

# InterRidge: International Cooperation in Ridge-Crest Studies



Online Steering Committee Meeting

The first year in Seoul Office (2020.05.01~2021.04.30)

Sang-Mook Lee, Chair

December 2021

InterRidge Office

School of Earth and Environmental Sciences

Seoul National University

Gwanak-ro 1, Gwanak-gu, Seoul 08826

Republic of Korea

Webpage: [www.interridge.org](http://www.interridge.org)

Email: [interridge@gmail.com](mailto:interridge@gmail.com)

## Executive Summary

This is part of InterRidge Annual Report which was referred to as Coordinator's Report. This report covers from May 1, 2020 to April 30, 2021. This period corresponds to the first year (12 month) of Korean Office at Seoul National University. In the previous years, Executive Summary of the report was not given. However, the last two years have been quite extraordinary, and therefore, as the Chair of InterRidge, it would be appropriate to describe the events that have happened in the first year, including global lockdown and travel ban resulting from COVID-19 which has disrupted scientific activities.

Korea had to assume the role of InterRidge Office suddenly. Korean scientists thought that someday Korea will host InterRidge but they never thought it would be so sudden. For your information, Korea had been a Regular Member of InterRidge. In order to bid for the Office and Chair, Korea had to upgrade its membership to Principal Member, and this meant the annual membership fee had to be increased by 10 times when all the budgetary decisions were made for the next fiscal year. First of all, this was a daunting challenge which could not have been possible without the help of many local scientists and the funding agency.

It was thought that Norway would make the bid and become the host of InterRidge. However, due to some circumstances, it became clear in the second half of 2019 that Norway would not become the next InterRidge Office after France. I'm sure this was a big shock to InterRidge community and Steering Committee members. In October-November 2019, then Co-Chair of InterRidge, Dr. Jerome Dymont of France, came to Korea and asked Korean scientists if we could be the next host of InterRidge. We were not ready for this sudden proposition. I myself had basically retired from InterRidge since 2006 after my accident which rendered me quadriplegic (completely paralyzed neck down). Korean representation at InterRidge was maintained by Dr. Sung Hyun Park who kept the flame of InterRidge alive by paying the regular membership fee from his personal research funds. There are at least 3 major programs related to mid-ocean ridge in Korea (2 in Indian Ocean and 1 in Antarctic) and they are run by scientists younger than myself. However, to save InterRidge, we had to come forward. Because of my seniority and public recognition, it was agreed that I would become the Chair and the office would be hosted at Seoul National University. A big problem was to come up with US\$50,000 as Principal Member and host country. This task was made easy by Dr. Jung Woo Park of Seoul National University who allowed the money to come from his ongoing Indian Ocean hydrothermal research project. Additionally, the funding agency graciously approved these actions. As the Chair, I would like to extend my great appreciation

for both Dr. Parks. Without their understanding and assistance, I don't know what would have happened to InterRidge.

InterRidge is an over 30 year old organization, created in the early 90s in the heydays of mid-ocean ridge studies by John Delaney of US and Jean Francheteau of France to serve as coordinator for various mid-ocean ridge studies among countries by sharing information and collaboration. However, with the ending of major scientific programs like Ridge 2000 in the US, enthusiasm for InterRidge has died down somewhat in the last 10 years. Another important change is that now many countries are studying the mid-ocean ridges not just for new scientific discoveries but for possible applications and economic benefits such as seafloor mining and biomedicine. Presently, three countries have applied for exploration licenses in the Mid-Atlantic and four countries in Indian Ocean. How we maintain scientific investigation for pure understanding is a challenge and an important issue for the entire InterRidge community.

The Korean Office officially started its work on May 1, 2020. Former office in France requested that extra time was needed to wrap up their activities, and thus for an additional 4 months from January to April 2020, the office remained in France. About the time the Korean Office began its activity, the global pandemic struck, and everything changed. Steering Committee meetings could not be held because of restriction in travel. Working group members could not meet for workshops and discussion. Fellowships would not be handed out because many international conferences were turned into online meetings. But more importantly, many seagoing scientific expeditions and cruises were either canceled or postponed. Even those that happened, because of quarantines, port calls were banned and many cruises were from mother port to mother port. COVID-19 was especially hard on the InterRidge community.

It was Erik Sevre who became the first InterRidge Coordinator in Korea. He was a US citizen and computer programming expert who had worked with me for many years in Korea. However, due to lockdown in Seoul and family matters due to pandemic back home in US, Erik decided to return home in March 2021, after serving less than a year for InterRidge. One of the things that we try to do is put all InterRidge related activities and materials on a cloud server so that transfer of InterRidge Office from one country to the next country could be made easier in the future. Currently, this is consolidated under Microsoft Azure.

Another important matter was to deal with local funding and bureaucracy. Because InterRidge is not a legal entity, receiving annual membership from various countries was really difficult. Although fiscal and financial matters were handled by Seung Jun Park also known as Kyle. It is really amazing that

InterRidge has to adapt to new host country every 4 years. For instance, the Korean office still has not received 2020 InterRidge membership from France (US\$25,000) and membership fee of Japan (US \$5000) which was submitted to France in January 2020 with the understanding that the money will be transferred to Korea. I have written to Director of IPGP for his attention and solution to these financial matters. After witnessing such bureaucratic misunderstanding and confusions during transitions, I truly feel that something has to be done for the future of InterRidge operations.

Traditionally, the Steering Committee members get together over a course of one week to discuss and decide important InterRidge matters once a year. However, because of travel ban, such face-to-face meetings could not be held. Internet online meetings were held instead. At least 3 online meetings were held in the first year (May 2020-April 2021) but because each meeting were about 90 minutes long, long in-depth discussions were not possible. This lead to difficulty in forming camaraderie among Steering Committee members.

Under such difficulties, InterRidge was able to keep the flames going. The discussion among Steering Committee members and member countries was kept alive. Many new ideas were suggested and are being implemented to adapt to this new world and new idea of normalcy. These include organizing a new InterRidge Webinar Series, consolidating all InterRidge matters to a cloud server, and ways to increase membership and attract young early career scientists. The role of InterRidge is to represent the deep-sea community in international organizations such as International Seabed Authority and SCOR. Also, the main scientific contributions of InterRidge is made through the Working Groups. In addition to Seafloor Massive Sulfides Resources along Mid-Ocean Ridges, Ocean Transform Faults, a new working group (A Macroecological Database for Species Distribution across Chemosynthesis-Based Ecosystems) was launched in the first year. We expect 2 new working groups to follow.

Transition of office is usually very hard and painful. However, the transition from France to Korea has happened, and despite glitches, I believe that InterRidge is on its way to a new Renaissance. Again, I would like to thank the Steering Committee members and all those fellow scientists who have shown their support.

Sang-Mook Lee  
Chair of InterRidge

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## List of Participants at Online Steering Committee Meetings

- 1. Nadine Le bris** (France, former IR Chair, non-voting)  
Universite Pierre et Marie Curie  
LECOB UPMC-CNRS UMR 8222  
Observatoire Océanologique de Banyuls,  
66650 Banyuls-sur-mer, France  
lebris@obs-banyels.fr
- 2. Shinsuke Kawagucci** (Japan)  
JAMSTEC  
2-15 Natsushima-cho, Yokosuka 237-0061,  
Japan  
kawagucci@jamstec.go.jp
- 3. Sang-Mook Lee** (Korea, IR Chair, non-voting)  
School of Earth and Planetary Sciences, Seoul  
National University, Seoul 08826, Republic of  
Korea  
smlee@snu.ac.kr
- 4. John Kurian Palayil** (India)  
ESSO – National Centre for Polar & Ocean  
Research, Headland Sada, Vasco-da-Gama, Goa  
403804, India  
john@ncpor.res.in
- 5. Philipp A. Brandl** (Germany)  
GEOMAR Helmholtz Centre for Ocean  
Research Kiel  
Wischhofstr. 1-3, 24148 Kiel, Germany  
pbrandl@geomar.de
- 6. Jiabiao Li** (China)  
Second Institute of Oceanography, MNR  
36 Baochubeilu Rd, Hangzhou, 310012, China  
jbli@sio.org.cn
- 7. John Chen** (China)  
Dept. of Ocean Science and Engineering  
Southern U. of Science and Technology  
(SUSTech)  
1088 Xueyuan Ave., Nanshan District  
Shenzhen, Guangdong 518055, China  
johnyc@sustect.edu.cn
- 8. Chunhui Tao** (China, Alternate)  
School of Oceanography, Shanghai Jiao Tong  
University, 200240, Shanghai, China  
taochunhuimail@163.com
- 9. Teresa Radziejewska** (Poland)  
Institute of Marine and Environmental Sciences  
University of Szczecin  
ul. Mickiewicza 16 A, 70-383 Szczecin, Poland  
teresa.radziejewska@usz.edu.pl
- 10. Ida Helene Steen** (Norway)  
Department of Biological Sciences  
Centre for Deep Sea Research  
University of Bergen, Bergen, Norway  
ida.steen@uib.no
- 11. Daniel Sauter** (France)  
Université de Strasbourg (UdS)  
Ecole et Observatoire des Sciences de la Terre  
(EOST)  
Institute de Physique du Globe (IPGS) (UMR  
CNRS/UdS 7516)  
Institut de Géologie

1 rue Blessing, 67084 Strasbourg Cedex, France  
Daniel.sauter@unistra.fr

**12. Yong-Jin Won (Korea)**

Department of Life Science, Division of  
EcoScience, Ewha Womans University  
Seoul 03760, Republic of Korea  
won@ewha.ac.kr

**13. Seung-Sep Kim (Korea)**

Department of Geological Sciences, Chungnam  
National University  
Daejeon 34134, Republic of Korea  
Seungsep@cnu.ac.kr

**14. Jérôme Dyment (France, former IR Chair,  
non-voting)**

Géosciences Marines, Institut de Physique du  
Globe de Paris & CNRS  
1 rue Jussieu, 75238 Paris Cedex 05, France  
jdy@ipgp.fr

**15. Hiromi Watanabe (Japan)**

JAMSTEC  
2-15 Natsushima-cho, Yokosuka 237-0061,  
Japan  
hwatanabe@jamstec.go.jp

**16. Seongjun Kyle Park (IR logistic  
Coordinator, non-voting)**

Research Institute of Oceanography, Seoul  
National University, Seoul 08826, Republic of  
Korea  
december@snu.ac.kr

**17. Erik Sevre (IR Coordinator, non-voting)**

Research Institute of Oceanography, Seoul  
National University, Seoul 08826, Republic of  
Korea  
interridge@gmail.com



## **Online Meeting Agenda**

### ***Online Meeting Agenda 1 – Thursday, 27<sup>th</sup> August 2020 (8 am GMT, 90 minutes) via ZOOM***

(Sang-Mook Lee, Teresa Radziejewska, Yong-Jin Won, Seung-Sep Kim, Nadine Lebris, Daniel Sauter, Jiabiao Li, Chunhui Tao, Shinsuke Kawagucci, Ida Steen, John Kurian Palayil, Philipp Brandl, Erik Sevre)

- Introduction and the new headquarters at Seoul National University in Korea.
- Introduction of the new Steering Committee members from Korea (Dr. Seung-Sep Kim and Dr. Yong-Jin Won) and Poland (Dr. Teresa Radziejewska)
- To check if Zoom (or some other) online communication works well for everyone in the future.
- To discuss how to adapt to the new era of coronavirus.
- To discuss a new working group proposal from biology community.
- The future of InterRidge
- Next steering committee meeting (scheduling)

### ***Online Meeting Agenda 2 – Wednesday 23<sup>rd</sup> December 2020 (8 am GMT, 90 minutes) via ZOOM***

(Jiabiao Li, Sang-Mook Lee, Hiromi Watanabe, Yong-Jin Won, Nadie Lebris, Javier Escartin, John Chen, Teresa Radziejewska, John Kurian Palayil, Ida Steen, Philipp Brandl, Erik Sevre)

- Plan for Webinar series

### ***Online Meeting Agenda 3 – Tuesday 23<sup>rd</sup> February 2021 (8 am GMT, 90 minutes) via ZOOM***

(Jerome Dymont, Sang-Mook Lee, Teresa Radziejewska, Yong-Jin Won, Seung-Sep Kim, Nadine Lebris, Jiabiao Li, Hiromi Watanabe, Ida Steen, John Kurian Palayil, Erik Sevre, Seungjun Kyle Park)

- Introduction of the new Steering Committee member from Japan (Dr. Hiromi Watanabe)
- Budget plan and issues
- Organization of the Webinar series and InterRidge webpage
- Appealing to the US community

## **1. Welcome and Introduction**

The Steering Committee meetings were held online. The chair welcomed everyone to the meeting and introduced new steering committee members.

## **2. Adoption of the Agenda, and Confirm Steering Committee Members**

The agenda of the meetings were circulated electronically to all Steering Committee members prior to the meeting.

### Current Steering Committee Members (as of April 2021):

China: John Chen

China: Jiabiao Li

France: Nadine Le bris (ex-officio)

France: Daniel Sauter

France: Jérôme Dymont (ex-officio)

German: Philipp Brandl

India: John Kurian Palayil

Japan: Shinsuke Kawagucci → Hiromi Kayama Watanabe

Korea: Seung-Sep Kim

Korea: Yong-Jin Won

Norway: Cedric Hamelin, Ida Steen

Poland: Teresa Radziejewska

InterRidge Chair: Sang-Mook Lee

InterRidge Coordinator: Erik Sevre (~ March 2021) → vacancy

## **3. InterRidge Coordinator's Report**

### *3.a. Installation of the new office*

Korea made a bid to host next InterRidge office in late 2019 and was awarded the office originally starting on January 1, 2020. However at the request of France, 4 months of time was given to previous InterRidge office to clear and make transition to Korea. The coordinators received the takeover of their work from France and the administrative tasks necessary to open an office in Seoul National University and consultations with related departments were carried out. As a result, InterRidge office of Korea officially began on May 1, 2020 with Sang-Mook Lee as the Chair.

### *3.b. Steering Committee Meeting*

It is customary for national representatives together at a certain place and discuss InterRidge matters over a course of several days. Also during this time InterRidge Coordinator's Report is written. However, due to outbreak of pandemic, physical face-to-face meeting was not possible. Steering Committee meetings were held online via Zoon. It is very difficult to run online meetings for many hours. The meetings were usually conducted over a time period of 90 minutes. In the first year, 3 online meetings were conducted. The details of the agenda are provided above. Had Steering Committee meetings been conducted face-to-face as tradition, more in-depth discussions would have been possible. Due to unexpected circumstances, in this report, we provide the basic information regarding those Steering Committee meetings.

### *3.c. InterRidge Working Group*

In the first year due to office transition, InterRidge had a hard time locating individuals of working group members. The detailed report regarding the working group will be provided in the second year.

### *3.d. InterRidge Actions for early-career scientists*

Due to global pandemic and travel ban, no fellowship and travel bursary were provided in the first year. As a matter of fact, there were no application.

### *3.e. Other InterRidge Activities*

Sang-Mook Lee participated following events as the InterRidge Chair.

- 2020 SCOR Annual Meeting 20-22 October 2020
- 2021 SCOR Annual Meeting 26-28 October 2021
- International Seabed Authority (ISA) Workshop on the Development of a REMP for the Area of the Northern Mid-Atlantic Ridge (23<sup>rd</sup> November – 4<sup>th</sup> December 2020)
- Marine Seismology Symposium March 8-19<sup>th</sup> 2021

## 4. Discussions

With the limited time, three online meetings mainly discussed website upgrade plan and webinar series organization.

### *4.a Website upgrade plan*

There are problems with the old InterRidge website. The old InterRidge website was created with Drupal 7 but many web hosting platforms don't support this version of Drupal. Some information is out of date, unorganized, broken links, low quality images and lack of reactive interface. Site doesn't adapt to mobile devices and different screen sizes. As for the site upgrade plan, WordPress using Divi for reactive site design was recommended. The new site should be rearranged to better facilitate online initiatives (webinar and online meetings). The other top priority is to port the Vents Database (Vents DB) from old site using Drupal 7. Simple interface to Vent DB will be created from scratch. Current version of Vents DB 3.4 will be maintained before the new one.

### *4.b Webinar Series*

In the age of Covid-19, facilitating events online is a natural fit. Webinar series allow for increased reach of lectures and communications. InterRidge's webinar model is "Ore Deposits Hub" (<http://oredepositshub.com/>) by Tom Belgrano (National Oceanographic Center, UK) and "Ridge Seminar Series" (<https://ridgeseminarseries.wordpress.com/>) initiated by Neil Mitchell (University of Manchester, UK) and Javier Escartin (CNRS, France). Webinar series will be streamed via Zoom and videos will be hosted on YouTube, with embedded videos in InterRidge website. However, before launching the webinar series, legal issues must be considered carefully.

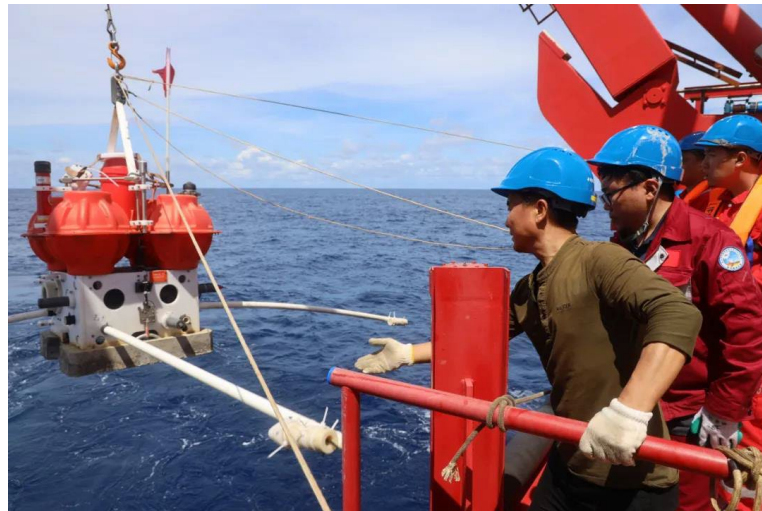
## 5. National Updates (2020.5.1 ~ 2021.4.30)

### National Update of China

Jiabiao Li and Y. John Chen

The mid-ocean ridge research in China has made significant progress during the past year even under the COVID-19 pandemic. Significant efforts have given to the earth system multi-spheric interaction, ridge crest and environmental surveys, as well as new deep-sea high-tech equipment. Several important progresses are reported as following:

#### *1. Major Research Plan on West-Pacific Earth System Multi-spheric Interactions*



*Deploying OBEM on CRUISE NORC2020-58, West Pacific Ocean, 2021*

The National Natural Science Foundation of China (NSFC) granted this 8-year research PLAN with a total of 200 Million RMB (about US \$31.4 M) in 2018, to conduct scientific research on the dynamic progresses and matter-energy cycles of west-Pacific earth system multi-spheric interactions ([www.wespmi.ac.cn](http://www.wespmi.ac.cn)). During Nov. 2020 to Jan. Mar. 2021, Chinese scientists have conducted a 99-days cruise (CRUISE *NORC2020-58*) on R/V “*Kexue Hao*”, which was the first shared cruise of the PLAN. During the long cruise, environmental and geological samples were collected including sea water, sediments, and rocks in Mariana Trench. OBS and OBEM were deployed to obtain the seismic/earthquake data. In 2020, this Plan funded 13 scientific projects to conduct research on key scientific problems including: 1) subduction of the Western Pacific plate and fluid-solid interaction in the deep earth; 2) mass and energy exchange processes across the fluid-solid interface in the Western Pacific; 3) effects of complex topography on oceanic dynamical processes and climate systems in the Western Pacific.

## **2. Geological surveys and biological research on Mid-Ocean Ridge**

Because of COVID-19 pandemic, international cruises wer somehow limited. During Nov. 2020 to Jan. Mar. 2021, we were on board the new R/V “*Dayang Hao*” to conduct the ridge-crest survey on the polymetallic sulfides exploration area located on the Southwest Indian Ridge. Three new hydrothermal sites were confirmed using deep-tow system, marine transient electromagnetic (TEM) system, and TV-



***Paralvinella mira* collected at Wocan vent field on the Carlsberg Ridge (Han et al., 2021)**

grab, etc. A 10-meter lander-type mobile drilling platform was applied to geological sampling under seafloor. The environmental baseline survey obtained the data and samples of near-bottom water and unique organism.

Collaborations among scientists from the Second Institute of Oceanography, MNR, Hong Kong Baptist University, Xiamen University and JAMSTEC, three polychaete species were identified and formally named, including two hesionid (Wang et al., 2020) and one alvinellid worms (Han et al., 2021). Han et al. (2021) found a new species, *Paralvinella mira*, based on the alvinellid specimens collected from Wocan and Daxi vent fields on the Carlsberg Ridge, Northwestern Indian Ocean, representing the first characterized alvinellid species out of the Pacific. Phylogenetic inference strongly supports its clustering with two West Pacific congeners, suggesting a possible invasion into the Indian Ocean from the West Pacific and expanding our understanding of alvinellid biogeography beyond the Pacific.

Han, Y., Zhang, D., Wang, C., and Zhou, Y. (2021). Out of the pacific: a new alvinellid worm (annelida: terebellida) from the northern Indian Ocean hydrothermal vents. *Frontiers in Marine Science*, 8: 669918.

Wang, Z., Xu, T., Zhang, Y., Zhou, Y., Liu, Z., Chen, C., Watanabe, H. K., Qiu, J-W. (2020). Molecular phylogenetic and morphological analyses of the 'monospecific' hesiolyra (annelida: hesionidae) reveal two new species. *Deep Sea Research Part I: Oceanographic Research Papers*, 166: 103401.

### **3. Deep-sea high-tech equipment**

On Nov. 10 2020, the Chinese new Human Occupied Vehicle (*Fendouzhe Hao HOV*) visited the Challenger Deep of Mariana Trench at the depth of 10909 meters (the maximum depth of Chinese HOV



***“Fendouzhe Hao” HOV in Pacific Ocean on Nov.2020***

dive), followed by several successful dives to over 10,000 meters in following days using the R/V “*Tansuo Yihao*”.

International cooperation on manned submarine diving is promoted in China. “*Fendouzhe Hao*” HOV will soon be open for international joint research plans on the deep-sea research

## **National Update of France**

Javier Escartin

France is becoming a Regular Member for the years 2021 and 2022. CNRS seeks to revive the InterRidge community nationally around a core group of young scientists, and to identify for 2022 a scientific representative for InterRidge. CNRS will review its InterRidge commitment by the end of 2022, based on the community effort and implication in InterRidge activities at that time.

### ***InterRidge related activities:***

- WGs and workshops

Following the iMOVE WG workshop, that met in Brest in 2020, there is a coordination of a paper regarding InterRidge iMOVE activities (to be submitted by the end of 2021 or early 2022)

#### - Cruises

The EMSO-Azores cruises to the Lucky Strike area were carried on in 2021, and a follow-up cruise is planned in June 2022 (yearly MOMARSAT cruises till 2024), for operations at the deep-sea seafloor observatory in place.

The Arc-en-Sub cruise will visit the Rainbow 2022 hydrothermal site area in May 2020, to map the Rainbow Massif and carry out geological observations and sampling, including at the hydrothermal vent site.

In addition to these scientific cruises, the French Government charters the Hermine Cruise to conduct studies in the French ISA concession along the Mid-Atlantic Ridge (July 2022). This cruise will also deploy the new French AUV Ulyx (see below).

#### - Technology

2021 has witnessed significant developments that open new perspectives in deep-sea exploration, including work at mid-ocean ridges:

a) the delivery of the new 6000 m AUV Ulyx to IFREMER that will be available to the scientific community from 2023, and after tests and a deployment during a government-chartered cruise (Hermine, July 2022) for routine mapping operations.

b) the development of a new ROV+, and a plan to upgrade ROV Victor, while maintaining Nautile for a few years more, so as to have 2 working deep-sea vehicles

c) the start of a major project (EQUIPEX DeepSea'nnovation) to develop sensors and tools that will be available with the ROVs and AUVs for deep-sea research.

## **National Update of Germany**

Philipp Brandl

The InterRidge community in Germany experienced a rather quiet time during the transition period of the InterRidge Office from Paris to Seoul and the covid-19 pandemic. However, as the new office is now settled in and InterRidge is gaining momentum again, we also hope to enhance networking activities across the German as well as with the international InterRidge community for the coming years.



### ***Research cruises***

Germany's global marine research program experienced a hard stop when the covid-19 pandemic hit the globe. SO273 to the Marion Rise was aborted while at sea and due to the closure of ports, the ship with its complete crew were transiting 32 days back to the ship's home port in Emden Germany. Also, the other ocean-going vessels Meteor and Maria S. Merian were called back to Emden. After several weeks of uncertainty and maintenance of the ships, RVs Sonne and Merian were sent to Svalbard to re-supply RV Polarstern during its year-long MOSAIC expedition into the Arctic Ocean. After that research activities started again with research expeditions from and back to Emden and with stringent quarantine measure. Research on the ocean floor thus focused on the North and Central Atlantic as well as the Mediterranean Sea during this period. An overview of the research cruise and short cruise reported are publicly available at the German Research Fleet Coordination Centre under this URL: <https://www.lfd.uni-hamburg.de/en/meteor/wochenberichte.html>

### ***Ocean floor research***

The German research community remains quite active in studies related to the ocean floor. Again, covid-19 heavily impacted networking and science exchange activities such as conferences but German ocean floor research was showcased in specific sessions at the EGU 2020 in Vienna, the virtual Goldschmidt conference in Hawaii, a virtual poster conference of the German Mineralogical Society (DMG). German researchers were also highly active as speakers in the virtual and open Ridge Seminar Series and recordings of their and all other lectures are archived on YouTube:

[https://www.youtube.com/channel/UCgyC\\_gtrB4wLGIkkuApZxRg/videos](https://www.youtube.com/channel/UCgyC_gtrB4wLGIkkuApZxRg/videos). One of the highlights of German research on the ocean floor was published in Nature by Grevemeyer et al. (2021). In this study, the authors developed a new concept on crustal accretion at oceanic transform faults. Please find below a non-exclusive list of publications (with first authors affiliated to an institution in German) with relevance to InterRidge:

Brandl, P.A., Hannington, M.D., Geersen, J., Petersen, S., Gennerich, H.-H., 2020. The submarine tectono-magmatic framework of Cu-Au endowment in the Tabar-to-Feni island chain, PNG. *Ore Geology Reviews* 121, 103491. <https://doi.org/10.1016/j.oregeorev.2020.103491>

Brandl, P.A., Schmid, F., Augustin, N., Grevemeyer, I., Arculus, R.J., Devey, C.W., Petersen, S., Stewart, M., Kopp, H., Hannington, M.D., 2020. The 6–8 Aug 2019 eruption of 'Volcano F' in the Tofua Arc, Tonga. *Journal of Volcanology and Geothermal Research* 390, 106695. <https://doi.org/10.1016/j.jvolgeores.2019.106695>

Devey, C.W., Greinert, J., Boetius, A., Augustin, N., Yeo, I., 2021. How volcanically active is an abyssal plain? Evidence for recent volcanism on 20 Ma Nazca Plate seafloor. *Marine Geology* 440, 106548. <https://doi.org/10.1016/j.margeo.2021.106548>

Diehl, A., de Ronde, C.E.J., Bach, W., 2020. Subcritical Phase Separation and Occurrence of Deep-Seated Brines at the NW

- Caldera Vent Field, Brothers Volcano: Evidence from Fluid Inclusions in Hydrothermal Precipitates. *Geofluids* 2020, 1–22. <https://doi.org/10.1155/2020/8868259>
- Dürkefalden, A., Geldmacher, J., Portnyagin, M., Garbe-Schönberg, D., Werner, R., Müller, D., Hauff, F. and Hoernle, K. (2021) Papanin Ridge and Ojin Rise Seamounts (Northwest Pacific): Dual Hotspot Tracks Formed by the Shatsky Plume. *Open Access Geochemistry, Geophysics, Geosystems*, 22 (9). e2021GC009847. <https://doi.org/10.1029/2021GC009847>
- Geissler, W.H., Wintersteller, P., Maia, M., Strack, A., Kammann, J., Eagles, G., Jegen, M., Schloemer, A., Jokat, W., 2020. Seafloor evidence for pre-shield volcanism above the Tristan da Cunha mantle plume. *Nature Communications* 11, 4543. <https://doi.org/10.1038/s41467-020-18361-4>
- Grevenmeyer, I, Kodaira, S., Takahashi, N., 2021. Structure of oceanic crust in back-arc basins modulated by mantle source heterogeneity. *Geology*. <https://doi.org/10.1130/G48407.1>
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## National Update of India

Kurian John

An exploration cruise onboard RV MGS Sagar from 15<sup>th</sup> March 2020 to 30<sup>th</sup> June 2020 was undertaken in parts of Central and South-West India ridges, with an objective to explore hydrothermal activity in the region. Comprehensive survey activities comprising geological, geophysical and water column studies paved way for mapping of a few indicative plumes in the region and were also successful in the

sampling of hydrothermal deposits from two locations in the Central Indian Ridge. Detailed analysis and integration of data and samples, being collected during the cruise, is in progress, which would give more scientific insights into hydrothermal activity and mineralization processes in the region.

## **National Update of Japan**

Hiromi Watanabe

The InterRidge-Japan program continues efforts to promote ridge-related studies in Japan and to maintain our community, even under the curious conditions due to global covid-19 pandemic. The outline of the ongoing project and other activities are described below.

### ***Domestic situation***

We are forced to get along without an umbrella project supporting InterRidge-Japan activity, and ridge-related studies are performed using individual project funding. Total ship-time for proposal-based cruises is decreasing in these years. In addition, due to the covid-19 pandemic, many planned cruises were cancelled including on board training cruise of *R/V Fukae-maru*, Kobe University. The cruising and survey systems of *R/V Hakuho-maru* is updating (Mar 2020 to Nov 2021) after its voyage around the world. Long-term plan (2023 - 2025) for *R/V Hakuho-maru* was discussed in a symposium (Oct 2021). A new training vessel equipped with latest research instruments, *Kaijin-maru* Kobe University is being built, and a plan to build an ice-breaker research vessel with ROV for Arctic research was accepted.

### ***Domestic Meeting***

We had business meeting on 20 Jul 2020 associated with Japan Geoscience Union Meeting (JpGU2020). We shared information on a budget of the IR, cruises, international affairs, and discuss the InterRidge-Japan annual activity plan. The membership fee payment is shared by JAMSTEC and The University of Tokyo in 2020.

Although an InterRidge-Japan symposium was not held in 2020 due to covid-19 pandemic, it will be held on 25 and 26 Nov 2021 at Atmosphere and Ocean Research Institute, University of Tokyo, entitled “Fluid Geoscience: Perspectives on comprehensive studies of physics, chemistry, geology and biology.”

### *Cruises FY2020 – 2021 under covid-19 pandemic*

Unfortunately, many cruises were affected by covid-19 pandemic. The cruises kept operating with some modifications of the plans, and the participants were required to have PCR test to identify covid-19 infection, in addition to record body temperature and the activities for two weeks before on-boarding. However, we experienced cluster infections occurred on board during a cruise of *R/V Yokosuka* in Aug 2021 and the regulation to on-boarding had been changed to; PCR test at two weeks, one week and three days before on boarding, five-days quarantine before on-boarding, and vaccinations twice.

## **National Update of Korea**

Seung-Sep Kim and Yong-Jin Won

Between 2006 and 2020, Korea was a Regular Member of InterRidge. During this period, the membership was maintained by Dr. Sung Hyun Park of Korea Polar Research Institute (KOPRI), who has contributed significantly to promoting mid-ocean ridge studies in Korea and served as a Korea representative of the InterRidge steering committee. In 2020, Korea successfully bided to host the InterRidge Office led by Prof. Sang-Mook Lee of Seoul National University. As a hosting country, Korea has become a Principal Member.

Korean studies of mid-ocean ridges are centered around 3 main government-funded projects, two Central Indian Ridge projects led by Korea Institute of Ocean Science and Technology (KIOST) using the 5894-ton RV *Isabu* and one Australian-Antarctic Ridge project by Korea Polar Research Institute (KOPRI) using the 6950-ton icebreaking research vessel (IBRV) *Araon*. The Central Indian Ridge projects are supported directly by the Ministry of Oceans and Fisheries, whereas the Australian-Antarctic Ridge project is funded internally by KOPRI. In addition to above three government projects which to visit the field sites annually, since 2017, so-called Shared Use Committee was formed which allows the scientists from academia and industry to take advantage of these cruises and transits to conduct independent seagoing observations. As a result, increasing number of people in the academic community are now working independently on ocean floor-related piggyback projects. So overall things are looking up in Korea.

See news article in Nature January 7, 2015 by Mark Zastrow titled “Korea opens up its ocean science”

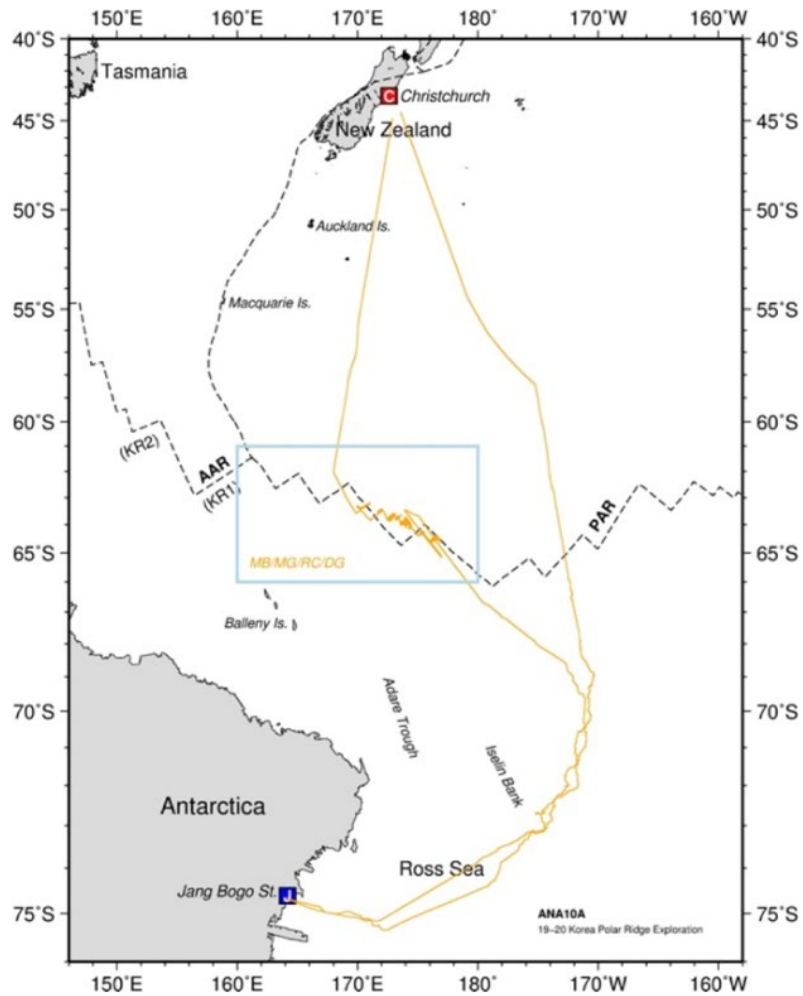
With the hosting of InterRidge, scientists (mostly young) have formed a special working group within Korean Geological Society and present academic results at annual meetings at least once a year.

The two Central Indian Ridge projects are:

1. “Exploration for seafloor hydrothermal deposits and Fe-Mn crusts in the Southwestern Pacific and the Indian Ocean.” This mineral resource project was led in 2020 by Dr. Seung-Kyu Son. Originally the cruise was supposed to happen after many delays in April 2021. But because of coronavirus the whole operation in Indian Ocean was delayed, and the most recent cruise occurred in November-December 2021. Recently the project was divided into two parts and Dr. Jonguk Kim took over the part related with Central Indian Ridge investigations as PI.
2. “Understanding the deepsea biosphere on seafloor hydrothermal vents in the Indian Ridge” is another project of KIOST led by Dr. Dong Sung Kim. This is largely a biology project. Seoul National University is official partner with Prof. Jung Woo Park as section PI. It was with the help of Dr. Kim and Prof. Park that InterRidge Korea was able to raise \$50,000 in the first year. A new active hydrothermal vent was discovered in 2021 using Canadian ROV ROPOS.
3. Perhaps the most interesting and challenging mid-ocean studies in Korea is the survey of Antarctic ridges by Dr. Sung Hyun Park of KOPRI. In recent years, the study focuses on a very complex section of mid-ocean ridge between two major systems (that is, Australian-Antarctic Ridge and Pacific-Antarctic Ridge). See below figure 1.

Korea saw the announcement by the government to launch a new seismic research vessel Tamhae 3 which is about 7000 ton, three times bigger than its predecessor in 2021. The new state-of-the-art seismic research vessel will become available 2024. KIGAM (Korea Institute of Geoscience And Mineral resources, equivalent to geological survey) will be the operator.

Lastly, the Korean government approved the construction of second icebreaking research vessel (15,000 ton) which will be at least twice the size of current IBRV Araon. The second icebreaking research vessel will allow Korean scientists to investigate Arctic ridges starting around 2027.



**Figure 1. The track line in 2019 Survey**

## National Update of Norway

Ida Steen

In 2020, Centre for Deep Sea Research at University of Bergen carried out a one-month expedition (June/July) to the Mohns ridge in the Norwegian Sea with the research Vessel G.O. Sars. Sampling and video analyses were conducted to fulfill the interdisciplinary research conducted in the Centre. Overall, the Centre carries out experimental and field approaches designed to raise our understanding about spreading ridges, hydrothermal activity, geobiological interactions in chemosynthetic ecosystems, biodiversity and ecology of ridge ecosystems, and assessments of resource potential.

Both the mountainous flank areas and the ridge axis were primary targets of the cruise.

At the eastern flank of the Mohns ridge, thick manganese crusts were collected. Video transects were carried out and specimens of benthic megafauna were collected to characterize benthic community structure in these mountainous areas. The sampling and the surveying contributed to paleo-oceanographic studies, and to the regional mapping of marine mineral resources and ecosystems in Norwegian waters.

At the ridge axis the cruise targeted active and extinct vent fields, as well as axial volcanic ridges. Both high-resolution seafloor mapping and plume studies were carried out at the Fåvne Vent Field where an ocean observatory will be deployed in 2022 as part of the EMSO-program. To prepare for a drilling expedition in the fall of 2022, a nearby extinct vent field (Gnitahei) was also surveyed using the Ægir6000 ROV-system. Continuing our biological studies of Arctic Mid-Ocean Ridge ecosystems, we conducted ROV video surveys and sampling of benthic communities on Mohns Treasure, Ægir Vent Field, Fåvne Vent Field and Gnitahei. Finally, samples were collected to continue our investigations of microbial activity in the deep marine biosphere.

## **National Update of Poland**

Teresa Radziejewska

Polish activities of relevance to the InterRidge in 2021 were focused on:

### ***1. Building a community of researchers interested in mid-ocean ridge studies:***

while there is a genuine interest in such studies in Poland, particularly in view of the Polish government's contract for exploration of polymetallic sulphides in an area at the Mid-Atlantic Ridge, this interest could not be pursued in any vital detail, as there have been no relevant activities. It has been announced only that the Ministry of Climate and Environment and the State Geological Institute acting on its behalf have signed a letter of intent with the interested research institutions regarding efforts towards acquiring a research vessel capable of carrying out exploration activities.

### ***2. Trying to raise Poland's status in the InterRidge:***

The Polish Committee on Oceanic Research has been in correspondence, first with the Ministry of Education and Science, and subsequently with the Ministry of Climate and Environment regarding

securing funding that would make it possible for Poland to become a regular member. However, although we have provided all the necessary explanations and justification required by the said ministries, no decision has been taken so far.

## **6. Working Group Updates (2020.5.1 ~ 2021.4.30)**

### **Report on the Seamounts and Islands Working Group**

Neil Mitchell

The Seamounts and Islands working group convened a workshop in Lisbon in September 2019 (<https://www.researchgate.net/project/Seamounts-and-islands-associated-with-mid-ocean-ridges-a-working-group-of-the-InterRidge>). The report on that is attached. Afterwards, we had planned on having a smaller workshop during the Vienna EGU meeting in 2020 to take advantage of researchers being at that meeting, although it unfortunately had to be cancelled due to COVID-19 restrictions on travel. There has been no further expenditure of the InterRidge funding provided. There have nevertheless been indirect benefits of the working group and from social interactions at the Lisbon workshop in particular. For example, Mitchell has had a small array of seismometers deployed near one of the Azores islands (Faial), which involved the help of workshop participant Telmo Morato in sorting out research vessel access. Telmo has also helped in collecting further swath bathymetry over that site. Mitchell was invited to write a review of seamount geomorphology for an Elsevier on-line encyclopedia (<https://doi.org/10.1016/B978-0-12-818234-5.00102-4>). Two Portuguese projects were funded concerning the Azores volcanic islands (these project proposals included international collaborators, at least one of whom was involved in the InterRidge workshop):

PTDC/CTA-GEO/0798/2020 HAZARDOUS - Evaluating HAZARDS related to the formation and development of detrital and lavic “fajãs” in the POrtugUese volcanic archipelagoS. Funded by FCT Portugal, €250k. PI: Rui Quartau, Co-PI: Ricardo Ramalho.

PTDC/CTA-GEO/2083/2021 GEMMA - improving GEodynamic Models in MAcaronesia by reconciling geodetic, geophysical and geological data. Funded by FCT Portugal, €250k. PI: Rui Fernandes, Co-PI: João Duarte.



Mitchell and Beier teamed up with Javier Escartín and others to run an on-line seminar series "Ridge Symposium", which included seamount research. The 15 seminars in that series covering many aspects of ridge science from mantle geochemistry and geophysics up to water column biology were recorded and provided online (both via Youtube and Bilibili) as a long-term legacy to the ridge community. As of July 2021, our web pages for the seminars (<https://ridgeseminarseries.wordpress.com/past-seminars/>) had been viewed 3000 times and the seminar recordings on Youtube had been accessed 1500 times.

There may be more indirect benefits of the InterRidge workshop that we are not aware of. The workshop proved to be tremendously successful and we are extremely grateful for the support that InterRidge provided for it.

## **Report on the Ocean Transform Faults Working Group**

Marcia Maia

This WG had not the opportunity to meet since the WS held in Brest in May 2018. However, the fruitful discussions and the prospective document written by the working group members and workshop attendees resulted in several research projects and new ideas about transform faults and fracture zones. The large number of articles recently published on prestigious journals, recent cruises and funded projects, done by members of the working group or participants to the meeting prove the strong momentum of this research theme in the international community. We can cite, as few examples, the 2020 GLORIA-FLOW cruise and researches on the Gloria fault, the 2019 S45 cruise on the Doldrums system, the 2019 SMARTIES cruise at Romanche and projects funded for the study of the large offset transform faults, modelling projects on the thermo-mechanical structure of transform faults and fracture zones and on the links between transform faults and subduction. In terms of publications, nearly 30 papers and abstracts were published between 2019 and 2021, covering different subjects such as petrology, seismicity, fluid circulation and the thermo-mechanical structure of transform faults, including a 2021 News and Views in Nature and a book dedicated to transform plate boundaries and fracture zones.

The WG clearly fulfilled part of its objectives, fostering exchanges and new exciting ideas and projects about transform faults and fracture zones. We therefore plan to reactivate the WG and organize a final meeting in 2022, to be held in GEOMAR, in order to discuss the recent advances and identify new and still open questions as well as the opportunity of proposing a new Working Group.

## 7. InterRidge Budget

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### 2020 InterRidge Income: National Contributions

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	\$	₩	
<b>Principal Members</b>			
Korea	50,000	60,000,000	2020.01.01
China	25,000	27,900,270	2021.01.06
Norway	25,000	27,233,187	2021.01.25
<b>Regular Members</b>			
India	5,000	5,485,388	2020.11.19
Germany	5,000	5,532,002	2021.02.08
Japan			
France			
Poland			
<b>Total</b>	<b>110,000</b>	<b>125,150,847</b>	

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### 2021 InterRidge Income: National Contributions

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	\$	₩	
<b>Principal Members</b>			
Korea	50,000	60,000,000	2021.01.01
China	25,000	29,356,202	2021.12.23
<b>Regular Members</b>			
India	5,000	5,838,120	2021.12.15
Norway	5,000	5,871,310	2022..01.19
Japan			
France			
Poland			
Germany			
<b>Total</b>	<b>85,000</b>	<b>101,065,632</b>	

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<b>InterRidge Expenses [W]</b>	2020	2021 (Jan – Apr)
<b>Salaries</b>		
Coordinator	35,236,920	Jan – Sep
Logistics Coordinator	43,468,861	13,332,000
Part timer		900,000
<b>Subtotal</b>	<b>78,705,781</b>	<b>14,232,000</b>
<b>Office</b>		
Recruitment notice cost	165,000	
Meeting		417,000
<b>Subtotal</b>	<b>165,000</b>	<b>417,000</b>
<b>For WEB</b>		
Adobe illustration		81,036
Microsoft Azure Cloud		137,269
Skin them for website		98,589
<b>Subtotal</b>		<b>316,894</b>
<b>OTHERS</b>		
Overheads	16,755,932	13,068,000
<b>Subtotal</b>	<b>16,755,932</b>	<b>13,068,000</b>
<b>TOTAL</b>	<b>125,310,747</b>	<b>95,522,154</b>

## 8. Meeting Adjourns

### Appendix I

#### InterRidge Chairs and Coordinators – Past and Present

##### InterRidge Chairs:

Sang-Mook Lee, chair (Korea)	2020 –
Jérôme Dymont co-chair (France)	2016 – 2019
Nadine Le Bris, co-chair (France)	2016 – 2019
John Chen, chair (China)	2013 – 2015
Jiabiao Li, co-chair (China)	2013 – 2015
Bramley Murton, chair (UK)	2010 – 2012
Jon Copley, co-chair (UK)	2010 – 2012
Jian Lin, chair (USA)	2007 – 2009
Chris German, co-chair (USA)	2007 – 2009
Colin Devey, chair (Germany)	2004 – 2006
Kensaku Tamaki, chair (Japan)	2000 – 2003
Mathilde Cannat, chair (France)	1997 – 1999
Roger Searle, chair (UK)	1994 – 1996
John Delaney, co-chair (USA)	1991 – 1993
H. David Needham, co-chair (France)	1991 – 1993

##### InterRidge Coordinators:

Erik Sevre	Jan 2020 – Mar 2021
Seongjun Kyle Park	Jan 2020 –

Kamil Szafrński	Apr 2017 – Dec 2019
Zengxi Ge	Jan 2013 – Dec 2015
Debbie Milton	Jan 2010 – Dec 2012
Stace Beaulieu	Oct 2007 – Dec 2009
Rhian Waller	Jan – Oct 2007
Sabine Lange	Jul – Dec 2006
Valérie Eplé	May – Jul 2006
Kristen Kusek (Education & Outreach)	Mar 2004 – Dec 2007
Katja Freitag	Mar 2004 – May 2006
Agnieszka M. Adamczewska	Nov 1999 – Mar 2004
Cara Wilson	Mar 1997 – Nov 1999
Ruth Williams (acting)	Oct 1996 – Mar 1997
Heather Sloan	Oct 1993 – Oct 1996
Trileigh Stroh	1991 – Oct 1993