Year 2 Report
SCOR Working Group 146:
Radioactivity in the Ocean, 5 decades later (Rio5)

The Scientific Committee on Oceanic Research (SCOR) 146 Working Group: Radioactivity in the Ocean, 5 decades later (RIO5) organized a series of activities from June 5 to June 11, 2016 in Xiamen, China, hosted by the State Key Laboratory of Marine Environmental Science, Xiamen University:

- Second WG Workshop, June 5-7, 2016
- Training Course on Marine Radiochemistry, June 8-10, 2016
- Public Outreach activities, throughout June 6 to 11, 2016

1) Number and name of Working Group:
   SCOR Working Group 146: Radioactivity in the Ocean, 5 decades later (Rio5)

2) Working Group Web site:
   WG Website: http://www.whoi.edu/CMER/rio5-working-group
   Training Course website: http://mel.xmu.edu.cn/conference/RIO5/

3) Date of most recent WG meeting:
   2nd WG Meeting on June 5-7, 2016, Xiamen University, Xiamen, China

4) Date of next planned WG meeting:
Aug. 9-11, 2017 in France.

5) Progress toward achievement of WG's terms of reference in past year (1000 words maximum)
   a) A review paper has been published at *Annual Review of Marine Science*: Buesseler, K., Dai, M., Aoyama, M., Benitez-Nelson, C., Charmasson, S., Higley, K., Maderich, V., Masqué, P., Oughton, D. and Smith, J.N., 2016. Fukushima Daiichi-Derived Radionuclides in the Ocean: Transport, Fate, and Impacts. *Annual Review of Marine Science*, 9:1.1–1.31.
   b) The WG members have organized a warehouse of education materials for the training and capacity building of the next generation of marine radiochemists and radioecologists. The materials were used in the Training Couse on Marine Radiochemistry and the public outreach activity. The four core lectures are: 1) Introduction to radiochemistry; 2) U-Th Series Radionuclides in Marine Systems; 3) Cosmogenic and Artificial Radionuclides in marine Systems; and 4) Marine Radioecology. A fifth lecture on ocean radiochemical methods is being considered.

6) Plans for achievement of WG's terms of reference in the coming year (1000 words or less)
   a) Publish our lectures as *Limnology & Oceanography e-lectures*.
   b) Organize a one-day training workshop "Training Course on Marine Radioactivity" at Goldschmidt 2017 in Paris. A workshop is being proposed as follows:

      Over the past 50 years, natural and anthropogenic radionuclides have been instrumental in addressing many important questions in oceanographic research. Yet knowledge gaps remain regarding their spatial and depth distributions and the temporal evolution of many radionuclides of importance to both oceanographic and human health issues. In order to meet the need for students and researchers to have the knowledge and skills that enable them to successfully address issues associated with the field of marine radioactivity and radioecology, the SCOR Working Group 146 "Radioactivity in the Ocean, 5 Decades Later (RiO5)" has developed materials for the short term training of both junior and senior researchers. The first training workshop was hosted by the State Key Laboratory of Marine Environmental Science Xiamen University, China on June 8-10, 2016 (http://mel.xmu.edu.cn/conference/RIO5/index.asp). From the very positive feedback on the first training course, we see a high demand for additional training workshops that convene scientists and students to gain the fundamentals within the field. The purpose of this training course at the 2017 Goldschmidt conference is to train graduate students and young professionals who are interested in or will pursue radiochemistry research and management. The one day course will include lectures cover the following subjects: natural, anthropogenic, and cosmogenic radioisotopes in the marine environment; radioecology, tracer and dating techniques, other applications of radionuclides as ocean tracers, and a brief introduction on radioanalytical methods.

   c) Organize final SCOR WG meeting in August 2017 in Aix-en-Provence (S. Charmasson local host)

7) Difficulties faced in achieving terms of reference (250 words maximum)

   With the efforts from all of the WG members, we are accomplished more than we had originally proposed to SCOR. The main difficulty has been the need for finding additional funding, such as needed for funding for the student training, and we'd like to find additional funds to bring more Associate Members to the final WG meeting in 2017.

8) Achievements in capacity building in the past year (500 words maximum)

A Training Course on Marine Radiochemistry was organized on June 8-10, 2016 in Xiamen University, attended by 28 young professionals and PhD students from 17 countries. This training course was well received by the trainees (details in Annex 1)

We also organized several events for general public to make people aware of the current situation of radioactivity including one panel discussion event on June 11, 2016 at the Arts & Science Center on campus of Xiamen University (see details in Annex 2).

9) URL for any additional information you would like to provide (e.g., meeting announcement, meeting agenda, meeting minutes, etc.)

Training Course website: http://mel.xmu.edu.cn/conference/RIO5/

Outreach activities announcement: http://mel.xmu.edu.cn/supervisefile.asp?id=621

Announcement of the public lecture (Earth: Our Radioactive Home -- Facts vs. Misconceptions): http://mel.xmu.edu.cn/lecturefile.asp?id=508

Annex 1: Training Course on Marine Radiochemistry, June 8-10, 2016

Goals:

The purpose of this Training Course is to train graduate students and young professionals who are interested in or will pursue radiochemistry research and management.
The course included in class lectures and hands-on experiments in the laboratory equipped with a variety of measurement tools. Subjects covered include natural, anthropogenic, and cosmogenic radioisotopes in marine environments; radioanalytical methods; and tracer and dating techniques.

People:
There were 91 applicants who registered for the course. WG had a committee to review the applications and finally got a list of 30 participants (2 cancelled the trip due to visa issues). Among the 28 participants, with a breakdown of 15 male to 13 female, from 17 countries (Benin, Brazil, China, Croatia, Germany, India, Indonesia, Japan, Lebanon, Malaysia, Myanmar, Nigeria, Pakistan, Russia, Thailand, USA, Vietnam) took part in the course. Participants were PhD candidates, postdoctoral scientists, researchers/faculty and management, with expertise in multiple sub-disciplines of marine chemistry, geology, biology and oceanography.

The 9 lecturers included Dr. Michio Aoyama (Fukushima University, Japan), Claudia Benitez-Nelson (University of South Carolina, USA), Ken Owen Buesseler (Woods Hole Oceanographic Institution, USA), Sabine Charmasson (ISRN, Laboratory for Continental and Marine Radioecological Studies, France), Minhan Dai (Xiamen University, China), Pere Masque (Edith Cowan University (Australia) and Universitat Autònoma de Barcelona (Catalonia, Spain)), Willard S. Moore (University of South Carolina, USA), Paul Morris (Environment Laboratories, International Atomic Energy Agency, Monaco), and John Smith (Bedford Institute of Oceanography, Canada).
Besides lecturers, Xiamen University also provided manpower to assist with lab practicals, who are Dr. Zhimian Cao, Dr. Weifang Chen, Dr. Guizhi Wang, Dr. Weifeng Yang, Dr. Ms Qing Li.

List of lecturers and instructors

No.	Lecturers	Institution	Expertise	Email
1.	Michio Aoyama	Fukushima University, Japan	Marine radiochemistry, global nutrient cycling	r706@ipc.fukushima-u.ac.jp
2.	Claudia Benitez-Nelson	University of South Carolina, USA	Marine radiochemistry, nutrient biogeochemistry, methods development, science communication and outreach	cbnelson@geol.sc.edu
3.	Ken Owen Buesseler	Woods Hole Oceanographic Institution, USA	Marine radiochemistry, C cycle, public education	kbuesseler@whoi.edu
4.	Sabine Charmasson	ISRN, Laboratory for Continental and Marine Radioecological Studies, France	Marine Radioecology (natural and artificial radionuclides)	sabine.charmasson@irsn.fr
5.	Minhan Dai	Xiamen University, China	Coastal biogeochemistry, radionuclide applications	mdai@xmu.edu.cn
6.	Pere Masque	Edith Cowan University (Australia) and Universitat Autònoma de Barcelona (Catalonia, Spain)	Marine radiochemistry, environmental radioactivity and teaching	Pere.Masque@uab.cat
7.	Willard S. Moore	University of South Carolina, USA	Geochemistry and Chemical Oceanography	moore@geol.sc.edu

No.	Lecturers	Institution	Expertise	Email
8.	Paul Morris	Environment Laboratories, International Atomic Energy Agency, Monaco	Radium isotopes and ocean radionuclide data bases	P.J.Morris@iaea.org
9.	John Smith	Bedford Institute of Oceanography, Canada	Radionuclides in Arctic and other basins	John.Smith@dfo-mpo.gc.ca
10.	Andy Johnson	Black Hills State University, USA	Teaching radiation literacy	andy.johnson@bhsu.edu
11.	Zhimian Cao	Xiamen University	Stable isotope geochemistry	zmcao@xmu.edu.cn
12.	Weifang Chen	Xiamen University	Carbon Analysis	chenwf@xmu.edu.cn
13.	Guizhi Wang	Xiamen University	Biogeochemical cycles in the ocean and sediments	gzhwang@xmu.edu.cn
14.	Weifeng Yang	Xiamen University	Marine Chemistry	wyang@xmu.edu.cn
15.	Qing Li	Xiamen University	sotopic Tracers	andrealily@xmu.edu.cn

List of participants

No	Name	Title	Institution	Country	Email
1.	Abdullah, Nooradilah	Research Officer	Malaysian Nuclear Agency	Malaysia	nooradilah@nm.gov.my
2.	Afsar, Nuzhat	Assistant Professor	University of Karachi	Pakistan	nuzhatafsar259@hotmail.com
3.	Akhighu, Andrew	GIS and coastal management officer	United Nations Environment Programme - Post Conflict and Disaster Management Branch	Nigeria	eaakhighu@yahoo.com
4.	Araujo, Beatriz	PhD student	Universidade Estadual do Norte Fluminense	Brazil	bfaraujo@yahoo.com.br
5.	Bureekul, Sujaree	Lecturer, Researcher	Chulalongkorn University	Thailand	bsujaree@gmail.com
6.	Chang, Zihao	PhD student	Peking University	China	zhchang@pku.edu.cn
7.	Dang Hoai, Nhon	Researcher	Institute of Marine Environment and Resources	Vietnam	nhonhio@yahoo.com
8.	Dovhyi, Illarion	Senior researcher	Marine hydro-physical institute RAS	Russia	dovhyi.illarion@yandex.ru
9.	Du, Jinqiu	Research Associate	National Marine Environmental Monitoring Center	China	jinqiu609@163.com
10.	Guo, Xiaoyi	PhD student	Ocean University of China	China	ouc_guoxy@163.com
11.	Kelassanthodi, Rasiq	PhD student	King Abdulaziz University	India (Saudi Arabia)	rasiqkt@gmail.com

No	Name	Title	Institution	Country	Email
12.	Kepel, Terry Louise	Researcher	Ministry of Marine Affairs and Fisheries	Indonesia	kepel74@gmail.com; kepel@kkp.go.id
13.	Kong, Fancui	Research Assistant	Qinghai institute of salt lakes, Chinese Academy of Sciences	China	kfc@isl.ac.cn
14.	Li, Mengren	PhD student	Peking University	China	jannylmr@163.com
15.	Magdic Kosicek, Katja	Postdoc	Rudjer Boskovic Institute	Croatia	kmagdic@irb.hr
16.	Mahfouz, Celine	Scientific Researcher	National Center for Marine Sciences	Lebanon	celine.mahfouz@gmail.com
17.	Parenkat Mony, Deepulal	Postdoc	Cochin University of Science and Technology	India	dlpmchem@gmail.com
18.	Poh, Seng Chee	Lecturer	Universiti Malaysia Terengganu	Malaysia	poh@umt.edu.my
19.	Santoro, Ana Lucia	Postdoc	University Federal of Rio de Janeiro	Brazil	analusantoro@gmail.com
20.	Schwing, Patrick	Research Associate	University of South Florida	USA	pschwing@mail.usf.edu
21.	Shota, Kambayashi	PhD student	University of Toyama	Japan	d1571301@ems.u-toyama.ac.jp
22.	Thant, Myo Min	Deputy Director	Department of Atomic Energy	Myanmar	mminthant@gmail.com
23.	Tura, Pedro Marone	PhD student	University of São Paulo	Brazil	pedro.tura@usp.br
24.	Vieira, Lucia Helena	PhD student	GEOMAR Helmholtz Centre for Ocean Research Kiel	Germany	lvieira@geomar.de
25.	Wang, Bo	PhD student	Xiamen University	China	aaronspecial@hotmail.com
26.	Wolschke, Hendrik	PhD student	Helmholtz-Zentrum Geesthacht	Germany	hendrik.wolschke@hzg.de
27.	Wongla, Kinhégbédé Kennely Serge	Chief of Capacity Building	Fisheries Development Department Benin	Benin	ken8fr@hotmail.com
28.	Xie, Tengxiang	PhD student	Xiamen University	China	xietengxiang@163.com

Lectures and lab practicals:

The structure of the course was developed by WG members during the 2nd WG Meeting. Dr. Benitez-Nelson provided an overview on Basics of Radioactivity; Dr. Buesseler give a talk to overall

introduce the marine radioactivity; Dr. Masque talked about radio isotopes as tracers in the sea; and Dr. Charmasson gave examples of impact of radionuclides on marine ecosystem.
Specific lectures were delivered on applications, such as applications of artificial and natural radionuclides (by John Smith); applications to biological pump studies (by Minhan Dai); Applications to sediment dating (by Pere Masque); and applications to submarine groundwater discharge studies (by Willard Moore).
Other lectures on database overview and management (by Paul Morris), methods and instrumentation (by Michio Aoyama and Willard Moore) were introduced to participants.
In addition, two half-day lab practicals were arranged during the day two and day three. Participants were divided into four groups, with 8 people in each group and 2 people in a sub-group to get familiar with the alpha spectrometers, beta counters, RaDeCC and gamma counters, as well as obtain a demo on MC-ICP-MS.
Course materials including "classic" papers were recommended for participants to read prior to the training course; PowerPoints of lectures, hands-on spreadsheet were posted on the course website to be shared with participants.

Training Course Agenda

Time	**Content of lecture (practical)**	**Lecturer(s)**
Day 0 June 7, 2016 Tuesday		
Arrival in Xiamen and onsite registration		
13:00-18:30	Registration in Ling Bo Wan Hotel	
18:40	Icebreaker with lecture by Andy Johnson (19:15-19:45) in Faculty Club	
Day 1 June 8, 2016 Wednesday, A3-206 Lecture Hall (*All lectures include >10 min Q+A)		
9:00-10:30	Overview talk 1: Basics of radioactivity	Claudia Benitez-Nelson
10:30-10:50	Tea break	
10:50-12:20	Overview talk 2: Introduction to marine radioactivity	Ken O. Buesseler
12:30-14:00	Lunch break	
14:00-15:30	Overview talk 3: Radio isotopes as tracers in the sea	Pere Masqué
15:30-15:50	Tea break	
15:50-17:20	Overview talk 4: Impact of radionuclides on marine ecosystem	Sabine Charmasson
17:20-17:40	Discussion	
17:40	Group photo	
18:00	Dinner	
Day2 June 9, 2016 Thursday, A3-206 Lecture Hall		
9:00-10:00	Specific lecture in marine radioactivity 1: Applications of artificial and natural radionuclides	John Smith
10:00-11:00	Overview of database in radioactivity and data management	Paul Morris
11:00-11:20	Tea break	
11:20-12:20	Methods in marine radioactivity and instrumentation	Michio Aoyama (others) & Willard S. Moore (RaDeCC)
12:30-14:00	Lunch break	
14:00-18:00	Lab Practicals: Group 1: Alpha & RaDeCC Group 2: Beta & Gamma Group 3: RaDeCC & Alpha Group 4: Gamma & Beta	Alpha: Michio Aoyama & Weifeng Yang Beta: Ken Buesseler & Qing Li RaDeCC: Claudia Benitez-Nelson & Willard S. Moore Gamma: Pere Masqué & Guizhi

Time	Content of lecture (practical)	Lecturer(s)
		Wang
18:30	Dinner	Faculty Club
Day 3 June 10, 2016 Friday, A3-206 Lecture Hall		
9:00-10:00	Specific lecture in marine radioactivity 2: Applications to biological pump studies	Minhan Dai
10:00-11:00	Specific lecture in marine radioactivity 3: Applications to sediment dating	Pere Masqué
11:00-11:20	Tea break	
11:20-12:20	Specific lecture in marine radioactivity 4: Applications to submarine groundwater discharge studies	Willard S. Moore
12:20-13:30	Lunch break	
13:30-14:00	MC-ICP-MS demo (in MS center)	Zhimian Cao
14:00-18:00	Lab Practicals: Group 1: Beta & Gamma Group 2: Alpha & RaDeCC Group 3: Gamma & Beta Group 4: RaDeCC & Alpha	Alpha: Michio Aoyama & Weifeng Yang Beta: Ken Buesseler& Qing Li RaDeCC: Claudia Benitez-Nelson& Willard Moore Gamma: Pere Masqué & Guizhi Wang
18:00-18:30	Closing	
19:00-	Workshop Dinner	Swiss International Hotel

Course evaluations

A course evaluation was designed by the WG (Andy Johnson in particular) and sent to participants by email, and 20 replies were received.

There was a clear consensus that the course lived up to expectations. Overall the participants enjoyed the course and the quality of the lectures and supervision, and their impressions were very positive. An example says: “My impression is that the course was uniquely designed to provide an extraordinary skills and opportunities for scholars, young professionals and students like myself to prepare ourselves to become distinguished future academia’s , scholar and leaders in our field of expertise’s.”

The main comments are summarized below.

1) 50% of participants have few knowledge of marine radiochemistry.
2) The goal of this training course was to give a basic introduction to marine radiochemistry to the participants and to provide useful information for the application and methods. The overall impression of the course is good. “The course was wonderfully structured; it starts from the basics of radiotracers and ends up with the interpretation of results. So I will give full mark to organizers and lectures.” Said a participant.
3) All participants thought the course lived up to their expectations.
4) 90% thought the course content was good/extensive enough to give sufficient knowledge to use it in their work/research.
5) More than 75% of participants thought the lecturers provide them the ability to ask questions and have discussions during the lectures?
6) Most participants thought the amount and difficulty of lab practicals was appropriate, and the quality of supervision is high.
7) All participants thought the teachers are approachable and helpful in and out of the classroom.
8) Most participants thought the logistical arrangement was good.
9) We also collected some suggestions from participants to improve the course:
   - Some participants thought the 3-day training is too short. Hope to extend the training to 5 days or one week
   - Hope to include more information about development of oceanography

- Expect more practicals/filed work and arrange breaks between the two lab activities
- Hope to get the PPT before the course to better follow the lectures

Annex 2: Public Outreach

Program Summary

The public outreach portion of the WG meeting consisted of 2 phases. Phase 1 involved going into classrooms and performing demonstrations and conducting hands on activities about radioactivity and radiation with the students. This was spearheaded by Dr. Andy Johnson, a member of the physics faculty at Black Hills State University and a specialist in science education. He was accompanied by Hui Lin, an ocean sciences graduate student at Xiamen University who acted as translator and Emily King, the development coordinator for COSEE China. Three primary school classes/homerooms were visited during the course of the week – Xiamen Songbai Elementary School (厦门松柏小学), Xiamen Yanwu Elementary (厦门演武小学), and Xiamen Experimental Primary School (厦门实验小学). The lesson was structured as an inquiry based activity whereby students were posed questions by Dr. Johnson and encouraged to think of the answers themselves. Portable Geiger counters were given to teams of students and they were encouraged to test the radioactivity of various items around the classrooms as well as of various items provided by Dr. Johnson (pitchblende, Fiestaware, a vintage watch with glow in the dark hands, etc.).

Phase 2 was a public panel lecture coordinated by COSEE China. Dr. Ken Buesseler, Dr. Claudia Benitez-Nelson, Dr. Sabine Charmasson, and Dr. Minhan Dai were the four panelists speaking a variety of radioactivity topics (see below). The bilingual talk was held at the Science and Arts Center on Xiamen University's primary campus.

In addition to these two programs we also offered specialized interactive lessons on radioactivity to be conducted at Xiamen University's small ocean sciences exhibit on the main campus. Students from Yanwu Elementary and the Foreign Languages Middle School both registered for this program (while we also conducted an in class lesson at Yanwu, we were unable to accommodate all ages and requests. This program allowed for more flexibility of participants). The lesson was also inquiry based and consisted of 2 parts. The first part involved Dr. Johnson teaching the students about radiation and radioactivity (similar to what he did in the classrooms). The second portion was conducted by MEL staffer Vera Shi and PhD student Pedro Tura, a participant in the training workshop. The two of them focused on teaching the participants the basic concept of radioactive decay and half-life.

PANELISTS AND TALK TITLES	
Dr. Claudia Benitez-Nelson	A General Introduction to Marine Radioactivity
Dr. Ken Buesseler	Fukushima 5 Years Later: A View from the Ocean
Dr. Sabine Charmasson	Radioactivity and Marine Organisms
Dr. Minhan Dai	Marine Radioactivity and Our Living Environment: Radioactivity in China Seas

Program Goals

The primary purpose of these events was to educate the local public about radiation and radioactivity as there are many misconceptions and fears surrounding this topic. Secondary to that was to conduct science education programs in a manner that most locals would not be familiar with, i.e. inquiry based learning. While teachers here are dedicated to teaching their students in the most effective manner possible, they may lack the expertise in such techniques or lack knowledge in the area itself (as even in the US and other western countries radioactivity is a

highly misunderstood subject). Therefore it is important to encourage such exchanges between specialists that come through Xiamen and local instructors.

It was also important to the training workshop organizers to hit as much of the local population at large as possible. After many discussions, the panel lecture format was chosen as a way to engage a larger cross section of the public by offering more topics for discussion. Although there were some linguistic challenges, the fact that the question and answer session lasted for 45 minutes (and had to be cut due to time) was evidence that the majority of the audience understood what was discussed.

Between the three separate programs, roughly 300 people were directly educated (about 200 during the panel discussion, and 100 during the classroom visits and museum programs). This number should increase indirectly as video of the talks are edited and then subtitled for uploading to MEL's website (work in progress).

The public panel lecture was covered by several national and local media in China, including Xinhua News Agency, the China News Service, People's Daily, Fujian Daily, Strait News, China National Radio, Xiamen Radio and Xiamen TV.

No sooner had the public panel lecture finished, the China News Service published news release entitled "Panel discussion on radiation in our oceans featuring researchers from China, America, and France". In the report it has mentioned the people's misconception of the radiation and the importance of raising public's awareness. This news report was reprinted in 15 news media in 15 minutes. (Links and an example was posted at the end of the report)

Program Challenges

The biggest impediment to all three programs was the language barrier. Everything required real-time translation which meant an activity that takes an hour to complete only in English required an hour and 45 minutes at least. This resulted in a culling of some material and shortening of discussion time with students.

While we did have an onsite translator for the classroom and museum portions, we decided to forego that option for the panel talk and relied solely on dual screen powerpoints (one in English and one in Chinese) to get the message across. There are pros and cons to this method as well, namely, no additional time needed. However, much more preparation time is required on the part of the speakers as they must fully outline their talk in English or Chinese and complete the slides well in advance so as to allow translators time to translate all material and ensure the accuracy of their translations. Furthermore, there were unforeseen technical difficulties which meant some of the powerpoints were difficult to see. To rectify this situation, all talks were videotaped and the COSEE China office is currently trying to put the slides and video together along with bilingual subtitling to upload onto the MEL website for the public.

One example of news release:

(From China News Service:
http://m.chinaso.com/news_share.html?device=1&app=chinaso&nid=http://focus.chinaso.com/gssdxqy/detail/20160611/1000200032728621465656057568825071_1.html&mname=中新网&time=1465656057000)

中美法专家齐聚厦大探讨海洋核辐射

2016-6-11 22:40 中新网

杨伏山 摄 (Photo: Fushan Yang)

中新网厦门 6 月 11 日电（杨伏山 翁苏伟）来自美国、法国与中国的四位著名海洋科学家，11 日晚齐聚厦门大学，以《地球：无处不在的核辐射??真相与误区》为题发表演讲，共同探讨海洋核辐射的真相与误区。

科学家们并和与会者展开面对面交流，对社会大众有关对核辐射的种种担忧，进行解疑释惑。

由厦门大学近海海洋环境科学国家重点实验室、国际海洋科学研究委员会第 146 工作组--“海洋放射性研究”以及美国伍兹霍尔海洋研究所海洋与环境辐射研究中心联合主办的本次活动，邀请了来自美国南卡罗来纳大学特聘教授 Claudia Benitez-Nelson 博士、美国伍兹霍尔海洋研究所资深研究员 Ken Owen Buesseler 博士、法国辐射防护与核安全研究院的海洋生物学家 Sabine Charmasson 研究员和厦门大学长江学者特聘教授戴民汉博士，对备受社会大众关注的核辐射相关问题展开科普讲座。

专家称，人类生活在核辐射无处不在的星球，其赖以生存的环境，比如呼吸的空气，喝的水和吃的食物都可能含有微量的放射性元素。

然而，专家对核辐射的风险评估与公众对核辐射的风险感知存在较大分歧，专家的结论来自于实验数据，而影响公众核辐射风险感知的因素却是复杂多样的，许多因素都有可能造成公众放大核辐射的风险。

美国南卡罗来纳大学特聘教授 Claudia Benitez-Nelson 博士以其幽默风趣的方式深入浅出地为与会者介绍了如何区别辐射与放射性这两个概念。她用核辐射检测仪现场测量了环境中的核辐射值，告诉观众人们核辐射其实无处不在，日常生活中一人一年接触的核辐射剂量为 3 到 6mSv，但都在安全范围内。

日本福岛核电站事故之后，中国尤其是沿海的民众曾一度存在焦虑和恐慌的情绪。围绕民众最为关切的“核辐射会不会辐射到中国？”、“近海的海产品还能放心食用吗？”等问题，美国伍兹霍尔海洋研究所资深研究员 Ken Owen Buesseler 博士用大量翔实的科学数据为公众呈现福岛放射性物质的传播路径和途径，海洋中的放射性核素主要来自于爆炸后的大气沉降、反应堆降温直接排放的废水、以及河流和地下水输入。至今虽然仍然有放射性物质输入，但浓度在逐渐减少，科学家仍然在密切关注福岛，并进行长期监测。

在海洋中，有各种各样的放射性核素，被海洋生物富集，但在不同的生物体中富集程度不同。来自法国辐射防护与核安全研究院的海洋生物学家 Sabine Charmasson 研究员，

通过检测海洋生物体内的污染物质富集，对海洋环境污染进行评估，告知公众海洋环境污染现状。

厦门大学长江学者特聘教授戴民汉博士则以其严谨的科学态度，直面中国公众的疑虑，科学评估了福岛核事故对中国邻近海域所产生的影响，通过海洋和大气数据证明，中国海的放射性物质水平处于较低水平，没有证据表明受到福岛核事故或中国沿岸核电厂的影响。

据悉，国际海洋科学委员会（SCOR）于 2014 年组建了“海洋放射性研究”工作组，由 Ken Buesseler 研究员与戴民汉教授担任共同主席，集合了来自 16 个国家的 19 名科学家与教育工作者，共同开展海洋核辐射最新前沿研究与教育，建立完善的全球数据库，期待为公众提供准确的数据，并推动此方面的公众教育，填补公众的认识空白。（完）

Some other news links:

Xinhua News Agency: http://www.fj.xinhuanet.com/jiaoyu/2016-06/12/c_1119026799.htm?from=singlemessage&isappinstalled=0

People’s Daily:

http://edu.people.com.cn/n1/2016/0613/c367001-28430252.html?from=singlemessage&isappinstalled=0

Fujian Daily:

http://img.fjdaily.com/data/fjrbwap/2016/06/12/cms_1703393522811904.html?from=singlemessage&isappinstalled=1

China National Radio：

http://m.cnr.cn/news/20160612/t20160612_522372835.html

Strait News：

http://szb.mnw.cn/html/2016-06/16/content_4410925.htm