Development of a web-application system for seismic waveform data observed at real-time with the seafloor seismic network, DONET

Sugiyama Daisuke[1], Morifumi Takaesu[2], Hiroki Horikawa[1], Kentaro Sueki[1], Narumi Takahashi[3], Akira Sonoda[1], *Seiji Tsuboi[1]

1. JAMSTEC, Center for Earth Information Science and Technology, 2. NME, 3. NIED

It is well-known that devastating earthquakes have struck the Southwest coast of the Japanese Islands repeatedly in the past. Of these earthquakes, those that occurred in the Nankai Trough region are very significant, because they have caused extreme hazards in these coastal areas due to large tsunamis. In order to detect tsunamis in the earthquake source areas, JAMSTEC deployed the seafloor seismic network, DONET in 2010. The DONET system consists of an array of 20 stations in total, each of which are composed of multiple types of sensors, including strong-motion seismometers and quartz pressure gauges. The recorded data are transferred to a land station through a fiber-optic cable in real time. We have developed a web application system, REIS (Real-time Earthquake Information System) that provides seismic waveform data to some local governments close to the Nankai Trough. The main purpose of REIS is to inform local government officers as to what has actually occurred in the Nankai trough region when there is a large earthquake. REIS itself is not designed to issue early tsunami warnings, but it should be useful for local government officers to get every possible piece of information to quickly assess large earthquakes. We have ensured that the display of real-time waveform data from DONET is performed with a maximum delay time of approximately 2 seconds, even though we do not use dedicated internet connection at the REIS users' sites. This delay time is considered appropriate to allow local government officers to promptly identify current seismic activity around Nankai Trough region. In 2016, the network has been enlarged to the west of DONET and about 30 new stations, DONET2, are added to the network. We have renovated the REIS system so that it may handle additional seismic waveform data without any problems. Also, since April 2016, the ownership of DONET has officially transferred to the National Research Institute for Earth Science and Disaster Prevention (NIED). JAMSTEC has a contract for the operation of DONET with NIED and will keep the operation of REIS and event data system as it is.

Keywords: Nankai Trough, Earthquake observation

A strategy for industrial utilization of atmosphere-ocean simulation data

*Shinya Kakuta[1], Hajime Nishimura[1]

1. JAMSTEC Japan Agency for Marine-Earth Science and Technology

To extend socio-economic ripple effects by research and development activities by public organizations, this presentation discusses strategy to generate business utilizing super-computers and their results under cooperation with private sectors. Meteorological data, for example, data on air temperature and wind velocity, are data on the environment. In principle, there is no rivalry for data, because they can be duplicated. Thus, environmental data can be club goods without rivalry, excludable against business competitors. On the other hand, the environment is not excludable as public property.
To solve social problems, it is necessary not only to create successful cases but also to roll them out and operate them for a long term. More and more public funding requires prospects for social application by private entrepreneurs to supplement itself. On the other hand, public research organizations are also required to increase socio-economic effects caused by research results. Bu, public research organizations are too short of human resources to meet the requirement, occupied with on-going national projects. To overcome this difficulty, it is recommended to cooperate with private application developers so that benefits will exceed burdens on researchers in public research organizations. To reduce burdens on researchers in instruction of the application developers, private companies are to be found to undertake the instruction as their own business.
So that, in the earliest stage, socio-economic ripple effects will take priority to profit of public research organizations, densely populated areas or cities are not excluded, involving intermediate-user companies with high potential to secure customers or such end-user companies with numerous customers as in building industry.
In a view point of eco-system of data industry, needs are matched with seeds in multi-players to make supply-chains from these companies. Comparing existing weather and geo-informatics services, which could compete, the following strategies should be proper.
To aim at niche tops with the blue-ocean strategy without competing.

At first, assessment without repeated operation; next, seasonal prediction; in the future, short-term prediction for early alert.

To take shaping-type business strategy; to grasp a chance to form industry toward a profitable direction, utilizing facilities as a platform, flexibly coordinating cooperation among stake holders varying from immediate customers to end-users.

Keywords: industrial utilization, strategy, atmosphere and ocean simulation

経営戦略アプローチ

経営戦略パレット

「**予測可能性**」(将来の市場・環境の変化を予測できるか？)、
「**改変可能性**」(自社単独で、あるいは他社と協業して、事業をつくり変えることができるか？)

＼改変可能性 予測可能性＼	低	高
低	Adaptive	Shaping
高	Classical	Visionary

研究成果の商業利用

予測はできないが改変可能性が高い
＝業界のルールが(再)定義される前の早い段階
→業界そのものの (再)形成を主導する類稀な機会

気象・水文シミュレーション会社、
コンサル、シンクタンク、認証機関、
損保、マリコン、商社、等…
の多様なステークホルダからなる
柔軟なeco-systemを
♪オーケストラ♪のように

施設・設備をPlatformとして協業を編成・調整

ビジョンを共有して自身の有利な方向に業界を編成

Open data on the atmosphere and ocean for commercial use

*Shinya Kakuta[1], Hajime Nishimura[1]

1. JAMSTEC Japan Agency for Marine-Earth Science and Technology

It is discussed what guidelines for terms of use would be desired in permitting commercial use of open data on the atmosphere and ocean generated by public organizations.
In some cases, users are charged for research data worthwhile. It is difficult to prepare rules, framework, and data-providing systems without supports of experts on accounting and intellectual properties for commercial use. According to questionnaire by Ono et al. (2016) over researchers community of DIAS and GRENE-ei, definite-term project of Ministry of Education, Culture, Sports, Science and Technology, 31.6 % of answers regarded NC (Noncommercial) of Creative Commons (CC) as agreeable for the provider side, if a researcher provided arbitrary others with data generated by oneself.
Most data freely downloadable from each ministry site are not academic research data. As their terms of use, Government of Japan Standard Terms of Use (ver. 2.0) is commonly adopted. The terms say, "…permitted to use without restriction, for example, to duplicate, broadcast, translate, and adapt, also for commercial use" under a certain conditions. However, the terms are not adopted for data with charge on use or with restriction on receivers and users. The terms are compatible with CC BY (Attribution). However, CC license is not suitable for cases with usage and support conditions and exemption from responsibility. Thus, terms of use of open source codes should be referred.
In a simple example, a data generator is equal to the reference on quality of the data, equal to a licenser. It depends on consensus among data generators whether their licenser is a natural or legal person. In the case that a licenser is natural, it could take time to respond to each use application, or farther, the licenser could become too short of time to decide to respond.
On the other hand, there are many research data generated from definite-term projects. Guidelines on data ownership are desired to determine whether data generators are natural or legal people, whether licensers are data generators or organizations in charge of open data, in case data generators could hardly continue to manage and open their own data.
Taking the above mentioned issues into consideration, we would like to discuss what guidelines are preferable for commercial use of data.
ONO Masafumi, KOIKE Toshio, SHIBASAKI Ryosuke (2016) "Survey for research data sharing in earth environmental information domain: Realities in research community," Journal of Information Processing and Management, vol. 59, no. 8, pp. 514-525.

Keywords: open data, commercial use, atmosphere, ocean

Development of Information System Infrastructure for Efficient Data Publication in JAMSTEC

*Tomoki SASAKI[1], Toko Kaneshi[2], Maki Kinjo[2], Anri Nagayama[2], Hideaki Saito[1], Yasunori Hanafusa[1]

1. Japan Agency for Marine-Earth Science and Technology, 2. Marine Works Japan Ltd.

The Japan Agency for Marine-Earth Science and Technology (JAMSTEC) archives and publishes large amounts of observation data and sample information obtained by cruise and dive surveys on a lot of database systems optimized depending on property of them. Therefore, efficient development and operation of the database systems are an important task in JAMSTEC.

One of the efforts against this task is development of common infrastructure system. Normally, every database system individually needs to be implemented all basic functions required for data publication. That causes an increase in system development cost and a decrease in efficiency of system operation. Furthermore, users of every database system are individually required to register user information, etc. That causes a decrease in convenience of users. In order to prevent these problems, JAMSTEC operates common infrastructure system implemented the basic functions required by every database system. The functions of this system are as follows.

・Access management
This system is implemented the centralized control function of publication of the database sites and access communication from the Internet.
・User registration and authentication
This system is implemented the function of user registration and single sign-on user authentication.
・Form creation and management
This system is implemented the function of creation and management of the customizable form for inquiry and data usage request, etc.
・Web map service
This system is able to provide the web map data for data visualization in every database site. Map data is selectable for every database site.
・Portal page
This system provides the portal page of the database sites “GODAC Data Site NUUNKUI” (http://www.godac.jamstec.go.jp/jmedia/portal/e/).

Furthermore, we optimize system position and network architecture. Data volume, publication method, and work location of data management staffs are different for every database system. Therefore, the database systems dispersedly install at Global Oceanographic Data Center (GODAC) in Okinawa prefecture and Yokohama Institute for Earth Sciences in Kanagawa prefecture depending on these conditions. Although the both institutes are distant, these are connected by high speed network using Science Information Network 5 (SINET5). In addition, network areas for data publication in both institutes are virtually constructed as a single network area. Therefore, these efforts contribute efficient data management and stable data publication.

In summary, a development of common infrastructure system and an optimization of system position and network architecture contribute an efficient operation of the database systems and an increase in

convenience of users. As a result of that, it is expected that the utilization of data published in JAMSTEC is promoted.

Keywords: data publication, information system infrastructure

Development of a visualization and analysis system for earth science information

*Daisuke Matsuoka[1], Hideo Miyachi[2], Koji Koyamada[3], Isamu Kuroki[4]

1. Japan Agency for Marine-Earth Science and Technology, 2. Tokyo City University, 3. Kyoto University, 4. Cybernet Systems Co., Ltd.

We have been developing a new visualization and analysis system which combines three-dimensional visualization software, multi-dimensional scatter plot matrix and parallel coordinate plot as the commissioned projects of A-STEP NexTEP B sponsored by JST. The system is able to treat various types of data format of numerical simulation and observation such as NetCDF and HDF5. In addition, the users can extract and visualize characteristic features of atmosphere and ocean by interactively setting of multi-dimensional color maps based on scatter plots matrix and/or parallel coordinate plots of multiple physical quantities. In this presentation, we introduce the prototype of the software and application results to atmospheric and ocean simulation data.

Keywords: Visualization, Scatter plot matrix, Parallel coordinate plot

