



Asia-Pacific Network for Global Change Research

The Surface Ocean – Lower Atmosphere Study (SOLAS) International Summer School 2005: Attendance of Young Scientists from the APN Region

Final report for APN project 2005-08-NSY-Shi

The following collaborators worked on this project:

Guang-Yu Shi, Institute of Atmospheric Physics, Chinese Academy of Sciences, Beijing China, shigy@mail.iap.ac.cn

Wade McGillis, Lamont-Doherty Earth Observatory, Columbia University, New York USA, wrm2102@columbia.edu

Phil Boyd, Centre for Chemical and Physical Oceanography, University of Otago and NIWA, Otago NZ, p.boyd@niwa.co.nz

Jeffrey Hare, Executive Officer, **SOLAS** International Project Office, University of East Anglia, Norwich UK, jeff.hare@uea.ac.uk

**The Surface Ocean – Lower Atmosphere
International Summer School 2005: Atter**

surface ocean **solas** lower atmosphere study
20|05

Scientists from the APN Region

2005-08-NSY-Shi

Final Report submitted to APN

©Asia-Pacific Network for Global Change Research

Overview of project work and outcomes

The second **SOLAS** Summer School ran from the 29th August to 10th September 2005 at the Institut d'Etudes Scientifique de Cargese, Corsica France. Seventy-four students of 29 different nationalities attended the School, and six students were supported by **APN** – Guo Xianghui, Zhang Kai, Shi Jinhui, Wei Jianwei, Xu Zongjun, and Zhang Guiling. Although all these students were from China, all students from the **APN**-region were eligible for support with these funds, but other (national) sources of funds were available to the attendees from Bangladesh (1), India (1), Japan (6), Mongolia (1), Korea (1), and the United States (16). Students were recruited from around the globe, and 26 **APN** region students were eligible to attend. We are grateful that **APN** has generously supported the six above-named students.

The principle aim of the **SOLAS** Summer School is to build capacity in the scientific areas of **SOLAS** by bringing together postgraduate students and young scientists from around the world for a series of lectures and practical sessions run by leading **SOLAS** scientists. Capacity building is achieved not only through lectures and practical sessions, but also through providing ample opportunity for scientific discussion (during poster sessions and coffee breaks) and social interaction which fosters networking within the student body, but also between students and lecturers. The learning achieved at the summer school is not a one-way process – lecturers often express joy in the opportunity to learn how a new generation of **SOLAS** scientists approaches the scientific questions that drive research into air-sea interaction and global change.

Objectives

The main objectives of the **SOLAS** Summer School are:

1. Build capacity within the scientific foci of **SOLAS** and global change research
2. Provide an opportunity for experienced **SOLAS** scientists (lecturers) to impart their vast resource of knowledge onto a new generation of researchers.
3. Strengthen and solidify the **SOLAS** network into nations with less-developed economies.

Amount received and number years supported

\$12,000 (USD), support supplied for one event (**SOLAS** Summer School 2005).

Activity undertaken

2005 **SOLAS** International Summer School

Results

During the summer of 2005, the **SOLAS** Summer School welcomed 74 students from 29 nations. Sixteen leading **SOLAS** lecturers from around the world engaged with the students during the two-week course. Students also had the opportunity to participate in practical workshops, with hands-on experience gained in a laboratory, on board a research vessel, and with instrumentation. Students were required to develop a research topic and present their work in oral and poster presentations.

Relevance to APN scientific research framework and objectives

The **APN** Science Agenda has four general themes: (1) climate, (2) ecosystems, biodiversity and land use, (3) changes in the atmospheric, terrestrial and marine domains, and (4) use of resources and pathways for sustainable development. **SOLAS** research clearly touches upon each of these, but in the context of the Summer School, the first three are of particular relevance. Via air-sea interaction, **SOLAS** seeks a fundamental understanding of the interaction between the oceanic ecosystem and climate, including how future climate will effect and be affected by changes in oceanic ecosystem function and air-sea interaction processes. The Summer School is a unique opportunity to bring

young **SOLAS** researchers and senior scientists together for synergistic interaction and capacity building. This networking directly addresses the **APN** agenda.

APN has a number of goals that are also addressed by the **SOLAS** Summer School:

Supporting regional cooperation in global change research on issues particularly relevant to the region

Networking of students from a variety of regions provides a synergy that cannot be gained by other means. Each of these students return to their respective region with new knowledge and enthusiasm for discovery, and this enthusiasm invariably leads to improvements in regional science and regional science policy decisions.

Strengthening appropriate interactions among scientists and policy-makers, and providing scientific input to policy decision-making and scientific knowledge to the public

As the young scientists depart the Summer School with distinctly stronger interest in and understanding of the **SOLAS** research fields, they return to their respective regions with a new-found drive to excel and succeed. These individuals make an impact in their home region, by influencing which science is funded and focused upon in their home nation.

Improving the scientific and technical capabilities of nations in the region

This goal is most apparently addressed by participation in the **SOLAS** Summer School. By increasing the base of knowledge within the individual young researchers, and by developing collaborative networks (which will continue beyond the time frame of the Summer School), long-lasting scientific expertise is imparted to the region.

Cooperating with other global change networks and organisations

Again, this goal is clearly addressed by the **SOLAS** Summer School. Students and post-docs came to the 2005 School from 29 nations. This incredible spectrum of young researchers become part of the fabric of global change networks across the globe. **APN**-region scientists and students thus are able to interact with and develop relationships with peers from around the world, and this networking enhances the scientific capacity for global change research in synergistic ways.

Facilitating the development of research infrastructure and the transfer of know-how and technology

Transfer of know-how is one of the primary goals of the **SOLAS** Summer School, as senior researchers are brought into a forum with the 70-odd student population. The interactions and imparting of knowledge created in this new network cannot be measured. The impact that this influence has on global change research is immeasurable.

Self evaluation

The **SOLAS** Summer School is unique in nature, as the interdisciplinary character of **SOLAS** dictates. Furthermore, as **SOLAS** addresses global change issues, the science within it requires a truly global approach. Thus, with all endeavors, and particularly with the Summer School, **SOLAS** strives to provide influence and education to people from around the world. **SOLAS** is proud to have participation in the Summer School from a large number of nations (29 in the 2005 School) and from a number of **APN** nations as well (7 nations).

Execution of the Summer School requires significant resources and planning. More than 12 person-months of **SOLAS** International Project Office administrative time is needed to manage the effort, and travel and accommodation costs for the participation of nearly

100 people can run up to over \$200K (US). It is only through the help of international agencies such as **APN** and national funding agencies in the USA, Germany, France, Korea, etc, that **SOLAS** can even contemplate such a financially complex endeavor.

At the end of the School, participants were asked to complete an evaluation form. Of the 74 students who attended, 69 completed evaluations. Of these 60% rated the school “excellent”, 36% “good” and 4% “ok”. None rated the school “poor” or “very poor”. For the most part, students found the Summer School a first rate learning experience and also found the opportunity to meet scientists from around the world a valuable and horizon-broadening experience. This was particularly the case for the students from developing countries. **SOLAS** is delighted to provide support for students from the **APN** region, and the support from **APN** is greatly appreciated.

See the **SOLAS** Summer School website for more information:
<http://www.uea.ac.uk/env/solas/summerschool/>

Potential for further work

The **SOLAS** Summer School is a biennial event, and plans are well underway for the 2007 event to be held at the Institut d’Etudes Scientifique de Cargese in Corsica France over the period 22 October – 3 November. **SOLAS** looks forward to continued cooperation and generous support from **APN** and other agencies for this effort. The global changes (environmental and social) that we are now experiencing and the need for informed future decisions dictate that this capacity building and educational endeavor continue.

SOLAS will again encourage participation of **APN** region students and lecturers, as well as students from South America, Africa and other developing regions. The content and format will be similar to previous years, but we continue to adjust the format and content based on evaluations from all participants. The lecturers at the next **SOLAS** Summer School will be asked to contribute chapters to a textbook.

Publications

Although no publications result in the immediate aftermath of the **SOLAS** Summer School, the educational and developmental experience is believed to lead to significant enthusiasm for young researchers to bring fresh ideas and new research into the world forum of peer-reviewed publications and international open science meetings.

There are plans to develop a **SOLAS** Summer School textbook, although publication date will probably extend over two years from this date.

References

The Surface Ocean Lower Atmosphere Study Science Plan and Implementation Strategy, IGBP Report No. 50, ISSN 0284-8105, 88 pp (www.solas-int.org).

Acknowledgments

SOLAS acknowledges the generous support of **APN**, the generous financial management of START, and the support of the many national and institutional scientific support agencies (too numerous to mention).

The Surface Ocean Lower Atmosphere Study (SOLAS) International Summer School 2005: Attendance of Young Scientists from APN Region

Preface

The 2005 **SOLAS** Summer School ran from the 29th August - 10th September at the Institut d'Etudes Scientifique de Cargese, Corsica France. Seventy-four students of 29 different nationalities attended the School, and six students were directly supported by **APN**. Participation from **APN** nations was particularly strong, with participation of students from the United States (16), Japan (6), China (6), Sri Lanka (1), India (1), Mongolia (1), and Korea (1). **APN** supported travel, accommodations and registration fees for six participants.

1.0 Introduction

The concept of global change, as manifested in climate and in imminent social change, brings us to a critical juncture in human history. The science of climate change has many components, and the study of the biogeochemical interaction between the atmosphere and ocean is one critical element to understanding the earth and climate system. The Surface Ocean Lower Atmosphere Study (**SOLAS**) is an IGBP-, WCRP-, SCOR-, and CACGP-sponsored project that seeks to understand air-sea interaction and how its associated processes affect climate and how those processes are affected by future climate. This crucial science is interdisciplinary and international, and **SOLAS** relies upon the broad spectrum of oceanographic, atmospheric and biological sciences for discovery and advancement. In addition, **SOLAS** science is a relatively 'new' approach to understanding the earth system, and new generations of bright scientists are needed to push forward scientific advances.

The principle aim of the **SOLAS** Summer School is to build capacity in the scientific areas of **SOLAS** and global change research by bringing together postgraduate students and young scientists from around the world for a series of lectures and practical sessions run by leading **SOLAS** scientists. Capacity building is achieved not only through lectures and practical sessions, but also through providing ample opportunity for scientific discussion and networking.

SOLAS is proud of the quality of the Summer School, and is equally proud of the multi-national character of the participation. Over the next 30 years, the decisions that will be made on an international scale to address global change must be made with the input of the best available scientific information from scientists around the globe. Thus, it is imperative that the **SOLAS** Summer School capacity building continue to thrive.

The Summer School is highly competitive. Over 200 applications were received for the 2005 School, but only 74 students could be accommodated. The applicants truly represent the best and brightest minds in **SOLAS** science, and the international composition of the ethnic and international backgrounds is striking.

2.0 Summer School Outputs

The most important outputs from the **SOLAS** Summer School are intangible – the education and capacity building of the newest generation of bright **SOLAS** scientists and the life and career enrichment that comes from sharing this unique experience with young peers and the leading senior **SOLAS** scientists. There are no 'deliverables' such as publications, reports, or power point presentations that arise from the **SOLAS** Summer School, but there are lifetimes of impacts to scientists from developing and developed nations. This impact is the legacy of the **SOLAS** Summer School.

For more information on the 2005 **SOLAS** Summer School, please visit the website: <http://www.uea.ac.uk/env/solas/summerschool/>

The lectures from the 2005 Summer School are available at:

<http://www.uea.ac.uk/env/solas/summerschool/2005/talks.html>

The list of participants:

<http://www.uea.ac.uk/env/solas/summerschool/2005/participants.html>

The list of awarded posters (including the poster presentations):

<http://www.uea.ac.uk/env/solas/summerschool/2005/otherstuff.html>

Contributed photos:

<http://www.uea.ac.uk/env/solas/summerschool/2005/photos.html>

3.0 APN-Funded Participants

Although the support was made eligible to students from every **APN** nation, six Chinese students were supported with the generous support of **APN**. The other 26 participants from **APN**-nations were supported through institutional or national support.

Provided here is a list of **APN** supported Summer School participants, including contact information and direct support provided (in local currency):

- 1) Shi Jinhui (14154 CNY), College of Environmental Science and Engineering
Ocean University of China, 5 Yushan Road, Qingdao 266003, China
Email: engroup@ouc.edu.cn, Phone: +86-532-82032823
- 2) Zhang Guiling (15063 CNY), College of Chemistry and Chemical Engineering
Ocean University of China, 5 Yushan Road, Qingdao 266003, China
Email: guilingzhang@ouc.edu.cn
- 3) Zhang Kai (13225 CNY), LASG, Institute of Atmospheric Physics (IAP), Post
Box 9804, Beijing 100029, China
Email: zhangkai@mail.iap.ac.cn, Phone: +86-10-62043451(Office)
- 4) Guo Xianghui (15599 CNY), State Key laboratory of Marine Sciences
Xiamen University, Xiamen 361005, Fujian Province, China
Email: xhguo@xmu.edu.cn
- 5) Wei Jianwei (13087 CNY), First Institute of Oceanography
State Oceanic Administration, 6 Xianxialing Road, Qingdao 266061, China
Email: jianwei@fio.org.cn, Phone: +86-532-88969373
- 6) Xu Zongjun (13275 CNY), First Institute of Oceanography
State Oceanic Administration, 6 Xianxialing Road
Qingdao 266061, China, Email: xzj@fio.org.cn

Testimonials from APN-Supported Participants

"I was so lucky that I participated the second **SOLAS** Summer School in Cargese, France last year. It's a good banquet for my soul. I met many famous scientists and Ph. D. students from many countries. The good presentations, friendly discussions broadened my eyesight. My research is on carbonate system, but I browse more papers in other **SOLAS** fields now, because I got to know that **SOLAS** has very large content, not only CO₂ or DMS, or dust, etc. I made many friends in the Summer School, we keep in touch and have discussions or talk about the progresses in research sometimes through email. I also learn how to organize a paper or Poster more scientifically. Most important, I got the up to date information in all fields from the Summer School, I also got the responsibility of working more hard because China lagged behind the developed countries in Marine Sciences research. Yeah, we need to work more hard. That's not all **SOLAS** Summer School gives me, but its benefit will accompany me in all my career. I am very grateful that I have the chance to attend this school, not only for the knowledge I gain, but to know so many people in the world so that I can learn from them about the ideas and technology of **SOLAS**. After the Summer School, my project can be guaranteed go on wheels!"

-Xianghui Guo

“I am very glad to be supported to attend the 2005 **SOLAS** Summer School, which is a wonderful and useful experience for me. It has been a well organized and carefully considered course, which provided me chances to improve the knowledge about the air-sea interactions and biogeochemical cycling of trace gases in the surface ocean and the atmosphere. After attending so many lectures, I also learned about many recent progresses, not only in my research field of methane and nitrous oxide, but also in the whole areas of **SOLAS**. What I enjoyed most is the experiences to communicate with peer scientists and other doctoral students to exchange the research experiences and results. I believe what I learned in this summer school will help me a lot in improving my future research work in China.”

-Guiling Zhang

“The 2005 **SOLAS** Summer School provided me with a valuable experience. I was able to gain a diverse impression of fields relating to **SOLAS** science. It also allowed me to meet many people working in the same area. In particular, I learned a lot from discussions with lecturers and other friends, who kindly offered a great deal of advice and good ideas. With help from lecturers, we learned the skills which are necessary to become eligible and successful scientists. This year, I have been selected to join an exchange program, which is hosted by the Max Planck Institute for Meteorology in Germany. I think the experience gained from attending the **SOLAS** summer school had helped me to get the opportunity. And I have encouraged my colleagues in our institute to join the next **SOLAS** Summer School.”

-Kai Zhang

“There are many reasons to make the biannual school a unique meeting, like great lecturers, enthusiastic students, and great ideas, and so on. I was very proud and so lucky to be involved in this community. And personally I am indebted to the convenors and sponsors for their fundamental supports. And the School is such a place where I could listen to those with world fame, share experiences, ideas and joys with participants from around the world, and express ourselves. I also had chances to take the lab classes, such as modeling, and field courses, all of which make us acquainted with the status of research in developed economies. I cannot forget the joyful night life in the village on the beach, with great wines and Italian style food, and our lively friends. But most of all, I think, it makes my way much more clear. It has actually been a fortune of mine.”

-Jianwei Wei

Other Testimonials (not supported from APN)

“My major is mechanical engineering, and I had never had opportunity to attend such lectures in my educational course. I met many lecturers and students from the various scientific fields of **SOLAS** topics and we shared two weeks together. I think that we rarely have such an experience at a normal academic conference. In addition, I could look at my study from another view point by meeting people attended the summer school and taking discussions with them. They gave many comments and advice that I had never thought of.”

-Kenji Tanno, Kyoto University, Japan

“What the **SOLAS** Summer School 2005 brought to my career? Loads! Through the interaction with lecturers and students during and after lectures my work was put in a context and my focus was drawn towards the global dimensions of climate change and human induced perturbations to the system. And who would not enjoy discussing science with fellow students doing very similar research at the institute beach during the lunch breaks? I also had the chance to participate in workshops such as a research cruise and a follow-up laboratory analysis that taught me where the data comes from which I use for

my modeling. Motivation and connections, guess these are the words describing best what I took home apart from the nice tan. Not to forget the personal experience – all the nights at the beach observing noctilucent phytoplankton, the social and natural science discussions during coffee breaks, a glass of wine during open-air poster sessions and all the interesting and enthusiastic participants from around the world...”

-Meike Vogt, University of East Anglia, UK

“**SOLAS** is about the interaction between the ocean and the atmosphere. To me, they look both very big and their physical and chemical processes are not so easy to understand. The **SOLAS** summer school was able to give me the broad picture of this very fascinating interaction. Now I know what the big **SOLAS** scientific questions are and this is an unvaluable feeling that will strongly help my future research. Life, along the atmosphere and the ocean, is another important thing to me. The **SOLAS** summer school was able to give me the opportunity to share 2 weeks with students and lecturers from about two dozens different nationalities, with different cultures and different scientific backgrounds. These things broaden your mind and improve your research.”

-Manuel Dall'Osto, University of Birmingham, UK

“The unique points of this school are 1) Substantial theoretical lectures; Lecturers checked our responses, and conducted their classes carefully so we could understand them well. Some of us stated our opinions or other information topics, which made very lively lectures. 2) Interesting practical workshops; We learned many things using our hands and brains on the land and the sea. I was especially impressed with the oral presentation class, and I learned the importance of not only content itself but technique for a successful presentation. I saw improved presentations by everyone and even I was able to improve mine (I got 3rd prize for oral presentation). 3) Enthusiastic poster session; I have never seen such an active and interesting poster presentation, which continued after sunset. 4) Peaceful environment; The school is held in the small village of Cargèse. Recreation was limited to a beach in the daytime and parties at nighttime, which let us concentrate on school inevitably. 5) Precious friends; Young scientists of my generation are researching **SOLAS** from different viewpoints, and here I made precious friends and good rivals at the same time. Seeing these friends and discussing again during future conferences will be my pleasure forever. As Rome and Carthage loved Corsica, I love Corsica and everyone I met in this splendid summer school.”

-Motoki Sasakawa, University of Tokyo, Japan

4.0 Conclusions

The **SOLAS** Summer School is truly a unique venue, and participants (students and lecturers) regularly report on their exhilaration at being involved in the project. As evidenced from these testimonies, the School has an impact beyond career enhancement or individual education. It is the subsequent enhancements of scientific attitude and global approach that is carried back to the participants' home nations, and **SOLAS** specifically and global change research more generally are beneficiaries of the improved scientific capacity. More intelligent policy decisions will result, and human societies will benefit over the very long term from such activities.

References

None (other than those within the **SOLAS** Science Plan and Implementation Strategy)

Appendix

2005 **SOLAS** Summer School Coordinators

Corinne LeQuere

c.lequere@uea.ac.uk

School of Environmental Sciences (ENV)
University of East Anglia (UEA)
Norwich UK

Veronique Garcon garcon@legos.cnes.fr
Laboratoire d'Etudes en Geophysique et Océanographie Spatiales (LEGOS)
Centre National de la Recherche Scientifique (CNRS)
Toulouse France

2005 SOLAS Summer School Programme

Institut d'Etudes Scientifique de Cargese, Corsica France (<http://cargese.univ-corse.fr/>)

Day 0 (August 28)

Arrival and registration

Day 1 (August 29)

Introduction to **SOLAS**
Greenhouse gases and climate change
Introduction to atmospheric physics and chemistry
Introduction to ocean physics
Poster presentation

Day 2 (August 30)

Air-water gas exchange
The global carbon cycle
Marine ecology: Phytoplankton and primary production
Biogeochemical modeling
Poster presentation

Day 3 (August 31)

Physics of the coastal ocean: Transfer and cycling of nutrients
Macronutrients in the ocean
Marine ecology: Bacterioplankton, respiration, and other microbial processes
Data assimilation: Concept and application – New techniques

Day 4 – 7 (September 1 - 4)

Practical workshops

1. Communication in science
2. Modelling
3. Cruise
4. Laboratory work
5. Atmospheric chemistry
6. Gas exchange

Day 8 (September 5)

Rest day

Day 9 (September 6)

Iron cycle
Gas exchange
Atmospheric gas phase reactions

Informal seminar: proposal writing
Student presentations

Day 10 (September 7)

Remote sensing: principles and applications
Introduction to marine aerosols
The dimethyl sulfide cycle
Informal seminar: Scientists and the press
Student presentations

Day 11 (September 8)

Time series observations
Biogeochemical processes in the coastal zone
Atmospheric dust sources
Informal seminar: IPCC process
Student presentations

Day 12 (September 9)

Paleo research
Climate change and variability
Informal seminar:
Student presentations
Ending dinner

Day 13 (September 10)

Departure

Lecturers

Sixteen leading **SOLAS** lecturers from around the globe attended the Summer School to lecture and engage with the next generation of **SOLAS** scientists in professional and social contexts:

Nick Bates (Bermuda)	Time series; Global observations of climate
Laurent Bopp (France)	Greenhouse gases and climate; Carbon cycle
Phil Boyd (New Zealand)	Iron cycle
Leticia Cotrim da Cunha (Germany)	Biogeochemical processes in the coastal zone
Paul Crutzen (Germany)	Atmospheric chemistry in the Anthropocene
Catherine Jeandel (France)	Macronutrients in the ocean
Markus Kienast (Canada)	Paleo research
Peter Liss (UK)	Introduction to SOLAS
Ulrike Lohmann (Canada)	The DMS cycle
Richard Matear (Australia)	Biogeochemical modeling; data assimilation
Wade McGillis (USA)	Gas exchange
Ulrich Platt (Germany)	Atmospheric gas phase reactions
Eric Saltzman (USA)	Marine particles in the atmosphere
Ina Tegen (Germany)	Atmospheric dust sources
Oswaldo Ulloa (Chile)	Marine ecology
Rik Wanninkhof (USA)	Gas exchange
Ric Williams (UK)	Physical processes in the open ocean and coasts

Practical / Workshop Activities

Over the middle weekend of the Summer School, practical and workshop sessions were conducted:

Cruise - Day research cruise in Gulf of Ajaccio on board CNRS research vessel
Laboratory - Analysis of samples collected during research cruise

Gas exchange - Micrometeorological flux measurement techniques from pier
Modeling - Introduction to modeling techniques in the computing lab
Oral communication - Advice to students on their oral communication skills
Written communication - Advice to students on written communication skills

List of Student Participants

The following is a list of student participants in the **SOLAS** Summer School, including email address, research interest, and nationality and current residency. Note that some attendees applied for the **SOLAS** Summer School from their country of origin, although they attend university elsewhere.

Richard Abell (UK)	richard.abell@bris.ac.uk
Tracing the carbon cycle: Lithium isotopes in planktic foraminifera	
Katye Altieri (USA)	altieri@marine.rutgers.edu
Formation of oligomers in clouds: Reactions of isoprene oxidation	
Maria Aranguren (Spain)	aranguren@uvigo.es
Plankton photosynthesis/respiration/bacterial abundance/production	
Ariunaa Batsaikhan (Mongolia/Germany)	ariunaa@ugc.uni-heidelberg.de
Reactive organic species on natural dust	
Simon Bélanger (Canada/France)	sbe@obs-vlfr.fr
Degradation of DOM in Arctic coastal waters	
Lucy Belmar (Chile)	lucy@profc.udec.cl
Phillipe Benoit (Canada)	pb@uvic.ca
Studying gaseous interactions at the base of the mixed layer	
Christopher Boxe (USA)	boxe@its.caltech.edu
Peter Brown (UK)	p.j.brown@uea.ac.uk
Kristen Buck (USA)	kbuck@ucsc.edu
Dissolved iron speciation: the importance of iron-binding	
Adrian Callaghan (Ireland)	adrian.callaghan@nuigalway.ie
Determination of factors affecting whitecap coverage in the Irish Sea	
Maria Calleja (Spain)	vialcc@uib.es
Air-sea CO ₂ disequilibria by planktonic metabolisms	
Nicolas Cassar (France/USA)	ncassar@princeton.edu
Dissolved inorganic carbon measurements	
Rosie Chance (UK)	r.chance@uea.ac.uk
Iodine in the Southern Ocean: A survey around South Georgia	
Antoine Corbière (France)	corbiere@ccr.jussieu.fr
Manuel Dall'Osto (Italy/UK)	mx266@bham.ac.uk
Aerosol particles by using particle mass spectrometry at Mace Head	
Douglas Day (USA)	daday@ucdavis.edu
Observations of Dissolved CO and CDOM in a Coastal Upwelling	
Daniela del Valle (USA)	ddelvalle@disl.org
Tara DePorte (USA)	tad2108@columbia.edu
Peter DiFiore (USA)	pdifiore@princeton.edu
Nitrogen isotope constraints on Subantarctic biogeochemistry	
Isabelle Dumont (Belgium)	idumont@ulb.ac.be

Biological impact on CO₂ exchange in Antarctic sea ice
Sarah Eaton (Canada) sarah_eaton@hotmail.com
 Sources of SO₂ over the NW Atlantic
Achim Falkenroth (Germany) Achim.Falkenroth@IUP.uni-heidelberg.de
 Imaging concentration profiles of water boundary layer
Sara Ferrón Smith (Spain) sara.ferron@uca.es

Heather Graven (USA) hgraven@ucsd.edu

Xiang-Hui Guo (China) xhguo@xmu.edu.cn
 CO₂ production and oxygen depletion
Jane Heywood (UK) jlh4@soc.soton.ac.uk
 Prochlorococcus and Synechococcus in Atlantic oligotrophic gyres
Andrew Hind (UK) Andrew.hind@uea.ac.uk

Chun-Ok Jo (Korea) cojoo100@snu.ac.kr
 Spring bloom along the Primorye coast in the East/Japan Sea
Emilie Journet (France) journet@lisa.univ-paris12.fr
 Characterization of iron in dust atmospheric cycle
Zhang Kai (China) zhangkai@mail.iap.ac.cn
 Towards the fully coupled aerosol-climate model
Pierre Karleskind (France) Pierre.karleskind@univ-brest.fr

Caroline Kivimäe (Sweden/Norway) Caroline.Kivimae@gfi.uib.no
 Variability of production and CO₂ air-sea exchange in the Barents Sea
Anne-Sophie Kremer (France) asklod@lodyc.jussieu.fr

Delphine Lannuzel (France/Belgium) dlannuze@ulb.ac.be
 Iron distribution in Antarctic Sea ice
Tim Lesworth (UK) t.lesworth@uea.ac.uk

Martine Lizotte (Canada) Martine.Lizotte@giroq.ulaval.ca
 Springtime DMSP and DMS cycling
Marlene Manzano (Mexico) callas22@yahoo.com
 Chlorophyll in the Gulf of Mexico; association with ENSO events
Julia Marshall (Canada) marshall@mathstat.dal.ca
 Aerosols over the waters surrounding Nova Scotia
Jeremy Mathis (USA) jmathis@rsmas.miami.edu

Svetlana Milutinovic (Croatia/Norway) svetlanam@nersc.no
 Satellite-derived estimates of net primary production in surface ocean
Simon Mueller (Switzerland) smueller@climate.unibe.ch

Nina Nemcek (Canada) nnemcek@eos.ubc.ca
 Mapping of DMS in coastal waters: application of the MIMS technique
Katarzyna Niewiadomska (Poland/France) kniewiad@obs-vlfr.fr
 Bio-optical and biogeochemical studies using an underwater vehicle
Sarah Norris (UK) snorris@env.leeds.ac.uk
 Flux measurements of sea spray particles using a spectrometer
Jane Paul (India) jane@darya.nio.org
 Distribution of phytoplankton in Summer monsoon
Olga Pikelnaya (Ukraine/USA) olga@atmos.ucla.edu

MAX-DOAS measurements, coastal iodine chemistry
Andrea Pineda (Argentina) pineda@at.fcen.uba.ar
 Modeling dry and wet deposition of nitrogen emitted to coastal waters

Matthias Piot (France/Germany) matthias.piot@iup.uni-heidelberg.de
 Ozone depletion events in the polar boundary layer in Spring

Parthipan Rajendran (Sri Lanka/UK) rp139@york.ac.uk

Sarah Reynolds (UK) s.e.reynolds@liverpool.ac.uk
 Supply of nutrients to the surface Atlantic Ocean

Roland Rocholz (Germany) Roland.Rocholz@IUP.uni-heidelberg.de
 Combined slope/height measurements of short wind waves

Baris Salihoglu (Cyprus/France) baris.salihoglu@notos.cst.cnes.fr
 Physical/biogeochemical processes on phytoplankton and carbon

Motoki Sasakawa (Japan/Netherlands) M.Sasakawa@phys.uu.nl
 Carbon isotopes and excess methane in subsurface seawater

Jens Schimanski (Germany) jschimanski@ifm-geomar.de

Patrick Schultz (Germany/USA) pschultz@princeton.edu
 Observing large-scale ocean ecosystem structure from space

Marie Séguret (France/UK) marie.seguret@postgrad.plymouth.ac.uk
 Evaluating factors controlling dissolution of aerosol iron in seawater

Nicole Shantz (Canada) Nicole.shantz@ec.gc.ca

Jinhui Shi (China) shijinhuidt@yahoo.com
 Amino acids of rain and aerosols in coastal and marine environments

Yohei Shinozuka (Japan/USA) yohei@hawaii.edu

Linda Smoydzin (Germany) linda.smoydzin@iup.uni-heidelberg.de
 Organic films on atmospheric aerosol particles / influence on clouds Rachel

Rachel Stanley (USA) rstanley@whoi.edu
 The Noble gas toolbox for air-sea gas exchange

Kenji Tanno (Japan) tankobu@t02.mbox.media.kyoto-u.ac.jp
 Effect of fetch on CO₂ transfer across atmosphere-ocean interface

Corey Tyree (USA) corey.tyree@asu.edu
 Submicrometer particles generated from seawater foams

Maria Vila (Spain) mariavila@icm.csic.es
 Metabolism and identification of DMS-consuming bacteria in seawater

Meike Vogt (Germany/UK) mvogt@bgc-jena.mpg.de
 Marine production of DMS and its interaction with climate

Thibaut Wagener (Luxemborg/France) wagener@obs-vlfr.fr
 Bioavailability of atmospheric iron

Jianwei Wei (China) jianwei@fio.org.cn
 Using the optical data for POC assessment in Philippine Sea

Toby Westberry (USA) toby@icess.ucsb.edu

Sam Wilson (UK) Sam.Wilson@sams.ac.uk

Zongjun Xu (China) xzj@fio.org.cn

Hiroaki Yamagishi (Japan) yamagishi.hiroaki@nies.go.jp

Naoki Yoshie (Japan) naoki@ees.hokidao.ac.jp

Guilin Zhang (China)

guilinzhang@ouc.edu.cn

Student Contributions

Students were asked to contribute to the Summer School by presentation of a poster and short (5 minute) oral presentation of their research. These were of an exceptionally high standard. Prizes were awarded for the best posters (judged by lecturers) and for the best oral presentations (judged by peers).

List of funding sources outside the APN

A list of agencies, institutions, organisations (governmental, inter-governmental and/or non-governmental), that provided any in-kind support or co-funding and the amount(s) awarded.

Support for students' registration, travel and subsistence was provided by the following agencies:

APN (\$12000)	Asia-Pacific Network for Global Change Research
CNES	Centre National d'Etudes Spatiales
CNRS	Centre National de la Recherche Scientifique
DFG	Deutsche Forschungsgemeinschaft
IAI (\$3000)	Inter-Americas Institute for Global Change Research
IOC (\$6000)	Intergovernmental Oceanographic Commission
NERC	Natural Environment Research Council
NOAA	National Oceanic and Atmospheric Administration
NASA	National Aeronautics and Space Administration
ORI-T	Ocean Research Institute, University of Tokyo

Additional funding was provided directly to students by the host universities of many of the attending students. Funding was also provided by the participants' PhD advisor grants or fellowships.

In most cases, support was provided directly to the students without disclosure to the **SOLAS** IPO or the current reporter.

Direct support for the running costs of the school (lecturers' travel and subsistence, costs of the host institute, consumables, transport of equipment and costs associated with running practical sessions were provided by:

CNES	Centre National d'Etudes Spatiales
CNRS	Centre National de la Recherche Scientifique
DFG	Deutsche Forschungsgemeinschaft
IAI (\$1000)	Inter-Americas Institute for Global Change Research
NERC	Natural Environment Research Council
NOAA	National Oceanic and Atmospheric Administration
NASA	National Aeronautics and Space Administration
SOLAS IPO (\$8500)	SOLAS International Project Office

Again, this mechanism of support was paid directly to the host institute, the lecturer, or the service provider without reporting to the **SOLAS** IPO or the current reporter.

"In-Kind" support 'in kind' was provided by numerous agencies, institutions, and university staff. In particular, support is appreciated from CNRS (research vessel,

oceanographic equipment and technical support), NERC (office salary support), the **SOLAS** IPO (overall management of the School) and SCOR (Scientific Committee for Ocean Research; financial management).

Glossary of Terms

APN	Asia-Pacific Network for Global Change Research
CNES	Centre National d'Etudes Spatiales
CNRS	Centre National de la Recherche Scientifique
DFG	Deutsche Forschungsgemeinschaft
IAI	Inter-Americas Institute for Global Change Research
IOC	Intergovernmental Oceanographic Commission
NASA	National Aeronautics and Space Administration
NERC	Natural Environment Research Council
NOAA	National Oceanic and Atmospheric Administration
ORI-T	Ocean Research Institute, University of Tokyo
SCOR	Scientific Committee for Oceanic Research
SOLAS	Surface Ocean Lower Atmosphere Study
SOLAS IPO	SOLAS International Project Office