

Activity Report from International Strategic Advisor

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Abstract:

The visit to ROIS-DS and its PEDSC (Polar Environment Data Science Center) ended after days of communication with the employees, scientists in NIPR, and its data infrastructure, activities, and relevant projects in NIPR. It is a full experience to understand the last development of its operations and the strategy for the research organization, project coordination, and data activities. All these findings are from the involvement in the DSWS-2023 and the communication with our colleagues coordinated by Dr. Masaki Kanao (PEDSC), and also based on a long-term contact with Prof. Hiroyuki Enomoto (NIPR) about the GEO and its cold regions initiative.

The report includes 1) science activities and exchange, with a focus on the polar Data and GEO services in the data era, and the strategy for the datasets mapping with variables; 2) Exchange on the international engagement of NIPR, the ARC, and its Data strategy; 3) suggestions on the international activities.

Overall, the development trend and its structure of the ROIS-DS, and the Polar Data have been in good condition, and aligned with the international development trend, with the most important way of the Earth Poles, as the common concern of different agendas in Japan, and also in the international bodies, the integration of the data is necessary for the whole country development, a good example is the ARC project almost include all the efforts by the public money or the international strategy of Japan. The frequent engagements are critical for the near-Arctic countries, like Japan, Korea, China, and Asia Countries. Another important way could be the development in Asia Oceania regions to engage the GEO, WDS, and CODATA as the platform for the collected efforts, and engaged in the global development.

1. General Activities in Japan visiting

1.1 Keynote and Session 7 in DSWS-2023

GEO CRI Talk: I was very honored to have a keynote talk in the opening session of the DSWS-2023, which kept us again to have the GEO and its cold regions development, especially from the data and the essential variables, and coordination development with the idea of the Earth three Poles, the Arctic, Antarctic and the Tibetan Plateau and mountain cold area, where the EO plays key roles in the far away places, and caring about the Earth environment in the fragile regions of cold area. As an international activity, now it is one of the GEO pilot initiatives, with a focus on the EO data, and its value-added products and services to different challenges on the warming Earth. This topic can be checked via www.geocri.org, addressing the aim of the last declarations of GEO in Cape Town in Nov. 2023 - multilateral environmental agreements (MEA) - the Paris Climate Change Agreement, the Sendai Framework for Disaster Risk Reduction, the 2030 Agenda for Sustainable Development, and the New Urban Agenda.

The GEOCRI is now ongoing with the hat of GEO, mainly forcing on the EO applications, especially the spaceborne observations, with the pilot services, and data development forwards of the streaming. NIPR is one of the players in this consortium, a co-lead position. About ten years ago, the 1st Polar data forum was held in Tokyo, which was the initial time of the data issue at the global scale after the IPY exercise. The data issue was a big

concern in the past ten years for collecting or gathering data that distributed in the scientist's hands, while now the data was enhanced again as the satellite EO is getting a fast development and open data policy in the world.

Session on GEO variables and data mapping for Cold Regions: Worked with the Asia Oceania players, the session background is about 1) Global warming threatens the world's cold regions, while the essential variables of the Group on Earth Observations (GEO) provide mapping schemes for the data in the current EO system. 2) GEO Cold Regions Initiative (GEO CRI) calls for a gathering of the GEO variables for cold regions and mapping existing or emergency data products for tackling the challenge of the warming world. 3) The topics could be essential variables, GEO data system, and data application, and pilot services using the data stream, and cases studies over cold regions by GEO. The main point discussed are,

- The session includes five talks on the variables of snow, glacier, and sea ice, both by in-situ measurement, and satellite observations, and its value-added products. The session tackled the questions of the value chain of EO data, especially the pilot service with the comprehensive service by multi-variables from the database, it is the way forward to have the GEO Cold Regions connection with data from different stakeholders and data holders.
- The session includes five talks on the variables of snow, glacier, and sea ice, both by in-situ measurement, and satellite observations, its value-added products and output from modeling.
- The data management and data-based applications on the disaster and Arctic Shipping were reported to raise the impact-driven approaches of data value.
- The audience asked questions about the value of the satellite in different time intervals about the sea ice, and proposed to consider the assimilation data products in the services, etc.,
- Comments from co-chairs were about the essential variables for the societal benefits to extent the value of data, like disaster mitigation, and shipping advisory.

The session was called from an international way, finally in the session, talks were about the snow and ice, and services (disaster, and shipping advisories), which brought a new chance the collaborate with GEO and WDS-ITO, or CODATA (if people could be engaged in the same group) for the pilot services as an international effort under the framework of the inter-governmental organization, for example, the expand of the engagement of China, and Japan, and Australia into a working group or engaged as the efforts from the perspective of the Aisa-Oceania region with the data and services, which broad the national effort and products (public goods) to a large domain of international perspective.

1.2 GEO Cold Regions Initiative (GEOCRI) Strategic Meeting: During the visit, a GEO Cold Regions Initiative strategy meeting was held in the PEDSC division, extensive exchange was engaged by the PoCs to GEOCRI, and players have been reported, and as the conclusion, few points development are proseed as follows, ROIS-DS/PEDSC/NIPR activities are impressive with its international plan and engagement, Co-Develop on Data-Information-Decision Support activities for Cold Regions

- Develop a Task Group on Pilot Service (or Expert Team) with national researchers, Task Group on Pilot Service, like Disaster, Water, and Sea Ice Services, for example, Snow and ice Disaster would be a potential pilot service at several different countries.
- Collaboration with ROADS/SAON Passion, and international bodies, initiate a talk online with SAON and its ROADS strategy, and adopt it to be a base. joint group, and implementation of service with the data, aiming to the GEO Declaration of Cape Town 2023 (see : <https://www.geocri.org/news/the-geo-post-2025strategy-earth-intelligence-for-all>).

- Funding opportunities in AO or broad communities, NSFC\JSPS\NRF call on New Generation Databases and Data-Empowering Technologies, collaboration with the international fundings, for example, the Belmont Forum.

2. Science Development and Data Management

As for Data Sharing and connections in domestic bodies, the way forward of current is fine at an international level, which is still a model for other countries, while the technique innovation is critical by recruiting and employing more international employees, especially in the field of AI and Big Data, and the current Big Model, the coming effort call for infrastructure, that can be used by most of the scientists for the knowledge discovery.

ArCSII and its Research Activities: The project ArCSII is well developed in the structure at a quite integration scheme, with all the scientists from nature science, society, and economy. This is from the nature of Polar activities, while the core of it is the samples and data collected from the expedition. Another nature of the polar research and public goods is the sharing and coordination system of the public goods. The ArCSII is recommended to report in the international level consortium expanding the impact. The potential place is GEO and its side event with GEOCRI, SAON and its ArcticGEOSS, and ASSW session with international organizations, or it can be linked with the SIOS, which is also Japan-tagged.

Potential Collaboration with Chinese Data activities: China initiated 20 national-level data centers, especially the polar data center (by PRIC), and CASEarth Data Portal (by AIR-CAS), which are more than happy to have connections and exchange, the applications and research activities that could be together develop.

- **Digital Arctic and its services:** this based on the activities of big data, providing services for the shipping, SDGs, innovation technique are compulsory, the science committee on the Digital Poles has been established under the Chinese Committee (CN) - International Committee on Digital Earth.
- **Sustainable Development Goals (SDGs):** As for the international research center for UN SDGs (CBAS) is an big data support decision maker (SDG) center, which is open for all connection over the world, and this is a good interface for joint activities on the SDGs in Arctic and its SDG13: climate actions, the report jointly would be much welcome also.
- **Data activities convening in Asia Oceania:** joint activities in AO through the convening power of Japan and China communities in the filed of data science in Asia and Oceania regions.
- **AI and Data Reconstruction for Arctic Sea Ice:** develop the emergency technology of AI for the sea ice data reconstruction from the satellite data of SDGSAT-1, Gaofen dataset, and compliment with JAXA dataset in the Arctic and Antarctic regions.
- **GEOCRI:** jointly activities under the umbrella of Group on Earth Observations in Japan or China, for example, the HiMAC Workshop (himac2023).

3. Benchmark Institutions

GEO and its GEOSS: A central part of Group on Earth Observations (GEO), and its Mission is to build the Global Earth Observation System of Systems (GEOSS), could check via www.geoportal.org. GEOSS is a set of coordinated, independent Earth observation, information and processing systems that interact and provide access to diverse information for a broad range of users in both public and private sectors. GEOSS facilitates the sharing of environmental data and information collected from the large array of observing systems contributed by countries and organizations within GEO. Further, GEOSS ensures that these data are accessible, of identified quality and

provenance, and interoperable to support the development of tools and the delivery of information services. Thus, GEOSS increases our understanding of Earth processes and enhances predictive capabilities that underpin sound decision-making: it provides access to data, information and knowledge to a wide variety of users.

The infrastructure and data basis of global players are good example for the PEDSC (ROIS-DS) activities, for example, the technique issue of the interoperability between the domestic universities or research centers, this would keep Japanese PEDSC to be with an international level and exchange the data with other country and international organizations.

Website: <https://www.geoportal.org/?m:activeLayerTileId=osm&f:dataSource=dab>

GEO Knowledge Hub: The GEO Knowledge Hub (GKH) is a central cloud-based digital library providing access to Earth Observations applications developed by the GEO Work Programme Activities. The GEO Knowledge Hub It is part of the GEOSS Infrastructure and helps the Group on Earth Observations (GEO) to advance Open Knowledge, cited from the website of GEO Knowledge Hub. The scope of the GKH is to promote the replicability and re-usability of EO Applications by sharing with the end users, all the Knowledge Resources essential to fully understand and re-use them. All knowledge resources of a registered EO application, will be openly shared, curated and organized into a Knowledge Package, including: (A) Research papers and reports describing methods and results; (B) Software algorithms and cloud computing resources used for processing; (C) In situ and satellite imagery data used and; (D) Results for verification.

The data federated by GEOSS Portal, and the tool resource are centered in the GKH, which is the development based on the last development of the cloud infrastructure. The open science and open knowledge are the main stream for the EO-based science discovery and data evidenced knowledge gap filling activities.

Website: <https://gkhub.earthobservations.org/>

CASEarth and its Data portal: The Big Earth Data Science Engineering Program (CASEarth) was officially approved on January 1, 2018, as a Strategic Priority Research Program (Class A) of the Chinese Academy of Sciences (CAS) with an implementation period of five years. CASEarth aims to draw advantages from extensive resources of CAS and other units at home and abroad to develop a data sharing platform for big data and cloud services, which is the CASEarth portal, to cater for the modern data intensive scientific applications for a wide variety of fields including resource management, environmental sciences, biology, and ecology and many others. The platform would promote technological innovations in the field of Big Earth Data, support major breakthroughs and scientific discoveries in Earth system sciences, enable all-round macro decision-making support and public knowledge dissemination services, and also function as a science-based decision support system for developing major strategies for regional or global sustainable development. The CASEarth projects is a milestone project for the data science and infrastructure for support the science evidence to the UN SDGs.

Website: <http://english.casearth.com/index.php>

CBAS, the International Research Center of Big Data for Sustainable Development Goals (CBAS), which has formally been established on September 22, 2020. CBAS facilitates the implementation of *Transforming our world: the 2030 Agenda for Sustainable Development* and organize global efforts to adopt science, technology, and innovation towards the Sustainable Development Goals (SDGs). As an international research center within the context of a "science for sustainability" framework, it develops scientific products, methods and technologies from global to local scales to ensure global access to the latest, most reliable information on the SDG indicators. It also work to mobilize the technological and data resources necessary to analyze and visualize information for informed actions and policies, with fair and open access to all. CBAS develop a Big Earth Data platform and operate a series

of scientific satellites for SDGs that provide data sources tailored to measuring the SDG indicators. Education initiatives and a think tank will also contribute to existing global efforts towards human resource development and training. The main basis is the big earth data infrastructures, including the CASEarth Data portal, and the launched SDGSAT-1 satellite dedicated to the SDGs addressing in the new era of 21 century.

Website: <http://www.cbas.ac.cn/en/>



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