dr. Wen-Tzong Liang and Francis T. Wu, beginning with data collection from BATS and CWASN, learning about earthquake location and focal mechanisms and conduct computation, in association with works by Drs Liang and Wu. The extent of student work will be commensurate with student’s level of learning, but will learn about basic seismological tools and the tectonics of Taiwan.

6. Synthesize lower mantle materials and explore their physical properties and impact on mantle dynamics (Moderator: Researcher Xie Wenbin)

Abstract: The physical properties of deep earth materials under high temperature and high pressure can help understand the evolution and dynamics of the thermochemical structure of the earth's interior. learning process, and verify the results of seismic wave observations. In this summer research, we will combine laser heating technology and high-pressure diamond anvils to synthesize lower mantle minerals. We will simulate the high-temperature and high-pressure conditions deep in the Earth in the laboratory, as if we are entering the Earth's interior step by step, and use novel optical methods to explore Heat conduction, sound velocity and Raman spectra of lower mantle minerals, such as davemaoite and ringwoodite, under extreme conditions. These research results will help further understand the thermochemical evolution history of the lower mantle and the dynamics of plate subduction.

Xie Wenbin Laboratory https://sites.google.com/site/whsieh2

7. Establishment and application of high-precision thermal ionization mass spectrometer analysis on tiny specimens (Host: Liu Yiwei, Assistant Researcher)

Abstract: As one of the most powerful analytical tools in the field of geochemistry, the isotope system can often provide us with more Information to understand the changes in the earth's environment and climate at different time and space scales and the control mechanisms behind the changes. The advancement of analytical technology can open up the application space of isotope systems. In this year's summer program, we will use our high-precision mass spectrometer to establish an analysis method for strontium and neodymium isotope systems below 1 ng, and apply it to the analysis of geological specimens. Due to the reduction in sample requirements, the time resolution of geochemical records can be greatly increased, or the types of samples can be increased to explore more issues. Students participating in the program are expected to be exposed to the operation and analysis of high-precision thermal ionization mass spectrometers, sample screening and processing, and isotope purification experiments in clean rooms during the two-month training period. Students who are interested in isotope geochemistry, biogeochemistry, earth environmental changes, and ocean and atmospheric circulation are welcome to sign up and join our research team!

8. (A) The association of the 20220918 and 19511124 Chihshang earthquake sequences (B) Exploring earthquake physics using optical fiber (Host: Ma Guofeng, Distinguished Researcher)

Abstract

:

(A) The association of the 20220918 and 19511124 Chihshang earthquake sequences

20220917 and 20220918 The rupture patterns of the Guanshan and Chishang earthquakes are similar to the Chishang series of earthquakes on November 24, 1951. However, there are different opinions on the correlation between the two earthquakes in the analysis of different research topics. We hope to collect and analyze the relevant historical earthquake records of November 24, 1951, as well as earthquake records recorded in other countries around the world, especially the records of Japanese seismic stations. Using current earthquake science methods, through earthquake travel time and waveform analysis, we can understand the possible correlation between these two earthquake series.

(B) Exploring earthquake physics using optical fiber

The high-resolution characteristics of space and time in earthquake observation and temperature measurement have been subject to many important discussions in related fields in recent years. It can be used for environmental monitoring and spatial and temporal change observations at many different scales. However, while this observation technology is being developed, there are still many possibilities to explore whether the basic understanding of earthquake physics from this observation itself can make different progress. Since Taiwan is in an active seismic zone and has the world's only underground fiber optic and underground seismometer observation station that spans fault zones, we look forward to making relevant breakthrough observations on this topic and leading to more sophisticated analyses. ? This summer project starts from this theme and explores the analytical characteristics of earthquake physics and source parameters.

9. Establish a numerical dynamic model of the subduction zone (Host: Associate Researcher Tan E)

Abstract: This project will use numerical simulation to construct a dynamic model of the subduction zone (as shown in the figure https://tan2.github.io/research /subduction.anim.gif), explores the factors that form subduction zones around the world. Participating students will set up, execute, and analyze a dynamic model, and learn the use of cluster computers, Python data processing, and graphics.

10. Reconstruction of past changes in the ocean environment using multi-isotope proxies of marine carbonate Reconstruction of past changes in the ocean environment using multi-isotope proxies of marine carbonate (Moderator: Associate Researcher Huang Guofang)

Abstract: In the past history of the earth , changes in the ocean's physical (such as temperature, salinity and ocean current circulation) and chemical properties (such as chemical composition, pH and redox state), drastic changes in climate and environment, and biological evolution or extinction are closely related . Therefore, reconstructing the history of changes in the marine environment can provide direct evidence to understand the operation mode of the Earth's climate system in the past, the main controlling factors of climate and environmental drastic changes, and the correlation between the two and biological evolution or extinction. This project will use the established high-precision trace element measurement technology and high-precision isotope mass spectrometry analysis to preserve marine biological calcium carbonate (such as foraminiferal shells, coral skeletons) or inorganic calcium carbonate (such as : Marine limestone) using multiple environmental proxy indicators to reconstruct the changes in the marine environment at interannual, millennium and million-year scales, and further explore how changes in the marine environment affect the operation of the earth's climate system at different time scales, as well as its relationship with large-scale organisms relationship to the occurrence of extinction events. We welcome students who are passionate about isotope geochemistry, biogeochemical cycles, paleooceanic environment and paleoclimate reconstruction to join our research team!!!

11. Challenges and Opportunities in Water Resources Management in Taiwan: Application of Geophysical Methods in Hydrological Surveys (Moderator: Researcher Xu Yaru) Abstract

: The frequency of heavy rain and drought events in Taiwan has increased, and solving the water shortage crisis requires effective and continuous management. Groundwater resources. However, due to the complex three-dimensional structure of aquifers hidden beneath the surface, we still have a poor understanding of the spatial distribution of aquifers, and similarly, little is known about the variability of groundwater on different time scales. This study will explore how to use groundwater level, surface displacement, and seismic wave velocity spatiotemporal changes to describe the deep structure of underground aquifers and temporal changes in the aquifer system to monitor groundwater resources and mitigate the impact of extreme climate events on water shortages in Taiwan.

12. Noise seismology, rupture/shear zones, and Bayesian inference (Moderator: Researcher Guo Benyuan)

Abstract: This year’s summer program is divided into two parts. (1) First, continue “array analysis” and extend noise seismology to the African continent. Technically, continue to "learn" how to use machine learning to analyze big data. (2) The second is to refine the Bayesian statistical method to infer the earth's internal dynamic system.

(1) The main noise (or noise) in the environment comes from waves and currents. High-intensity noise can propagate far in the earth's crust in the form of seismic waves; the noise propagating along the earth's surface is the surface wave in traditional seismology. The Institute of Earth Sciences (IES) has cooperated with the Department of Geology (Geoscience) of National Taiwan University for many years, using noise surface waves to explore the crustal structure. It has done a lot of work in Taiwan, Ryukyu and other places, and has generated new insights into local structures. In the summer vacation of 2024, our team (IES-Geoscience) hopes to leave Taiwan as far as possible to enhance students' horizons; the African Rift Valley is a possible target. (2) Last year’s summer students used Bayesian inversion to analyze anisotropy measured on the San Andreas fault zone in California, and the results have developed into the prototype of a paper. This year we will expand to New Zealand and Turkey in an attempt to cover more continental lithospheric shear zones and learn more about Bayesian inversion. Last year was a learning journey, and this year teachers and students continue to learn!

Participants must have a basic desire for self-study. Teachers and assistants will try their best to get you started, but the rest still depends on your own requirements. This is an excellent opportunity to learn basic concepts of earth science and programming languages. Anyone who has a certain foundation in physics and likes to play with programming is suitable to participate. Those who are curious about the world outside Taiwan are more welcome.

6. Application method and attached information:

1. To register and submit information, please go to the link: https://forms.gle/oE6Jtj9KFhg5G1DN9 (resume form, transcripts of each semester and other supplementary information, please merge into a single pdf file, The file name format should be marked as school department + grade + name, for example: National Taiwan University Geology II Wang Daming)

2. Resume (including name, date of birth, gender, school grade, contact number, and e-mail)

(a) A simple autobiography describes the concept and interest in earth science, such as: 1) brief self-introduction; 2) motivation for participation; 3) understanding of earth science; 4) past learning background; 5) topics of interest; 6) others.

There is no word count requirement. The focus of review is whether the above sub-projects can be clearly expressed.

(b) Provide the e-mails or office phone numbers of two or more teachers who can provide recommendations.

3. Proof of grades for each semester. (If the total score is on a hundred-point scale, please be sure to convert it into GPA)

4. Other supplementary information (for example: if you are unable to participate full-time, please explain here.)

5. Plan the order of application. * Note: Please evaluate carefully

7. Subsidy items:

1. Living allowance: During the training period, the program host will subsidize each trainee with a living allowance of NT$30,000 for 2 months.

2. Insurance fee: Our institute will handle accident insurance for participating students during the training period.

8. Review method: The review will be conducted by our firm, and the application results will be announced on our website at the end of April.

9. Submit the research results report:

1. Mid-term oral report: Handled at the end of July;

2. Final results report: Handled at the end of August. The research results will be made into posters and participated in the poster exhibition held by the institute. Those with outstanding results will be awarded Award certificates for outstanding, outstanding, and excellent works.

10. Study certificate: The institute will issue a study certificate to those who complete this study plan.

Registration and information submission link QR Code