Institute of Nature and Environmental Technology

Kanazawa University
Japan

2012

http://k-inet.w3.kanazawa-u.ac.jp/inet/index.html

Institute Establishment Aim

The Institute of Nature and Environmental Technology, Kanazawa University (K-INET), established in 2002, is a university-affiliated institute for research and education on the nature and environmental technology. One of the largest issues, which science and technology in the twenty-first century is facing, is the environmental problems that are caused by natural and anthropogenic environmental changes.

The research program of the Institute focuses on environmental monitoring with high-resolution measurement equipments such as radioactivity sensing and biosensing. Analysis, modeling and prediction are an integral part of the program. Green technology in harmony with nature on the basis of biodiversity, biotechnology, electromagnetism, etc. is also being studied.

The Institute of Nature and Environmental Technology played an important role in promoting the 21st-century COE program “Environmental Monitoring and Prediction of Long- and Short-term Dynamics of Pan-Japan Sea Area by JSPS (2002-2007).The Institute undertakes collaborative research with institutes throughout the world on a wide range of topics and is contributing to a number of social and international activities.

History – Foundation and Progress –

The Institute was established in 2002 by reorganizing the following four Laboratories and adding new researchers from Faculty of Science and Faculty of Engineering:

The Low Level Radioactivity Laboratory, Faculty of Science, which was the sole university research installation in Japan for environmental radioactivity research,

The Laboratory of Magnetic Field Control and Applications, Faculty of Engineering, which developed the tools for studying the influence of strong magnetic fields on human beings, etc,

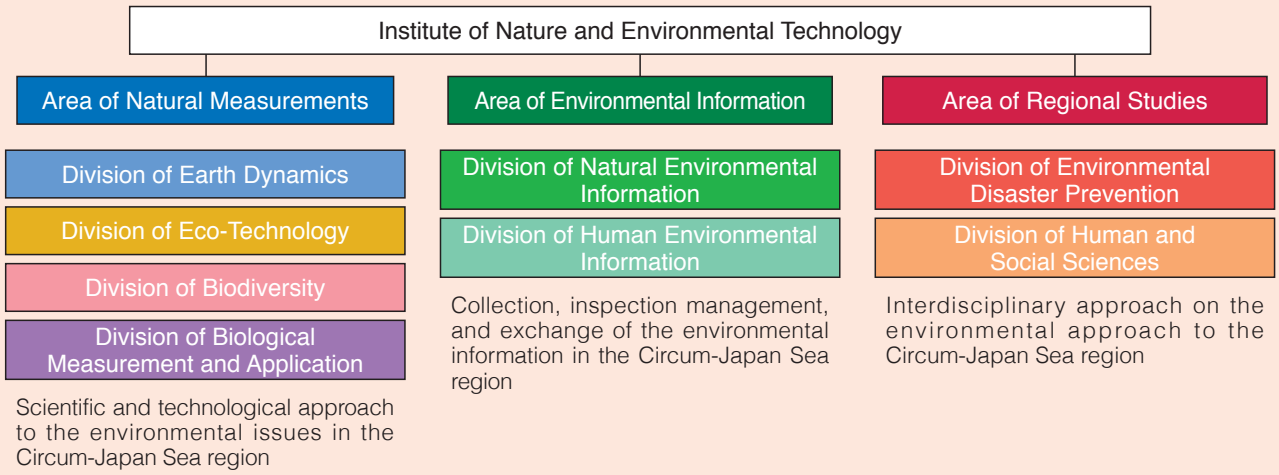
The Marine Laboratory, Faculty of Science, located in the Noto Peninsula, which studied the effects of biological diversity on the marine environmental and developed educational programs, and

The Botanical Garden, Faculty of Science, which carried out botanical and ecological research and education, and the conservation of genetic resource.

The Institute was reorganized in 2007 in order to develop the theme "Environmental monitoring and prediction of long- and short-term dynamics of Pan-Japan Sea area" of 21st COE(Center of Excellence) program(2002-2007).

May , 1949	The Botanical Garden, Faculty of Science, was established
April, 1958	The Noto Marine Laboratory, Faculty of Science, was established.
April, 1975	The Low Level Radioactivity Laboratory, Faculty of Science, was established. (to March, 2002)
April, 1982	The Electric Energy Conversion Laboratory, Faculty of Engineering, was established. (to March, 1992)
April, 1992	The Laboratory of Magnetic Field Control and Applications, Faculty of Engineering, was established. (to March, 2002)
April, 1993	The Noto Marine Laboratory was renamed the Marine Laboratory, Faculty of Science.(to March, 2002)
June, 1995	The Botanical Garden, Faculty of Science, moved to the Kakuma campus
April, 2002	The Institute of Nature and Environmental Technology, Kanazawa University, has been established.

Organization Chart



Research Subjects

Our Aim for Science and Technology in the Twenty-First Century

Environmental Monitoring and Prediction

- High resolution analysis of the natural environment.
- Analysis of the global environment using radioactive elements and isotopes.
- Hydro-geomorphological research on the evolution of the Earth's surface.
- Research and management of biodiversity and ecosystems in Japan Sea and Hokuriku areas.

Development of Green Technology

- Medical technology development from a vital reaction analysis under environmental stress.
- Biosensing technology development for environmental monitoring.
- Industrial waste disposal systems that preserve the environment.
- Technology development targeting low enthalpy natural energy.

Common Subjects

- Use of radioactive tracers and electromagnetic fields to probe the changes in the natural, biological and man-made environment, and the other related applications for monitoring techniques.
- Development of technologies to preserve and manage natural environment in the framework of global environmental changes with the cooperative efforts among science and engineering faculty members.
- Promotion and creation of interdisciplinary regional studies related in the Circum-Japan Sea region as a hub of the region of East Asia.

Outline of the Research Divisions

Area of Natural Measurements

Division of Earth Dynamics

Physical- and chemical- analyses of terrestrial materials (e.g., aeolian and lacustrine sediments) are carried out to determine the structure and evolution of the global environmental system. Modern high-resolution, high-precision equipments are used to acquire analytical results of high quality including the measurement of isotopic ratio and radioactivity even at very low concentration levels. The obtained results are further processed for the purpose of future prediction, development of new research endeavors in the vicinity of environmental sciences and geochemistry.

Division of Eco-Technology

This division pursuits of development of geothermal energy and analyses of environmental flow systems, creation of progressive monitoring technology of atmospheric researches and its application, and evaluation of environmental changes in the East Asia on the basis of geo-scientific techniques in order to create sustainable utilization of bio- and geo-resources.

Division of Biodiversity

The aims are to clarify: (1) the evolutionary and ecological relationships between the diversity of the environments and that of marine and terrestrial organisms in the Japan Sea and Hokuriku areas and (2) the effects of natural and anthropogenic environmental changes on the diversity of organisms and ecosystems, using various techniques ranging from molecular biology to population biology.

Division of Biological Measurement and Applications

We develop the measurement technique for measuring the electromagnetic field, hazardous chemical and noise stresses that humans are exposed to. We also contribute to the maintenance of the environmental preservation, the safety management of industrial activity, the creation of the environment industry and the healthy life of the mankind.

Area of Environmental Information

Division of Natural Environmental Information: The purpose of the division is to integrate and construct database of natural environmental information on Eastern Eurasia and Pan-Japan Sea area, additionally, to assemble and analyze the information for terrestrial atmosphere-hydrosphere (including cryosphere) environment and remote sensing.

Division of Human Environmental Information: The purpose of the division is to integrate, advance and construct database of geographical and human environmental information on Eastern Eurasia and Pan-Japan sea area. Environmental geography.

Area of Regional Studies

This area pursuits of the social and environmental problems which have become objects of public concern in the Circum-Japan Sea region as a hub of the East Asia from the view point of natural, human and social sciences. It also promotes interdisciplinary research in the region with the areas and divisions of the institute.

Details of Research Divisions

Division of Earth Dynamics

■ Global Environment System

The research focus of this field is to understand the global environmental system. The behavior of the lithosphere, hydrosphere, and atmosphere, and their interactions with human activities are studied in the time-space coordinates system by analyzing terrestrial material and processing environmental information. This information is used to determine the structure and evolution of the environmental system and to assist in the forecasting and prediction of future trends.

Sampling and obtained lake core sediment

■ Isotope Geo-science Field

We measure precisely, in the Ogoya underground laboratory, very low level alpha-, beta- and gamma-emitting radionuclides and their stable isotopes in various environmental samples by using an ultra sensitive mass spectrometer.

Through these analyses, we explore the temporal distribution, spatial distributions and cycling behavior of the materials, and challenge to reclaim research areas by using radioisotopes as tracers.

■ Extremely Low-level Counting System Development Field

Underground Laboratory (OUL, 270 mwe) was constructed in order to measure extremely low level radionuclides. The facility is equipped with more than ten ultra low-background Ge detectors (ranked #1 in the world) which are located in the tunnel of former Ogoya Copper Mine. The following studies have been performed using this system: high resolution analyses of temporal variations of airborne radionuclides, the assessment of low-level neutrons using the nuclear activation method.

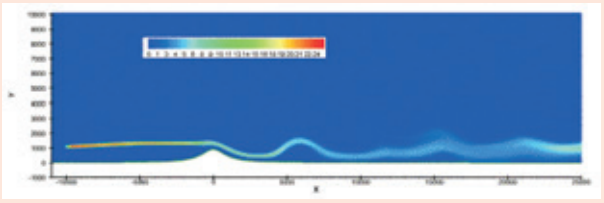
Division of Eco-Technology

■ Environmental Protection System

Our aim is to develop an innovative system used for field measurements of atmospheric environment. This system has been used in various international projects, and recently the measurements at Dunhuang, China, made large contribution to ACE-Asia (Atmospheric Aerosol Characteristics Experiment in Asia) project which was made to obtain better understanding of the effect of Asian atmospheric aerosols on climate changes and global worming processes.

■ Eco-energy

We aim to develop an easy-to-use but high-accuracy groundwater measurement system, which is indispensable for the effective utilization of low enthalpy natural energy, such as groundwater and river water. Fundamental analysis and related research activities are directed at large-scale extraction of energy from the molten magma that sleeps at the great depth in the earth.



■ Environmental Dynamics

In order to grasp geo-historical changes of natural environment in and around the marginal seas after the Last Glacial Maximum and to expect their future fluctuations, geo-scientific and oceanographic researches are carried out in the Japan Sea and Hokuriku region of Japan, coastal areas of the South China Sea and continental areas of the Southeast Asia. Further, environmental and social conservation programs in the Angkor World Heritage of Cambodia have been managed in connection with the Cambodian government and UNESCO, and the Area of Regional Studies.

Division of Biodiversity

Terrestrial Biodiversity

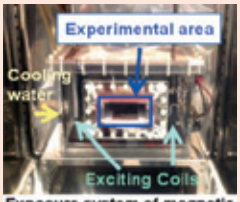
The terrestrial ecosystem on the Sea of Japan side differs in many aspects owing to heavy snowfall from that on the Pacific side. We intend to clarify the histories and processes of differentiation using molecular techniques at DNA level, phylogenetic analyses at individual level, and ecological research at population, community and ecosystem level. We analyze the impacts of natural and anthropogenic changes in the ecosystem and utilize those information for the regional revitalization and sustainable development.

Japan serow at Kakuma Campus

Marine Biodiversity

The aims of our research are to clarify the diversity of marine organisms and their adaptation to different environments. We finally clarify the mutual relationship between the diversity and environments, and their evolution. In addition, the effects of environmental pollutants on living organisms are investigated. We consider Japan Sea as a suitable place for our aims because of a closed environment. We have noticed the biota around the Noto Peninsula in which the Tsushima warm current flows on the cold water mass.

Division of Biological Measurement and Applications



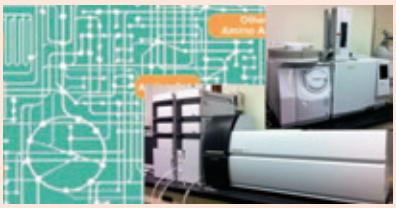
Exposure system of magnetic fields for cell culture

Electromagnetic Environment Field

The researches concerning effect of magnetic fields on anticancer drug potency, and on bone metabolism are being conducted by the exposure system of magnetic fields for cell culture. This knowledge will be applied to medical treatment with magnetic fields.

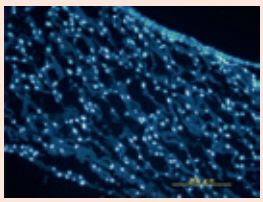
Bioassay Field

Biological responses of microorganisms and human cells against various environmental stimuli are analyzed using mass-spectrometry. The obtained information is utilized for researches concerning green-innovation and life- innovation.

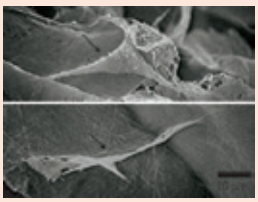


Mechanical Environment Field

Bones adaptively respond to mechanical stimulation in vivo. However, the details of the bone mechanoadaptation have not been fully understood yet. We perform various mechanical stimulation experiments for regenerative bones in vitro using a piezo-driven mechanical stimulator. Obtained data help us reveal the mechanism and our findings will be clinically applied to bone regenerative medicine.



DAPI stained cross-section of a regenerative bone with osteoblasts scattering in a collagen sponge scaffold.



SEM image of the inside of a regenerative bone, showing an osteoblast settling on the surface of collagen sponge scaffold.

Area of Environmental Information

Division of Natural Environmental Information

The purpose of the division is to integrate and construct database of natural environmental information on Eastern Eurasia and Pan-Japan sea area, additionally, to assemble and analyze the information for terrestrial atmosphere-hydrosphere (including cryosphere) environment and remote sensing.

Division of Human Environmental Information

The purpose of the division is to integrate, advance and construct database of geographical and human environmental information on Eastern Eurasia and Pan-Japan sea area. Environmental geography.

Area of Regional Studies

The area composed of **Division of Environmental Disaster Prevention** and **Division of Human and Social Sciences** was established in the institute in 2007 as the incoming organization of the "Japan Sea Research Institute of Kanazawa University". The former division concerns prevention of damage from various natural disasters and environmental problems, and the later pursuits to promote and develop interdisciplinary studies among human, social and environmental sciences which have become objects of public concern in the Circum-Japan Sea region as a hub of the East Asia. This area has published a unique annual journal "Japan Sea Research (*Nihon Kaiiki Kenkyu*)" which specializes in regional studies of the Circum-Japan Sea region since 1969.

Special Projects

The Institute and the 21st Century COE Program

The project "Environmental monitoring and prediction of long- and short-term dynamics of Pan-Japan Sea area" by Kanazawa Univ. (leader, Prof. W. Hayakawa) was selected as one of the 21st Century COE (Center of Excellence) Program projects in 2002 by the Ministry of Education, Culture, Sports, Science and Technology, Japan (MEXT).

Northeast Eurasia including the Japan Sea (Sea of Japan) is a region that is highly sensitive to climatic changes. Located in the middle latitudinal zone, this region is not only affected by the prevailing western winds, but is also controlled by East Asian monsoons. The Sea of Japan is a semi-closed area surrounded by the Japanese Islands (Japan), the Korean Peninsula and the Eurasian Continent. The countries around the sea (Japan, Korea, China and Russia) are rapidly developing industries and economies with large populations, suggesting that the Sea of Japan is a key region for natural and artificial environmental monitoring.

This fact leads that Kanazawa University should be a main player for Pan-Japan Sea environmental studies. The program was carried out under 6 sub-projects, among which four sub-projects (Limno-climatic change, Atmospheric environment, Ecosystem & biodiversity and Environmental radioactivity) were developed in the Institute. Most results and themes developed in the project have been undertaken by the Institute (reorganized in 2007)

Satoyama & Satoumi Nature Project

In 1999, we launched the "*Kakuma Satoyama Nature School*" to open the *Satoyama* forest in the Kakuma Campus of Kanazawa University up to the public for a lifelong learning project of the conservation of *Satoyama* as well as to education and research in Kanazawa University. In 2006, we expanded our mission to the Noto area. The "*Noto's Satoyama* and *Satoumi*" are rich in traditional culture and biodiversity. In June 2011, it was designated as a site of Globally Important Agricultural Heritage Systems (GIAHS). The ecosystems of these landscapes are under threats from a shrinking rural population and an ageing society. In close cooperation with local residents, we carry out the research and education activities to conserve the rural landscape and biodiversity and to reactivate the local communities in the Noto area.

Common Facilities

◆The Marine Laboratory "a public seaside practice"

We have the lodging facility, and at this factory, the seaside practice of multiple departments of Kanazawa University is carried out. Otherwise, seaside practice of the university in the neighborhood is also carried out. Various practical facilities to the field from the molecule for seaside practice have been arranged.

◆The Botanical Garden and Satoyama area in Kamura Campus of Kanazawa University

Botanical Garden, located in Kakuma Campus, is comprised of administration building, staff and student rooms, green houses and experimental fields. Satoyama area (74 ha), also located in the campus, has patches of Satoyama forests with oaks and bamboos and sugi (a kind of coniferous tree) plantations etc. The area is used for education and research in Kanazawa University and for environmental education by citizens and volunteers outside of Kanazawa University.

◆Kakumano-sato Hall, commemorating the 50th anniversary of Kanazawa University

This is a 350 year-old large farmer house, transplanted from Shiramine village at the foot of Mt. Hakusan in 2005. This Hall is used as the hub for education and research of Kanazawa University and for environmental education and conservation activities. by citizens and volunteers outside of the University.

◆Kanazawa University Noto School

This is a former elementary school building, donated by Suzu city in 2006, is used as the hub of various activities of *Satoyama Satoumi* Project in research, education and regional collaborations and as the atmospheric observation center "Noto Super Site".

◆The Low Level Radioactivity Laboratory

This laboratory is situated on a hill in Tatsunokuchi Town located in Ishikawa Prefecture. In this laboratory, practical training of Kanazawa University students and collaborative research activities with other universities and research institutes are carried out by using the extremely low background radioactivity measurement system constructed in former Ogoya mine.

◆China office of Kanazawa University http://www.lasg.ac.cn/COKU/index.html

Japan branch of China was jointly established with Institute of Atmospheric Physics,Chinese of Academy of Sciences in April 2007. Its mission is to promote further bilateral cooperation in both research and education, by hosting research collaborations as well as meetings, fostering young researchers, and endorsing international exchange students.

◆Korea office of Kanazawa University

It was the first research center built abroad for Kanazawa University. Its aim is to facilitate mutual exchange and cooperation among the common disciplines. Expectations are high for the further development of collaborative projects.

◆International laboratory in Kanazawa University

Japan branch of Korean Institute of Geosciences and Mineral resources (KIGAM) is open in the Institute since 2008 under the agreement concluded in 2005. The branch has been a key station for promoting joint researches, joint meetings, etc. between Japan and Korea since then.

Cooperative Researches

- Research and development on the biofuel production using a high-functional bioreactor. (Osaka Science & Technology Center)
- Research on electromagnetic wave technology which contributes to the development of the regional industry. (Ministry of Education, Culture, Sports, Science and Technology)
- Evaluation of the present environmental pollution and destruction in and around the Angkor World Heritage, Cambodia (APSARA National Authority, Cambodia and UNESCO)
- Geo-environmental development and evaluation of mechanisms sustaining the biodiversity in Lake Tonle Sap, Cambodia (APSARA National Authority, Cambodia and UNESCO)
- Environmental changes in and around mangrove habitats in South Thailand with special reference to their restoration after the attack of the Sumatra-Andaman Tsunami in 2004 (Prince of Songklha University and Mahidol University)
- Research and development of needle type micro magnetic probe and applications to low-invasive measurements in bio-fields(Technical University of Lublin, Poland, University of Lorraine, France)
- Study on sex-determination in Thai medaka using by molecular biological methods(National Institute for Basic Biology in Japan, Srinakharinwirot University in Thailand)
- Regulation of bone metabolism in space: Analysis by an in vitro assay system using goldfish scale as a model of bone (Japan Space Forum)

Partner Institutions

Institutions	Country	Contact Person	Detail
Coordinating Committee for Geoscience Programs in East and Southeast Asia [CCOP]	Intergovernmental Organization	Prof. Shinji Tsukawaki	Capacity building and personnel exchange of students and researchers in the East and Southeast Asia.
Authority for the Protection and Management of Angkor and the Region of Siem Reap (Siem Reap)	Cambodia	Prof. Shinji Tsukawaki	Conservation programs for conservation and protection of natural and social environment in the Angkor World Heritage and capacity building
Institute of Technology of Cambodia (Phnom Penh)	Cambodia	Prof. Shinji Tsukawaki	Educational support of the Geo-resource Department, and capacity building in the fields of science and technology in Cambodia
Yanbian University (Yanji)	China	Prof. Kenji Kashiwaya	Joint research on global environment measurement and student exchange programs
Xidian University (Xi'an)	China	Prof. Shigeo Kimura	Joint research and student exchange program
State Key Laboratory of Numerical Modeling for Atmospheric Sciences and Geophysical Fluid Dynamics (LASG), Institute of Atmospheric Physics (IAP), Chinese Academy of Sciences (CAS)	China	Prof. Kazuichi Hayakawa	Joint research on global environment measurement
Institut Teknologi Bandung (Bandung)	Indonesia	Prof. Koji Nakamura	Joint research on terrestrial biodiversity and student exchange programs
Korea Institute of Geoscience and Mineral Resources (Daejeon)	Korea	Prof. Kenji Kashiwaya	Joint research on global environment measurement
Korea Advanced Institute of Science and Technology, College of Engineering (Deajeon)	Korea	Prof. Shigeo Kimura	Joint research and student exchange programs
National Taiwan University (Taipei)	Taiwan	Prof. Kenji Kashiwaya	Joint research on global environment measurement and student exchange program
Kyung Hee University, Faculty of Sciences (Seoul)	Korea	Prof. Kenji Kashiwaya Asso. Prof. Noriko Hasebe	Joint research on global environment measurement and student exchange programs
Chulalongkorn University (Bangkok)	Thailand	Prof. Shinji Tsukawaki	Interdisciplinary exchange and capacity building programs of students and researches
Chiang Mai University (Chiang Mai)	Thailand	Prof. Kazuichi Hayakawa	Joint research and student exchange programs
Prince of Songkla University (Had Yai)	Thailand	Prof. Shinji Tsukawaki	Research and evaluation of environmental pollution and destruction in South Thailand and restoration program after the attack of the 2004 Sumatra-Andaman Tsunami
Mongolian Academy of Sciences, Institute of Geology and Mineral Resources (Ulaanbaatar)	Mongolia	Prof. Kenji Kashiwaya Asso. Prof. Noriko Hasebe	Joint research on global environment measurement
Mongolian Academy of Sciences, Institute of Geography (Ulaanbaatar)	Mongolia	Prof. Kenji Kashiwaya Asso. Prof. Noriko Hasebe	Joint research on global environment measurement
National University of Mongolia (Ulaanbaatar)	Mongolia	Prof. Kenji Kashiwaya Asso. Prof. Noriko Hasebe	Joint research on global environment measurement
Griffith University (Brisbane)	Australia	Prof. Sotoshi Yamada	Joint research on magnetic applications and student exchange programs
University of South Australia, Division of Information Technology, Engineering & the Environment (Adelaide)	Australia	Prof. Sotoshi Yamada	Joint research on magnetic applications and student exchange programs
Lublin University of Technology (Lublin)	Poland	Prof. Sotoshi Yamada	Joint research on magnetic applications and student exchange programs
University of Nevada, Reno (Reno, Nevada)	USA	Prof. Shinji Tsukawaki	Management and promotion of student exchange programs

The Map of Institute of Nature and Environmental Technology

① Kakuma Campus : Kakuma-machi, Kanazawa, Ishikawa 920-1192, JAPAN
Phone : +81-76-234-6821

② The Low Level Radioactivity Laboratory : Wake , Nomi, Ishikawa 923-1224, JAPAN
Phone : +81-761-51-4440

③ Ogoya Underground Laboratory: Ka 1-1, Ogoya, Komatsu, Ishikawa 923-0172, JAPAN
Phone and Fax : +81-761-67-1740

④ The Marine Laboratory “a public seaside practice": Mu 4-1, Ogi, Noto-cho, Housu-gun, Ishikawa 927-0553, JAPAN,
Phone : +81-768-74-1151

⑤ *Satoyama Satoumi* Natural School : 33-7 Kodomari, Misakicyou, Suzu, Ishikawa, 927-1567, JAPAN
Phone and Fax : +81-768-88-2528

⑥ *Satoyama* Narural School in Kakuma : Kakuma-machi, Kanazawa, Ishikawa 920-1192, JAPAN

⑦ China office of Kanazawa University : Institute of Atmospheric Physics, Chinese Academy of Sciences, Beijing 100029, CHINA
Phone : +86-10-82995148

⑧ Korea office of Kanazawa University : Korea Inter-University Institute of Ocean Science #312, Pukyong National University, Daeyon-dong, Nam-gu, Busan 608-737, KOREA
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⑨ International laboratory in Kanazawa University: Kakuma-machi, Kanazawa, Ishikawa 920-1192, JAPAN

- Division of Earth Dynamics ……①,②,④
- Division of Eco-Technology ……①
- Division of Biodiversity ……①,③,⑤
- Division of Biological Measurement and Applications ……①
- Division of Natural Environmental Information ……①
- Division of Human Environmental Information ……①
- Division of Environmental Disaster Prevention ……①
- Division of Human and Social Sciences ……①

Kanazawa University

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〈Office〉

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