



2019 Advanced Training Course on Ocean Colour Remote Sensing

IOCCG 2019年海洋水色遥感高级培训班

24 – 31 October 2019, Hangzhou, China



Overview

An advanced training course on ocean colour remote sensing will be held in Hangzhou, China during 24-31 October 2019 to promote satellite ocean colour data applications. This training event is sponsored by the International Ocean-Colour Coordinating Group (IOCCG), the European Commission Copernicus Programme, the European Organization for the Exploitation of Meteorological Satellites (EUMETSAT), the State Key Laboratory of Satellite Ocean Environment Dynamics (SOED/SIO/MNR, China), the National Satellite Ocean Application Service (NSOAS, China), and Zhejiang University (ZJU, China).

The key objective of this training is to help early career scientists to download, analyze and visualize data from the EUMETSAT Copernicus Marine Data Stream as well as the Chinese HY-1C ocean colour mission. Participants will also learn how to use the Marine Satellite Data Online Analysis Platform (SatCO2) for environmental monitoring and scientific research, including water quality monitoring, red tide detection, and marine carbon cycling/climate change investigations.

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Logistics

Registration

October 23, Wednesday, 14:00 - 18:00

Lobby of Zhejiang New Century Hotel

No. 18, Wensan Road, Xihu District, Hangzhou, China.

Tel: 086-571-88391111

浙江新世纪大酒店, 杭州市西湖区文三路18号



Venue

Second Institute of Oceanography (SIO), Ministry of Natural Resources (MNR)

No. 36, Baochubei Road, Xihu District, Hangzhou, China.

Wi-Fi ID: siosio

Password: chinasio_123456



I. Meeting Venue

- ◇ Icebreaker (October 24)
Room 1210, 12th floor, Building 1[#], SIO/MNR
- ◇ Open Ceremony and invited talk (October 25)
Meeting Room, 15th floor, Building 1[#], SIO/MNR
- ◇ Lectures and hands-on training (October 25-28, 30-31)
Room 1402, 14th floor, Building 1[#], SIO/MNR
- ◇ Field Investigation (October 28-29)
Qiandao Lake

II. Food

- ◇ Meals on campus: 2nd Floor, Zhejiang University Canteen
- ◇ Dinner Banquet: evening of October 25, Zhejiang New Century Hotel

III. Contact us

For any additional information or assistance, please feel free to contact:

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Ms. Shuyi Xie (谢书谊), 086-13585208238, email: xieshuyi@sio.org.cn

Ms. Binxia Chen (陈彬霞), 086-15967181881, email: cbx1004@163.com

Ms. Yan Bai (白雁), 086-13858023060, email: baiyan@sio.org.cna

Course Description

The training course will include lectures and hands-on practical sessions, as well as one field investigation to Qiandao Lake. The main purpose of this field practice is to help trainees to gain a fundamental knowledge of optical instruments and instruct them to make high-quality measurements.

The one-week training workshop activities cover the following.

1. Lectures

- L1. Introduction of SatCO2 software and Hands-on Training
- L2. Accessing Copernicus data
- L3. Introduction to tools and system setup check
- L4. Assessing ocean colour data quality
- L5. Principle of satellite ocean color remote sensing
- L6. Ocean color remote sensing of sea surface salinity
- L7. Satellite remote sensing of coastal water quality and harmful algal blooms
- L8. Remote sensing of marine carbon cycle
- L9. Time series of satellite records and climate variability

2. Hands-on Practical Sessions

- P1. Introduction of Marine Satellite Data Online Analysis Platform (SatCO2)
- P2. Data access (CODA and batch downloading with Python)
- P3. Data quality assessment in SNAP
- P4. Working with OLCI data in Python
- P5. Sea surface salinity in SatCO2
- P6. Coastal water quality classification in SatCO2
- P7. Harmful algal bloom detection in SatCO2
- P8. Air-sea CO2 flux estimation in SatCO2
- P9: Time series satellite data analysis in SatCO2

3. Icebreaker, Mini Project, Discussion, and Q & A

- 1) Trainees introduce their background and expectations from this training workshop;

- 2) Trainees are divided into several groups, and conduct mini project based on what they learned and provide reports;
- 3) Q & A on training workshop and related issues;
- 4) Discussions and Feedbacks.

Agenda at glance

	Date	Venue	Morning Session	Afternoon Session
1	Oct. 24 (Thu.)	SIO	Icebreaker & Visiting Laboratory	Lectures from SIO/MNR
2	Oct. 25 (Fri.)	SIO	Invited Talks	Lectures from EUMETSAT
3	Oct. 26 (Sat.)	SIO	Lectures from EUMETSAT	Hands-on Training
4	Oct. 27 (Sun.)	SIO	Lectures from EUMETSAT	Hands-on Training
5	Oct. 28 (Mon.)	SIO	Lectures from SIO/MNR	Shuttle Bus to Qiandao Lake
6	Oct. 29 (Tue.)	Qiandao Lake	Practice on optical instruments in the field	
7	Oct. 30 (Wed.)	SIO	Lectures from SIO/MNR	Hands-on Training
8	Oct. 31 (Thu.)	SIO	Mini projects Review and Discussion	

Schedule

Time	Oct. 24 (Thu.)	Oct. 25 (Fri.)	Oct. 26 (Sat.)	Oct. 27 (Sun.)
09:00-10:10	Icebreaker	Opening ceremony & Invited talks	Lecture: Assessing ocean colour data quality Lauren Biermann	Hands-on Training: Working with OLCI data in Python
10:10-10:30	Break	Break	Break	Break
10:30-11:40	Tour of Laboratory	Invited talks	Hands-on Training: Data accessing (CODA and batch downloading with Python)	Discussions and Feedbacks
11:40-14:30	Lunch	Lunch	Lunch	Lunch
14:30-15:40	Lecture: Introduction of SatCO2 software BAI Yan	Lecture: Accessing Copernicus data BIERMANN, Lauren and CLEMENTS, Oliver	Hands on Training: Data quality assessment in SNAP	Lecture: Principle of ocean color remote sensing HE Xianqiang
15:40-16:00	Break	Break	Break	Break
16:00-17:10	Hands-on Training: Introduction of SatCO2 CHEN Yijun	Lecture: Introduction to tools and system setup check CLEMENTS, Oliver	Hands on Training continue	Lecture: Ocean color remote sensing of sea surface salinity CHEN Shuangling

Schedule

Time	Oct. 28 (Mon.)	Oct. 29 (Tue.)	Oct. 30 (Wed.)	Oct. 31 (Thu.)
09:00-10:10	Lecture: Satellite remote sensing of coastal water quality and harmful algal bloom TAO Bangyi		Lecture: Satellite remote sensing of marine carbon cycle BAI Yan	Group reports & Feedbacks
10:10-10:30	Break	Practice on optical instruments in the field	Break	
10:30-11:40	Hands-on Training: SatCO2 software 1) Sea surface salinity; 2) coastal water quality classification; 3) Harmful algal bloom detection		Lecture: Applications of time series ocean color satellite records CHEN Xiaoyan	
11:40-14:30	Lunch	Lunch	Lunch	Lunch
14:30-15:40	Tour to Qiandao Lake & Break	Shuttle bus to Hangzhou	Hands-on Training: SatCO2 software 1) Estimation of Carbon flux; 2) Time series satellite data analysis	
15:40-16:00			Break	
16:00-17:10			Hands on Training continue	

Detailed Program

Thursday, October 24, 2019

9:00-10:30 Ice breaker

Each trainee prepares 3-5 slides to introduce himself/herself and his/her expectation from the training workshop (3 mins for each).

10:30-11:30

Tour of Laboratory (Shuangling Chen/Shuyi Xie)

14:30-17:00 Lecture

Introduction of SatCO2 software and Hands-on Training (Yan Bai and Yijun Chen)

——The SatCO2 software (Marine Satellite Data Online Analysis Platform) is a tool to fulfill visualization and scientific calculations of various datasets (i.e., satellite data, in situ data, and model outputs) on a three-dimensional virtual Earth.

Friday, October 25, 2019

9:00 -9:10

Opening ceremony

9:10 -9:40

General introduction of SIO (MNR) and SOED

Fei Chai, Director of SOED

9:40 -10:10

Introduction of Chinese ocean color satellite missions

Jianqiang Liu, Deputy General Director of NSOAS

10:10 -10:30

Group photo and break

10:30 -11:00

Introduction of Copernicus and the EUMETSAT marine data stream

Lauren Biermann and Oliver Clements, Marine Satellite Researchers (Plymouth Marine Laboratory and EUMETSAT)

11:00-11:30

GEO (Group on Earth Observations) oriented data sharing activities in China

Li Guoqing, Director of National Earth Observation Data Center (NODA), China GEOSS Data Sharing Network (China GEOSS DSNet)

14:30 -15:40

Accessing Copernicus data

——We will introduce you several ways you can access the Sentinel-3 data available through the Copernicus Marine Data Services, including EUMETView, CODA, and the Data Center Long-Term Archive. We will also introduce you the WekEO, which is one of the Copernicus Data Information & Access Services (DIAS).

16:00 -17:10

Introduction of tools and system setup check

——Working with marine satellite data often involves using large numbers of large data files, of varying formats. The applications for this data are also broad, and range from exploratory, research led purposes, to routine and operational analysis for more commercial applications. As such, there are many different tools available to work with marine satellite data. This session will introduce you to some commonly used tools by the marine remote sensing community.

Saturday, October 26, 2019

9:00 - 10:10

Assessing ocean colour data quality Lauren Biermann and Oliver Clements

—Within this topic we will look at the format of the Sentinel-3 marine data files, and the quality processing that needs to take place to get measurements made by the satellite instrument (raw Level 0 information) to a usable format or product. Included in this session is atmospheric correction for ocean colour data.

10:30 - 11:40

Hands-on Training: Data access (CODA and batch downloading with Python)

—This session will highlight the different ways to access data through a browser and through code, with some live examples to get students started on their own data access.

14:30 - 17:10

Hands-on Training: Data quality assessment in SNAP

—Using toolboxes available through the SNAP software, we will take you through the steps required to visualise, process and assess the Sentinel data you downloaded from the earlier Hands-on Data Access Training session.

Sunday, October 27, 2019

9:00 -10:10

Hands-on Training: Working with OLCI data in Python (Oliver Clements)

—This session will provide examples and code for analysis and processing of OLCI including; spatial interrogation, spectral interrogation and comparison of different chlorophyll algorithms

10:30 -11:40

Discussions and Feedbacks

—If trainees have finished their mini project, they will be arranged to report their work results in this section; discuss and provide feedbacks about the applications of Copernicus and the EUMETSAT marine data stream.

14:30 -15:40

Principle of satellite ocean color remote sensing (Xianqiang He)

——The lecture will overview the principle of the satellite ocean color remote sensing, including the radiative transfer theory, vicarious calibration and atmospheric correction. Moreover, new advance techniques (e.g. geostationary satellite remote sensing, polarization remote sensing) will be introduced.

16:00 -17:10

Ocean color remote sensing of sea surface salinity (Shuangling Chen)

——The lecture will review the general rules of measuring surface ocean salinity from ocean color satellites, and present the state-of-art approaches in its estimation.

Monday, October 28, 2019

9:00 -10:10

Satellite remote sensing of coastal water quality and harmful algal blooms (Bangyi Tao)

——Introduce the principle and algorithms of remote sensing in classifying coastal water quality and detecting harmful algal blooms.

10:30 -11:40

Hands-on Training: SatCO2 software

——Practice related modules (functions) of SatCO2 on 1) coastal water quality classification, 2) harmful algal bloom detection in coastal waters, and 3) Harmful algal bloom detection.

13:00

Shuttle bus to Qiandao Lake

Meet together at the gate of SIO.

Thursday, October 29, 2019

8:30 -12:00

Practice on optical instruments in the field

14:00

Shuttle bus to Hangzhou

Meet together in the Hotel Lobby in Qiandao Lake

Wednesday, October 30, 2019

9:00 -10:10

Remote sensing of ocean carbon cycle (Yan Bai)

——Introduce general concepts and main properties in ocean carbon cycle, and principles of satellite remote sensing algorithms. This lecture will focus on estimation of air-sea CO₂ flux, carbon lateral transport flux, and particle sinking export, etc.

10:30 -11:40

Time series satellite records and climate variability (Xiaoyan Chen)

——Introduce the most commonly used climate indices (ENSO, PDO, etc.) and some Essential Climate Variables recorded by satellites, such as sea surface chlorophyll, sea surface wind, sea surface temperature; Analyze these data variables derived from multi-satellites to understand the potential responses of marine system to climate variability over the global ocean, the Bay of Bengal, and the South China Sea, respectively.

14:30 -17:10

Hands-on Training: SatCO₂ software

——Practice related modules (functions) of SatCO₂ software on 1) carbon flux estimation and 2) time series satellite data analysis.

Thursday, October 31, 2019

9:00 -9:40

Group reports

——Representatives of each group report/present their mini project (10 min per report).

9:40 -10:20

Feedbacks about the training course

10:20 -11:00

Certificate of training course issued; group photo

Additional information

1. Laptop preparation and Group division

The training workshop will provide some desktops for hands-on training, but we strongly suggest you to bring your own laptop.

All trainees will be divided into several groups, which can be discussed and finalized on the first day. Trainees in each group will work together during the entire workshop especially for the mini project. Each trainee group is expected to apply satellite data on a special topic, prepare a presentation of their group research results, and report on the last day of the workshop.

2. SatCO2 software from www.SatCO2.com

Laptop with discrete graphics is suggested to ensure the proper functioning of the SatCO2 software. Some functions of the SatCO2 software might not work well for the laptop without discrete graphics, but it is fine as well.

How to check whether your computer is installed with discrete graphics card?

- ◇ Right-click “Computer”, and left-click “Properties”;
- ◇ Left-click “Device Manager”;
- ◇ Left-click “Display adapters”, if it shows “AMD” or “NVIDIA”, then it has discrete graphics card; if it shows only “Intel”, then it doesn’t have discrete graphics card.

3. Install SNAP, Python and GIT on your laptop

Register for data access at <http://coda.eumetsat.int>

Organizers and Invited Speakers

The International Ocean-Colour Coordinating Group (IOCCG)

The International Ocean-Colour Coordinating Group (IOCCG) is an international Committee of experts with representatives from national space agencies as well as the ocean colour and inland water user communities (research scientists). It was established in 1996 under the auspices of the Intergovernmental Oceanographic Commission of UNESCO, following a resolution endorsed by the Committee



on Earth Observation Satellites (CEOS). IOCCG promotes the application of remotely-sensed ocean-colour/inland water radiometry data across all aquatic environments, through coordination, training, liaison between providers (space agencies) and users (scientists), advocacy and provision of expert advice. Objectives include developing consensus and synthesis at the world scale in the subject area of satellite ocean colour radiometry (OCR), establishing specialised scientific working groups to investigate various aspects of ocean-colour technology and its applications, and addressing continuity and consistency of ocean colour radiance datasets through the CEOS OCR-Virtual Constellation. The IOCCG also has a strong interest in capacity building, and conducts and sponsors advanced ocean colour training courses in various countries around the world.

A major focus of the IOCCG is to broaden the user community for ocean-colour data, particularly in developing countries, through the coordination and sponsoring of advanced training courses. The IOCCG has sponsored and coordinated a number of specialized ocean-colour training courses, providing comprehensive training to a large number of students from around 60 different countries. Generally the courses are one to two weeks in duration and are aimed at undergraduate and postgraduate students, university lecturers and researchers.

Website: <https://ioccg.org/>

European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT)

EUMETSAT is an intergovernmental organisation and was founded in 1986. Its purpose is to supply weather and climate-related satellite data, images



and products – 24 hours a day, 365 days a year – to the National Meteorological Services of our Member States in Europe, and other users worldwide. [Copernicus](#) is a European system for monitoring the Earth using satellites and in situ sensors. The Earth observation satellites contributing data to Copernicus are split into two groups of missions: the Copernicus Sentinels and the Contributing Missions.

EUMETSAT provides data, products and support services to the Copernicus information services and user communities, with a focus on marine, atmosphere and climate. This involves delivering Earth observation data services to Copernicus from the Sentinel satellites, from its own [Metop](#) and [Meteosat](#) missions, from the ocean-monitoring [Jason-2](#) and [Jason-3](#) satellites, and from missions of its international partners (e.g. USA, China, India and Japan). EUMETSAT is responsible for operating the [Sentinel-3](#) satellites, with ESA support, and delivering the [marine data](#) and will also operate and deliver products from the [Sentinel-4](#), and [Sentinel-5](#) instruments, and the [Sentinel-6](#) satellites.

Website: <https://www.eumetsat.int/>

State Key Laboratory of Satellite Ocean Environment Dynamics, SIO, MNR

The establishment of the State Key Laboratory of Satellite Ocean Environment Dynamics (SOED) was approved by the Ministry of Science and Technology in July 2006. The lab passed the initial inspection in December 2009. SOED was restructured on the existing Laboratory of Ocean Dynamic Processes and Satellite Oceanography (LOPSO), gathering talents of traditional disciplines of physical oceanography, marine remote sensing and marine ecological environment at the Second Institute of Oceanography, Ministry of Natural Resources of the people's Republic of China. The founding director of SOED was Dr. CHEN Dake, who was an academican of the Chinese Academy of Sciences (CAS). The current Director is Dr. CHAI Fei, and the current Chair of the Academic Committee is CAS Academician WU Guoxiong.



Motivated by vital needs for protecting national maritime rights and interests and for disaster prevention and mitigation, and with the goals of improving technology and theory used for establishing three-dimensional marine environmental monitoring and prediction systems, the staff at SOED carries out research on satellite marine environment dynamics, with an emphasis on application. The lab creates unique marine science and technology platform with distinctively international influences. There are three main research themes at SOED: Technology and Application of Satellite Remote Sensing, Ocean Dynamic Processes and Ecosystems, Ocean Circulation and Climate Change. In addition, there are four supporting platforms: National Marine Satellite Ground Station, China Argo Real-Time Data Center, Computing and Data Center, and Marine Instrument Sharing Platform. These platforms serve marine observation data not only to researchers but also to marine laboratories nationwide.

There are currently over 110 members at SOED, including two academicians of CAS, one academican of Chinese Academy of Engineering (CAE), one member of "National Hundred, Thousand and Ten Thousand Talents Project," three members of national "Ten Thousand Talents Plan," one members of "National Funds for Distinguished Young Scholars," one member of "Young Science and Technology Innovation Leaders," 20 members of provincial and ministerial talents programs. SOED has a well-balanced research team, with highly qualified senior staff as academic leaders and talented young as the backbone.

National Satellite Ocean Application Service (NSOAS)

National Satellite Ocean Application Service (NSOAS) is a public service organization, which is under Ministry of Natural Resources (MNR), mainly responsible for development of ocean satellite series and satellite ocean applications. NSOAS provides public services for ocean economy, ocean management, ocean safety. Established in 1996, the predecessor of NSOAS was State Oceanic Administration ocean satellite integrative system design department. In September 2000, approved by State Commission Office for Public Sector Reform China, NSOAS was officially founded.



Main Responsibilities of NSOAS are 1. to make plan for China's ocean satellite and satellite ocean application system development, organize key satellite ocean remote sensing application project comprehensively demonstration; 2. to make plan for ocean satellite remote sensing technical standard, organize ocean satellite data application and user training; 3. to assume satellite ocean remote sensing planning and construction, act satellite ocean remote sensing application and technical research; 4. to assume ocean satellite ground application system and ocean satellite ground receiving station construction and operation management; 5. to assume construct and manage ocean satellite data base and information system, make and public ocean satellite data and information product; 6. to undertake ocean satellite remote sensing monitoring, providing service and technical support for public incident and security; 7. to undertake provide the satellite ocean application product and service for ocean environment service support, compile "China Ocean Satellite Application Report"; 8. to take duty of ocean radiation calibration field and real test field planning, construction, maintenance and management, take sea and land test task; 9. to take the duty of ocean satellite data international exchange, organize marine remote sensing international cooperation and academic exchange; 10. to undertake other State Oceanic Administration's matters.

The Chinese ocean satellite programme includes ocean colour (HY-1 satellite series), ocean dynamic monitoring (sea surface wind, ocean surface topography, and sea surface temperature and salinity from HY-2 series), and synthetic aperture radar (SAR, HY-3 series) missions.

http://www1.nsoas.org.cn/NSOAS_En/index.html

The institution of Geographic Information Science, Zhejiang University

The Key Laboratory of Resources and Environmental Information System of Zhejiang Province was permitted to organize in November 1993 and established in April 1995. The laboratory mainly focuses on Digital Earth, Geographic Information System (GIS), Remote Sensing (RS), Global Positioning System (GPS) and other national key high-technology fields. Basing itself on the Department of Earth Sciences, Faculty of Science, Zhejiang University and Institute of Geographic information science of Zhejiang



University. The director of the laboratory and institute, Prof. Liu Renyi, is the academic leader of Geographic Information Science and young expert with outstanding contributions of Zhejiang province. The laboratory offers undergraduate program of Geographic information science, master's and doctoral program of Cartography and Geographic information science (GIS), and master's program of Physical Geography. It now boasts 12 professors, 23 associate professors, 10 post doctor, more than 30 doctoral candidates and more than 50 master candidates.

The laboratory engages in research of GIS theory, technological methodology and application software, including space-time data modeling, high performance GIS, comGIS, WebGIS, massive spatial data management, remote sensing image processing technology, virtual reality GIS, three-dimensional GIS visualization, mobile GIS, etc.. It also undertakes nearly 50 national research projects (including 863 program, National Science Foundation, National Science and Technology Major Projects) and provincial projects. Furthermore, it has won more than 10 provincial and ministerial level scientific and technological progress awards, published more than 60 papers on core journals of China, more than 30 papers cited by SCI/EI, and 7 monographs. It has acquired 33 software copyrights and 5 patent for invention.

The laboratory has accumulated dozens of application software for land, marine, surveying and mapping, water conservancy immigration, urban planning, house property, environment, water conservancy, environmental protection, radio and television, tourism, security, quality supervision, agriculture, forestry, urban law enforcement and administration, planning management, national defense and many other department, which has significant popularization and application.

Through 20 years construction, the laboratory have become a distinctive base for all-round personnel training and scientific research, supplying high-level talents to GIS teaching, research and management in our country, and providing GIS services with many forms to government administration department and society.

Website: <http://gis.zju.edu.cn/>

Invited Talks



CHAI Fei

Director of SOED

Prof. CHAI has a master's degree from Princeton University and a Ph.D. from Duke University. He served as the Director of the School of Marine Sciences at the University of Maine from 2012 to 2015. He is currently a member of several international organizations and programs, promoting interdisciplinary and collaborative research projects. He also serves as an editor of several international journals (Biogeosciences, Ocean Dynamics, Journal of Oceanography, and Progress in Oceanography). He has led and participated in a number of research projects in the United States and China, and has published more than 150 papers in top academic journals, including Science, JGR, EPSL, and GRL.

Deputy General Director of National Satellite Ocean Application Service, Chief Scientist of CFOSAT, Deputy Chief Designer of Ocean Satellite Ground Application system.

Prof. Liu has been engaged in marine satellite engineering construction, marine remote sensing applications and planning demonstration for a long time. He presided over or participated in more than 30 scientific research and construction tasks, such as the completion of the HY- A/B satellite project, Beijing-1 satellite project, manned space civilian remote sensing project and 863 plan, the North and South Arctic expeditions and so on. He has won 8 ministerial science and technology awards and received a special government allowance in 2000. He is currently responsible for the construction and operation of HY-C/D satellite, Sino-French ocean satellite, new generation ocean color satellite project, as well as high-resolution satellite Mudanjiang Station, Snow Dragon ship-borne remote sensing system.



LIU Jianqiang

**Deputy General Director
of NSOAS**



LI Guoqing

Professor of Aerospace Information Research Institute, Chinese Academy of Sciences

Director of National Earth Observation Data Center (NODA)

Director of China GEOSS Data Sharing Network (China GEOSS DSNet)

Dr. Guoqing Li, is the director of National Earth Observation Data Center of China, and a Professor of Aerospace Information Research Institute in the Chinese Academy of Sciences. He has been the Head of the Satellite Data Technology Division since 2007. His favorite research areas concern high-performance remote-sensing image-processing technology and the big earth data. His main focus is currently on next-generation spatial data infrastructure and nature disaster data management. He has served as the Member of the Science Committee of ICSU World Data System for 2 terms and also the co-chair of CODATA Task Group on Linked Open Data for Global Disaster Risk Research since 2012. He has also been involved in the national committees of international organizations of ICSU, CODATA, WDS, IRDR, and GEO.

The Aerospace Information Research Institute (AIR) under the Chinese Academy of Sciences (CAS) was established in July 2017, following the approval for consolidation of three CAS institutes: IECAS, RADl and AOE. AIR houses twenty national-level / CAS-level key laboratories, centers, and unincorporated units. AIR aspires to achieve major scientific breakthroughs and take the lead in constructing a national laboratory in the field of aerospace information by pooling research advantages inherited from its former institutes and in line with major national needs. AIR also houses three committees with the mandate to define national standards for remote sensing technologies, optical-electronic measurement, and to perform quality check for laser devices.

National Earth Observation Data Center (NODA) was founded by the Ministry of Science and Technology of China. NODA has been the largest remote sensing data facility in China and connected to more than 20 Chinese satellite center and research centers. As NODA international data portal, ChinaGEOSS Data Sharing Network is the coordinator to promote and organize Chinese Earth observation resources to participate in regional and global GEOSS activities. It is the connector with China remote sensing data resources with GEO data portal. For the user, they can via such a portal to use more than 30 millions of remote sensing images, especially including Analysis Read Data for 500TB and more than 100 published scientific datasets.

List of Trainees

	Name		Nationality	Email
1	ALLAM, Mona	Remote sensing institute and Digital Earth	Egypt	monaecri@yahoo.com
2	CHOWDHURY, K M Azam	Ocean University of China	Bangladesh	azam_oceanographer.ocn@du.ac.bd
3	GUSMAWATI, Financia Niken	Marine Research Center, Ministry of Marine Affairs and Fisheries of Indonesia	Indonesia	niken.gusmawati@kkp.go.id
4	HE, Huixin (何惠馨)	Ocean University of China	China	hehx_sdut@163.com
6	KIM, Euihyun	Korea Institute of Ocean Science & Technology (KIOST)	South Korea	kimuih@kiost.ac.kr
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11	LU, Shiming (陆诗铭)	Zhejiang University	China	lsm2997@126.com
12	MASCARENHAS, Veloisa John	Institute for Chemistry and Biology of the Marine Environment (ICBM)	India	veloisa.john.mascarenhas@uni-oldenburg.de
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List of Lecturers and Assistants

Name	Institute	Email
BAI, Yan	Second Institute of Oceanography, MNR	baiyan@sio.org.cn
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Assistants

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BAI, Yan

Experience

Mar 2007 ~ Jun 2009 Second Institute of Oceanography, MNR, Assistant Professor

Jul 2009 ~ Dec 2013 Second Institute of Oceanography, MNR, Associate Professor

Jan 2014 ~ Present Second Institute of Oceanography, MNR, Professor

Research Interests

Satellite oceanography and Ocean Optics
Remote sensing of biogeochemistry and Ocean carbon

Selected Publications

- (1) **Bai, Y.**, W.-J. Cai, X. He, et al. A mechanistic semi-analytical method for remotely sensing sea surface pCO₂ in river-dominated coastal oceans: A case study from the East China Sea. *Journal of Geophysical Research: Oceans*, 2015, 120: 2331-2349.
- (2) **Bai, Y.**, X. He, D. Pan, et al. Summertime Changjiang River plume variation during 1998–2010. *Journal of Geophysical Research: Oceans*, 2014, 119: 6238-6257.
- (3) **Bai, Y.**, D. Pan, W.-J. Cai, et al. Remote sensing of salinity from satellite-derived CDOM in the Changjiang River dominated East China Sea. *Journal of Geophysical Research: Oceans*, 2013, 118: 227-243.
- (4) **Bai, Y.**, T.-H. Huang, X. He, et al. Intrusion of the Pearl River plume into the main channel of the Taiwan Strait in summer. *Journal of Sea Research*, 2015, 95:1-15.
- (5) **Bai, Y.**, X. He, S. Yu, et al. Changes in the Ecological Environment of the Marginal Seas along the Eurasian Continent from 2003 to 2014. *Sustainability*, 2018, 10(3): 635.



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Experience

UK government: Senior Earth Observation Scientist (September 2015 – June 2018)
Plymouth Marine Laboratory: Marine Earth Observation Researcher (June 2018 – Current)

Research Interests

Ocean colour remote sensing
Forging patterns of marine mammals
Detection of objects including vessels using Sentinel-1 synthetic aperture radar (SAR)
Detection and classification of floating marine debris using Sentinel-2 data

Selected Publications

Snapir, B., Waite, T. W., and Biermann, L. (2019). Maritime Vessel Classification to Monitor Fisheries with SAR: Demonstration in the North Sea. *Remote Sensing*, 11(3), 353.

Bean, T.P., Greenwood, N., Beckett, R., Biermann, L., et al. (2017). A Review of the Tools Used for Marine Monitoring in the UK: Combining Historic and Contemporary Methods with Modeling & Socioeconomics to Fulfill Legislative Needs and Scientific Ambitions. *Frontiers in Marine Science*.

Fassbender, A.J., Biermann, L., et al. (2017). Perspectives on Chemical Oceanography in a changing environment: Participants of the COME ABOARD Meeting examine the field in the context of 40 years of DISCO. *Marine Chemistry*.

Biermann, L., Guinet, C., Bester, M., Brierley, A.S., & Boehme, L. (2015). An alternative method for correcting fluorescence quenching. *Ocean Science*, vol. 11, no. 1, pp. 83-91.

Burls, N.J. and Biermann, L. (2013). An African Perspective on Climate Education and Outreach. *ACCESS Research Highlights 2013*, pp. 41-43.

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Experience

Aug. 2013 ~ Dec. 2018 University of South Florida, Ph.D.
Dec. 2018 ~ Present Second Institute of Oceanography, MNR, Associate Professor

Research Interests

Ocean color remote sensing
Oceanic carbon cycling, primary production, air-sea CO₂ flux
Marine disasters (i.e., algal blooms, oil spills)

Selected Publications

- (1) **Chen, S.**, & Hu, C. (2019). Environmental controls of surface water pCO₂ in different coastal environments: Observations from marine buoys. *Continental Shelf Research*, 183, 73-86.
- (2) **Chen, S.**, Hu, C., Barnes, B. B., Wanninkhof, R., Cai, W. J., Barbero, L., & Pierrot, D. (2019). A machine learning approach to estimate surface ocean pCO₂ from satellite measurements. *Remote sensing of environment*, 228, 203-226.
- (3) **Chen, S.**, Hu, C., Barnes, B. B., Xie, Y., Lin, G., & Qiu, Z. (2019). Improving ocean color data coverage through machine learning. *Remote sensing of environment*, 222, 286-302.
- (4) **Chen, S.**, and C. Hu (2017). Estimating sea surface salinity in the northern Gulf of Mexico from satellite ocean color measurements. *Remote Sensing of Environment*, 201, 115-132.
- (5) **Chen, S.**, and C. Hu (2014). In search of oil seeps in the Cariaco basin using MODIS and MERIS medium-resolution data. *Remote Sensing Letters*. 5(5): 442-450.



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Experience

Sep 2010 ~ Jun 2013 Zhejiang University, Ph.D. candidate
Jul 2013 ~ Present Second Institute of Oceanography, MNR, Assistant Professor

Research Interests

Phytoplankton and their responses to climate variability
Long-term time series data analysis
Oceanic biological and physical response to tropical cyclones
Remote sensing of upwelling

Selected Publications

- (1) **Chen, X.**, D. Pan, Y. Bai, et al. Estimation of typhoon-enhanced primary production in the South China Sea: A comparison with the Western North Pacific. *Continental Shelf Research*, 2015, 111: 286-293.
- (2) **Chen, X.**, D. Pan, Y. Bai, et al. Episodic phytoplankton bloom events in the Bay of Bengal triggered by multiple forcings. *Deep Sea Research Part I*, 2013, 73:17-30.
- (3) **Chen, X.**, D. Pan, X. He, et al. Upper ocean responses to category 5 typhoon Megi in the western north Pacific. *Acta Oceanologica Sinica*, 2012, 31(1): 51-58.
- (4) **Chen, X.**, Y. Bai, X. He, et al. Unusual phytoplankton blooms in the southwestern Bay of Bengal: a comparative study. *Proceedings of SPIE*, 2017, DOI:10.1117/12.2278010.
- (5) Wang, H., **X. Chen***, Y. Bai, et al. Abnormal upwelling off the southeast of Vietnam in summer 2016. *Proceedings of SPIE*, 2018.

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CLEMENTS, Oliver

Experience

Oliver has worked in the area of data services and data visualisation for the last 7 years. He has worked on several European projects championing the use of open data services such as Web Coverage Service. He has also focused on providing material and tools so that non-specialists, such as farmers, are able to make use of and benefit from the large archives of satellite data that are available.

Research Interests

As a programmer Oliver is very interested in producing web based tools to allow exploitation of satellite data, this usually takes the form of a web based GIS systems. More recently he has started working with teaching tools such as Jupyter notebooks as another way to promote the use of satellite data.

Selected Publications

Geospatial web services pave new ways for server based on demand access and processing of Big Earth Data.

Julia Wagemann, Oliver Clements, Ramiro Marco Figuera, Angelo Pio Rossi & Simone Mantovani (2018)

International Journal of Digital Earth, 11:1, 7-25

DOI:10.1080/17538947.2017.1351583

Use of Sentinel-1 and Sentinel-2 for Monitoring Illegal Fishing Off Ghana

Andrey Kurekin, Benjamin Loveday, Oliver Clements, Graham Quartly, Peter Miller, George Wiafe, Kwame Adu Agyekum

IGARSS 2018 - 2018 IEEE International Geoscience and Remote Sensing Symposium

DOI: 10.1109/IGARSS.2018.8519539

[Chapter] Fostering Cross-Disciplinary Earth Science Through Datacube Analytics

In book: Earth Observation Open Science and Innovation (Jan 2018)

DOI: 10.1007/978-3-319-65633-5_5



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Experience

Sep 2004 ~ Jun 2007 Shanghai Institute of Technology and Physics, CAS, Ph.D. candidate
Jul 2002 ~ 2004 Second Institute of Oceanography, MNR, Assistant Research Scientist
2004 ~ 2006, Second Institute of Oceanography, MNR, Assistant Professor
2006 ~ 2009, Second Institute of Oceanography, MNR, Associate Professor
2009 ~ Present, Second Institute of Oceanography, MNR, Professor

Research Interests

Radiative transfer in a coupled ocean-atmosphere system
Atmospheric correction of ocean color remote sensing
Satellite oceanography based on ocean color remote sensing

Selected Publications

- (1) **He, X.**, K. Stamnes, Y. Bai, et al. Effects of Earth curvature on atmospheric correction for ocean color remote sensing. *Remote Sensing of Environment*, 2018, 209: 118~133.
- (2) **He, X.**, Y. Bai, J. Wei, et al. Ocean color retrieval from MWI onboard the Tiangong-2 Space Lab: preliminary results. *Optics Express*, 2017, 25(20): 23955~23973.
- (3) **He, X.**, D. Pan, Y. Bai, et al. A Practical Method for On-Orbit Estimation of Polarization Response of Satellite Ocean Color Sensor. *IEEE Transactions on Geoscience and Remote Sensing*, 2016, 54(4): 1967-1976.
- (4) **He, X.**, Y. Bai, D. Pan, et al. Using geostationary satellite ocean color data to map the diurnal dynamics of suspended particulate matter in coastal waters. *Remote Sensing of Environment*, 2013, 113: 225-239.
- (5) **He, X.**, Y. Bai, Q. Zhu, et al. A vector radiative transfer model of coupled ocean-atmosphere system using matrix-operator method for rough sea-surface. *Journal of Quantitative Spectroscopy and Radiative Transfer*, 2010, 111: 1426-1448.

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Experience

Jul 2008 ~ Jun 2011 Shanghai Institute of Technical Physics, CAS, Ph.D. candidate

Jul 2011 ~ Jun 2013 Second Institute of Oceanography, MNR, Postdoctoral Fellow

Jul 2013 ~ Present Second Institute of Oceanography, MNR, Associated Professor

Research Interests

Harmful algal bloom detection, phytoplankton bloom type discrimination
Lidar ocean remote sensing including bathymetry and optical properties retrieval
Hydrologic optics including radiative transfer model
Optical measurement and optical instrument design

Selected Publications

- (1) Shi, L., **B. Tao***, Z. Mao, et al. Retrieval of absorption coefficients for a drinking water source using a green-red band quasianalytical algorithm. *Journal of Applied Remote Sensing*, 2018, 12(4):42802.
- (2) **Tao, B.**, Z. Mao, H. Lei, et al. A semianalytical MERIS green-red band algorithm for identifying phytoplankton bloom types in the East China Sea. *Journal of Geophysical Research: Oceans*, 2017, 122(3):1772-1788.
- (3) **Tao, B.**, Z. Mao, H. Lei, et al. A novel method for discriminating *Prorocentrum donghaiense* from diatom blooms in the East China Sea using MODIS measurement. *Remote Sensing of Environment*, 2015, 158:267-280.
- (4) **Tao, B.**, Z. Mao, D. Pan, et al. Influence of bio-optical parameter variability on the reflectance peak position in the red band of algal bloom waters. *Ecological Informatics*, 2013, 16:17-24.
- (5) **Tao, B.**, Z. Mao, D. Pan, et al. Optical detection of *Prorocentrum donghaiense* blooms based on multispectral reflectances. *Acta Oceanologica Sinica*. 2013, 32(10):48-56.



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Experience

Jul 1998 ~ Jun 2001 Zhejiang Provincial Surveying and Mapping Bureau, Associate Engineer
Sep 2014 ~ Oct 2015 University of California, Santa Barbara, Visiting Scholar
Jul 2007 ~ Present Zhejiang University, Lecturer / Associate Professor

Research Interests

Spatio-temporal modeling
High-performance GIS computation and analysis

Selected Publications

- (1) **Zhang, F.**, X. Sun, Y. Zhou, et al. Ecosystem health assessment in coastal waters by considering spatio-temporal variations with intense anthropogenic disturbance. *Environmental Modelling & Software*, 2017, 96: 128-139.
- (2) **Zhang, F.**, J. Zhou, R. Liu, et al. A new design of high-performance large-scale gis computing at a finer spatial granularity: a case study of spatial join with spark for sustainability. *Sustainability*, 2016, 8(9): 926.
- (3) **Zhang, F.**, Y. Wang, M. Cao, et al. Deep-learning-based approach for prediction of algal blooms. *Sustainability*, 2016, 8(10): 1060.
- (4) **Zhang, F.**, Y. Zheng, D. Xu, et al. Real-time spatial queries for moving objects using storm topology. *International Journal of Geo-Information*, 2016, 5(10): 178.
- (5) **Zhou, Y.**, F. Zhang, Z. Du, et al. Integrating Cellular Automata with the Deep Belief Network for Simulating Urban Growth. *Sustainability*, 2017, 9: 1786.

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Research Interests	Remote sensing study on the atmospheric radiation transmission based on ultraviolet band



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Research Interests	Computational fluid dynamics Shallow water flow and sediment transportation



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Research Interests	Marine ecological environment



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Research Interests	Ocean color remote sensing

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Research Interests Estimation of particulate organic carbon flux in high dynamic Changjiang Estuary by satellite and FVCOM model



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Research Interests Remote sensing estimation of organic carbon storage and flux in upper ocean



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Institute Zhejiang University

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Research Interests Spatial-Temporal image fusion based on sparse representation



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Research Remote sensing study on the variation of dissolved
Interests organic carbon export of the Arctic great rivers



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Research Computational fluid dynamics
Interests Shallow water flow and sediment transportation



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Research Spatial-temporal visualization
Interests

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Research Interests	Decadal changes in chlorophyll concentration and primary production in marginal seas



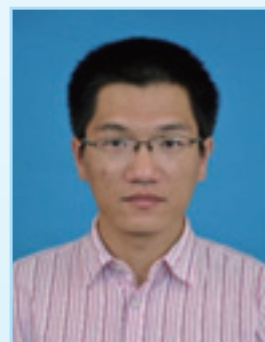
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Research Interests	Remote sensing based analysis of global partial pressure of carbon dioxide



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Research Interests	Inherent Optical Properties



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Travel

Transportation

Hangzhou Xiaoshan International Airport

Hangzhou Xiaoshan International Airport is about 30km away from Wulin Square, the centre of the city. Zhejiang New Century Hotel is located about 3km from Wulin Square. For passengers to and from this airport, both shuttle buses and taxis are available. Shuttle buses (CN¥20) between the airport and Wulin Square are available from 7:30am until after the last flight; the time interval is 15-30 minutes or whenever the bus is full. Tickets should be purchased at the booth just outside the airport exit before boarding the bus. Alternatively, taxis can be a convenient way of getting around Hangzhou and you can easily hail one along almost any street. A taxi will cost about CN¥15 from Wulin Square to Zhejiang New Century Hotel. The cost is about CN¥130.00 by taxi from the airport to Zhejiang New Century Hotel.

By train

There are two kinds of bullet trains running between Shanghai and Hangzhou. One has the letter “G” at the beginning of its train number, and the other begins with the letter “D”. The speed of the G-train is up to 350km/hr, which enables the train to complete the trip in 45 to 60 minutes. The D-train is a little slower, taking about 60 to 90 minutes to ending the trip. Departing from Shanghai Hongqiao Railway Station, over 100 high-speed trains run between these two cities from 06:00 to 21:30 every day. The cost is about CN¥30 by taxi from Hangzhou railway station to Zhejiang New Century Hotel.

Tips

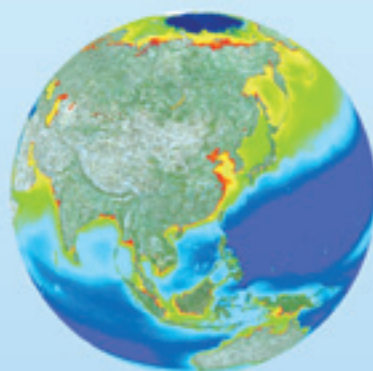
Weather

Electric power in Hangzhou is 220 volt, 50HZ alternating current. Laptop computers usually have dual voltage (110 and 240 V) charging devices, but other electrical appliances (e.g. iPods, cameras) may require electrical voltage converters – please check beforehand to avoid any potential damage or inconvenience. A variety of electrical outlets can be found throughout China, so a good all-around adaptor plug set is also recommended.

Internet

Bing is a web search engine owned and operated by Microsoft. When you are in China, you can use Bing instead of Google to enjoy internet surfing.

Webpage: www.bing.com



2019 Advanced Training Course on Ocean Colour Remote Sensing

24 – 31 October 2019, Hangzhou, China



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