

2020-2022 GEO Work Programme Activities

(Community Activities)

Global Ecosystem and Environment Observation Analysis

Research Cooperation (GEOARC)

Contents

1. Executive Summary	1
2. Purpose.....	1
3. Background and Previous Achievements.....	2
4. Key Activities	4
5. Relationship to GEO Engagement Priorities and to others.....	5
6. Governance	7
7. Data Policy	8
Tables.....	10
Annexes.....	16

1. Executive Summary

- Full title of the Community Activity: **Global Ecosystems and Environment Observation Analysis Research Cooperation**
- Short title or acronym: **GEOARC**
- Proposed or existing category: **Community Activity**

Overview (summary of section 2 below)

This activity mainly focus on the ecological and environmental monitoring at global or regional scope, to provide information and knowledge service to support the GEO priorities, including Sustainable Development Goals (SDGs), Paris Agreement, and Sendai Framework for Disaster Risk Reduction. This activity promote a cooperation network to release Annual Report and share related dataset by training courses or workshops.

Planned Activities (summary of section 4 below).

- 1) Integrate multi-source data for global or regional terrestrial ecological and environmental monitoring, and provide Analyzed Ready Dataset for sharing.
- 2) Analyze and evaluate the global, regional ecosystem and environment status and provide the policy-making based information for the public human health and environment protection.
- 3) Compose and release the Annual Report to the public. The Annual Report and the related Data Products will be shared by the GEOSS portal (<http://www.geoportal.org/>; <http://www.geodoi.ac.cn/WebCn/>) and ChinaGOESS DSNet (<http://www.chinageoss.org/geoarc/>).
- 4) Organize side events at the GEO Plenary and special sessions in different international conferences; hold or attend training workshops for the Annual

Report and Data Product applications.

2. Purpose

In recent decades, the global economy and science/technology have made rapid progresses, which has created huge wealth for mankind. However, it has also accelerated the predatory consumption of resources on the earth and the wanton destruction of the common environment. The global warming, the relative lack of resources, ecosystem degradation and environmental pollution, human induced disasters will not only threat the global or regional ecological environment safety, but also influence the global economy sustainable development and social stability. It is challenging issues to protect the surrounding ecological environment, and remote sensing can play a significant role for global or regional ecological environment monitoring. This activity aims to:

- Improve the standard methodology for ecological and environmental monitoring at a global or regional scope.
- Promote the international cooperation network for all participants to support data sharing, product validation, information communication and public decision-making.
- Provide information and knowledge service to support the GEO priority fields of Sustainable Development Goals (SDGs), Paris Agreement, and Sendai Framework for Disaster Risk Reduction.
- Release Annual Report and share related dataset by training courses or workshops, deliver and exchange information among the current GEOSS programme activities.

3. Background and Previous Achievements

Ecological and environmental monitoring and analysis has been partially conducted in various GEO activities, such as AfriGEO, AmeriGEO, AOGEO, EUROGEO, GEO BON, GEOGLAM, GFOI. For public decision-maker support, a user-oriented easy-reading and comprehensive report is required. Following the Global Ecosystem and Environment Observation and Analysis Annual Reports, which were launched by the Ministry of Science and Technology of the People's Republic of China in 2012, the GEOARC has been adopted as a Community Activity in the 2017 - 2019 GEO Work Programme. There are series outputs have been released in 2018.

- Regional Ecosystem Trends along the Belt and Road
- Supply Situation of Maize, Rice, Wheat and Soybean
- Temporal Dynamics and Spatial Distribution of Global Carbon Source and Sink



Fig.1 GEOARC 2018

The Annual Reports in 2018 mainly focus on the typical ecological environment

elements and hot environment issues, the dynamic monitoring and comprehensive analysis was conducted using the advantage of the earth observation technology. The Annual Reports were published, and the related datasets have been released on the website (<http://chinageoss.org/dsp/home/index.jsp>) and published by the Global change scientific research data publishing system (<http://www.geodoi.ac.cn/WebCn/>), all of which are open to public for free. Until June 17, 2018, according to incomplete statistics for 2012-2017 Annual Reports, more than 1000 reports have been made by major news media, the downloads of Annual Report were 11107, and the downloads of related products were 12,136, and the downloaded datasets reached 124.95TB.

The Annual Report has made a positive impact in China and abroad, and has attracted extensive attention from the industry, the public and the media. The Annual Report has been widely publicized through international cooperation, and its international influence has been increasingly enhanced, highly recognized by international peer experts and closely watched by international organizations. In order to keep good continuity and cooperation, the Annual Reports during 2020 to 2022 have been planned and organized, which has great significant for the implementation of SDGs.

4. Key Activities

The activity would like to generate information and knowledge in the Annual Report to support decision-making. To summarize, it's a synergic activity of collection, integration, interpretation and knowledge-generation in the global or regional scope of ecology and environment. On the basis of the existing Annual Reports, global ecological environment monitoring by remote sensing with multi-frequency, multi-topic and multi-hot regions will be carried out in the future. The global ecological environment monitoring reports from 2020 to 2022 are mainly planned for continuous monitoring, hot regions and hot issues monitoring, focusing

on sustainable agriculture, global natural disasters monitoring, atmospheric environment monitoring and climate change response, global carbon source and sink, sustainable ecological environment and service, marine/coastal resources monitoring, water resources management, land degradation/desertification monitoring and evaluation, glacier monitoring and dynamic change, sustainable development of clean energy, etc., which are highly related with SDGs.

The main activities include:

- Remote sensing data integration and normalization, the Multi-source Synergized Remote Sensing Common Product Generation platform for Products including:

Land Cover (LC), Solar Radiation (SR), Photosynthetically Active Radiation (PAR), Photosynthetic Thermal Productivity (PTP), Precipitation, Evapotranspiration (ET), Fraction of Vegetation Cover (FVC), Leaf Area Index(LAI), Vegetation Index(VI), Biomass, Phenology, Fraction of Absorbed Photosynthetically Active Radiation(FAPAR), Albedo, Net Primary Productivity (NPP), Gross Primary Productivity(GPP), Urban Heat Island, Arable Land use Intensity, Cropping Index, Farmland Planting Proportion, Arthropod-borne, etc..

- Annual Report composing, invite different industries or different countries to work together and employ experts of different fields to analyze the condition of ecosystem and environment and monitoring the global change, even make suggestions for the local development, to protect the health of human and environment and form the Annual Reports;

- Annual Report and product releasing to the public at the GEO Plenary, Annual Report and products publication on the GEOSS portal (<http://www.geoportal.org/>; <http://www.geodoi.ac.cn/WebCn/>)

- Organizing side event or joining in the international conferences, communities or training workshops to publicity the reports and data sharing, such as GEO ministerial summit meeting, GEO plenary session, GEO Week, AP-GEOSS session, etc.

5. Relationship to GEO Engagement Priorities and to other Work Programme Activities

5.1 Relationship to GEO Engagement Priorities

GEOARC pay more attention to the three priorities of the GEOSS, which focus on eight key fields, such as disaster prevention and reduction, food security and sustainable agriculture, water management, energy and natural resource management, human health monitoring, environmental impact of biodiversity and ecosystem protection, urban development, infrastructure and traffic management, to provide three categories of products and technical services, including data, information and knowledge.

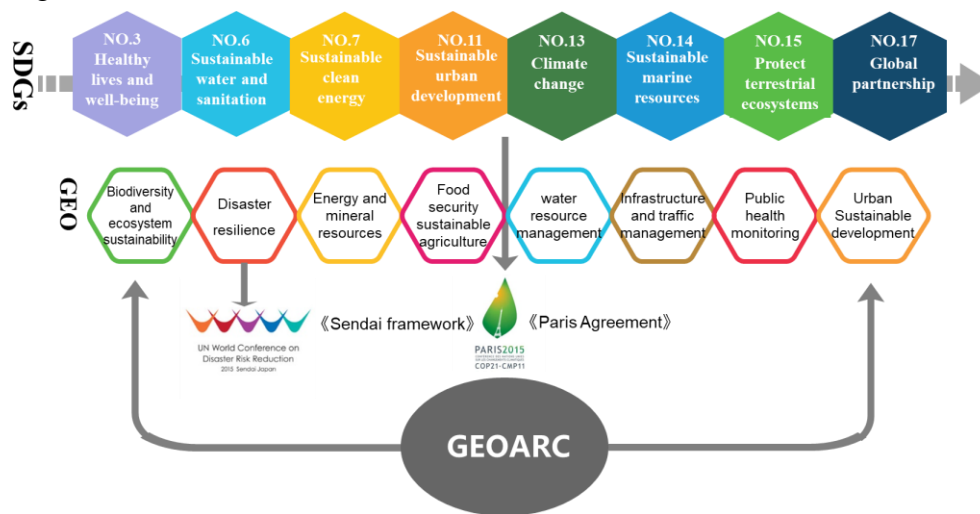


Fig.2 The relationship between GEOARC and SDGs & GEO

The planned contents of GEOARC for 2020-2022 are highly related with Paris Agreement, Sendai Framework for Disaster Risk Reduction, and SDGs, such as

SDGs3, 6, 7, 11, 13, 14, 15, 17.

- SDGs3 ensure healthy lives and promote well-being for all at all ages;
- SDGs6 Ensure availability and sustainable management of water and sanitation;
- SDGs7 ensure access to affordable, reliable, sustainable and modern energy;
- SDGs11 Make cities and human settlements inclusive, safe, resilient and sustainable;
- SDGs13 Take urgent action to combat climate change and its impacts;
- SDGs14 Conserve and sustainably use the oceans, seas and marine resources for sustainable development;
- SDGs15 Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss;
- SDGs17 Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development.

5.2 Relationship to other Work Programme Activities

GEOARC will keep close connection with other related other Work Programme Activities

- GEOMUSYQ have supported the monitoring and analyzing the typical ecological environment elements and hot environment issues. MuSyQ products have been directly used to support the GEOARC (Global Ecosystems and Environment Observation Analysis Report Cooperation) report and these products played the great role. The products of GEOMUSYQ will support the GEOARC continually during

2020-2022 as the main data source.

- AOGEO is a regional GEO for ASIA-OCEANIA region. Ecosystem and Environment Monitoring is a main task of AOGEO. This activity aims to evaluate and monitor the ecological and environmental situations in Asia and Ocean area, which made a solid basis for GEOARC to conduct the ecological and environmental monitoring at global scale.

- The "Belt and Road" initiative put into practice of the new concept of green development in the process of construction, investment and trade, advocate a green, low-carbon, circular and sustainable way of life and production, strengthen cooperation in ecological and environmental protection, avoid possible risks, and jointly build the green Silk Road. The monitored contents about ecology and environment in 2020-2022 GEOARC are well responding the initiative, which will provide a basis to formulate environmental policies, and deepens the public's understanding of the global ecological environment.

6. Governance

- Leadership

Under the leadership of the Ministry of Science and Technology (MOST) of the People's Republic of China, the Annual Report is organized by the National Remote Sensing Center of China (China GEO Secretariat), assisted by the State Key Laboratory of Remote Sensing Science in operation and management. The ecological environment remote sensing research center was jointly established by the two sides, which is responsible for the daily operation of the Annual Report. The foreign organizations like EAS and other GEO members are welcome to participant in the GEOARC.

- Workgroups

The top research teams at home and aboard were organized interdepartmentally, giving full play to the advantages of remote sensing technology, the ecological environment of long-term dynamic change monitoring by remote sensing were conducted at the global, regional and national scales, to analyze the ecological environment change rule and driving factor, to release the Annual Report and datasets. The work group contains five parts: Supply Situation of Maize, Rice, Wheat and Soybean, disaster monitoring and assessment, ecology and environment monitoring, climate change monitoring and analysis, data publish and sharing. The advisory and expert groups give suggestion during the process of Annual Report writing and the secretariat group gives service to guarantee the Annual Report releasing successfully. In a word, the Annual Report was governed from organization, manpower and technology to ensure the orderly and smooth work.

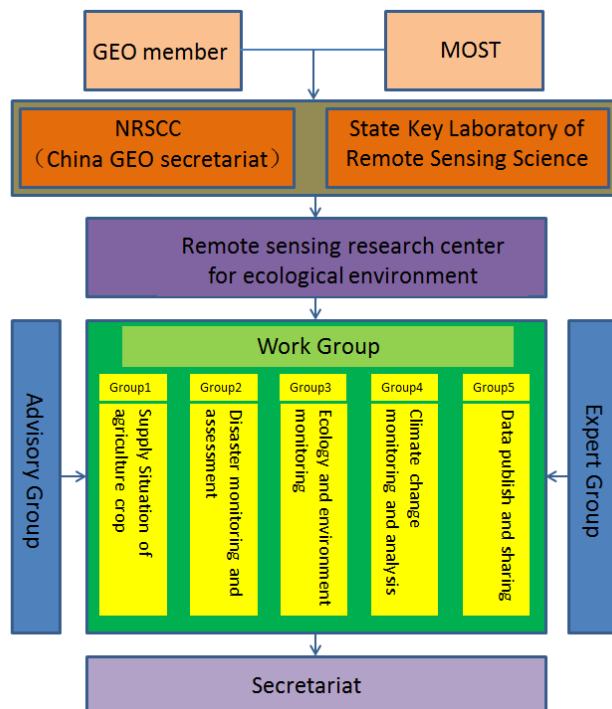


Fig.3 Organization structure of GEOARC

7. Data Policy

GEO promote and encourage the implementation of GEOSS Data Management Principles laid out below five headings: discoverability, accessibility, usability, preservation, and curation. GEOARC will strictly abide by GEOSS Data Management Principles. China GEOSS Data Sharing Network has been proposed as a part of China's Plan for Implementing GEOSS (2016-2025) to address the restrictions in distributed resource management and tightly coupled service interoperability and facilitating cross-disciplinary exploration and application. China GEOSS Data Sharing Network develops a national GEOSS data sharing framework, including resource integration mechanism, sharing-oriented metadata standards, and lightweight interoperability service to coordinate various Earth observation resources and enhances international cooperation. The related datasets of Global Ecosystems and Environment Observation: Annual Report from China (GEOARC) can also be queried and downloaded for free at the website (<http://www.nrsc.gov.cn/>) of National Remote Sensing Center of China and ChinaGOESS DSNet (<http://www.chinageoss.org/geoarc/>).

Tables

A. Individual Participants

Name	Organization	Email	Nationality	contributions
Leader				
Zhang Songmei	NRSCC	songmei.zhang@nrsc.gov.cn	China	Leader
Contact				
Miao Chen	NRSCC	geoarc@nrsc.gov.cn	China	Contact
Ecology and environment monitoring				
Liu Qinhuo	RADI	liuqh@radi.ac.cn	China	Ecology and Environment
Shi JianCheng	RADI	shijc@radi.ac.cn	USA	Ecology and Environment
Gong Peng	THU	penggong@mail.tsinghua.edu.cn	China	Land Cover
Liang Shunlin	UMD	sliang@umd.edu	USA	LAI
Alfredo Huete	UTS	Alfredo.Huete@uts.edu.au	Australia	Ecology and Environment
Gao Zhihai	IFRIT	zhihai_gao@163.com	China	Land Degradation
Niu Zheng	RADI	niuzheng@radi.ac.cn	China	Urban
Zhang Yili	IGSNRR, CAS	zhangyl@igsnr.ac.cn	China	Ecology and Environment
Su Fenzhen	IGSNRR, CAS	sufz@lreis.ac.cn	China	Ecology and Environment
Biswajit Nath	CU	nath.gis79@gmail.com	Bangladesh	Earthquake, Vegetation and Environment
Cathy Nielsen	ECCC	Cathy.nielsen@canada.ca	Canada	Environment and Monitoring Methods
RangaMeneni	BU	ranga.myneni@gmail.com	USA	LAI
YuYunyue	NOAA	yunyue.yu@noaa.gov	USA	Radiation Products
Zhu Zhiliang	USGS	zhu@usgs.gov	USA	Land Cover
Dara Entahabi	MIT	darae@mit.edu	USA	Smapsoil Moisture Product and Validation

Gregory Asner	SU	gpa@carnegiescience.edu	USA	Ecosystem Monitoring
Manop Aorpimai	APSCO	manop@apsco.int		Ecosystem Monitoring
Sungu Lee	KARI	leesg@kari.re.kr	Korea	Ecosystem Monitoring
Bassem Ebead	SCU	Bassem_ebead@agr.suez.edu.eg	Egypt	Hydrology
Debashish Chakravarty	IIT	drdebashish.chakravarty@gmail.com	India	Geo-hazards and Environmental Studies
Marco Mancini	PUM	marco.mancini@polimi.it	Italy	ET/Hydrology
Massimo Menenti	TUD	m.menenti@tudelft.nl	Netherlands	ET
Wim Bastiaanssen	UNESCO-IHE	w.bastiaanssen@unesco-ih.e.org	Netherlands	ET/Water Accounting
Zhongbo Su	UT	z.su@utwente.nl	Netherlands	Evapotranspiration and surface fluxes
Majid Nazeer	COMSATS IIT	majid.nazeer@comsats.edu.pk	Pakistan	Coastal and Inland water quality Parameters Modeling
Muhammad Shakir	IST	mshakirgeo@gmail.com	Pakistan	Vegetation
Gabriel Del Barrio	CSIC	gabriel@eeza.csic.es	Spain	Vegetation Products Validation
Qiaoyun Xie	UTS	qiaoyun.xie@uts.edu.au	Australia	Ecology and Environment
Xin Xiaozhou	RADI	xinxz@radi.ac.cn	China	Radiation Products
Li Jing	RADI	lijing01@radi.ac.cn	China	Vegetation Products
Zhong bo	RADI	zhongbo@radi.ac.cn	China	System and Technology
Wu Junjun	RADI	wujj@radi.ac.cn	China	Ecosystems and Environment
Li Li	RADI	lili3982@radi.ac.cn	China	Ecosystems and Environment
Di Wu	MEE	wudi@mep.gov.cn	China	Ecosystems and Environment
Supply situation of agriculture crop				
Wu Bingfang	RADI	wubf@irsa.ac.cn	China	Agriculture
Miao Zhang	RADI	zhangmiao@radi.ac.cn	China	Agriculture
Chris Justice	UMD	cjustice@umd.edu	USA	Agricultural Monitoring
Climate change monitoring and analysis				

Zeng Ning	IAP	zeng@lasg.iap.ac.cn	USA	Climate Change
Phil Delola	UMD	pdecola@umd.edu	USA	Earth Observation, Climate Change
Disaster monitoring and assessment				
Wu Jianjun	BNU	jjwu@bnu.edu.cn	China	Disaster
Gong Adu	BNU	gad@bnu.edu.cn	China	Vegetation and Disaster
Shukla Acharjee	DU	sacharjee@dibru.ac.in	India	Vegetation Index, Urban heat Island and Disaster (flood)
Md. Nurul Islam	JU	nislamju@gmail.com	Bangladesh	Flood Monitoring and Mitigation
Data publish and sharing				
Li Guoqing	RADI	ligq@radi.ac.cn	China	Data Sharing
Liu Chuang	IGSNRR	lchuang@igsnr.ac.cn	China	Data Publish
Li Xin	NIER	lixin@lzb.ac.cn	China	Validation Data
Xiao Qing	NIER	xiaoqing@lzb.ac.cn	China	Validation Network
Li Fuqin	GA	Fuqin.Li@ga.gov.au	Australia	Products Application
Kevin Gallo	NOAA	Kevin.P.Gallo@noaa.gov	USA	US Validation Network
Jan-Peter Muller	UCL	j.muller@ucl.ac.uk	UK	European Validation Network
Jean-Loius Roujean	Météo-France	jean-louis.roujean@meteo.fr	France	Land Surface and Atmosphere Interactions
YannKerr	ESA	yann.kerr@cesbio.cnes.fr	France	SMOS Soil Moisture Product and Validation
Secretariat				
Zhang Chi	NRSCC	zhangchi@nrsc.gov.cn	China	Secretariat Group
Zhang Jing	NRSCC	zhangjing@nrsc.gov.cn	China	Secretariat Group
Liu Yiliang	NRSCC	liuyiliang@nrsc.gov.cn	China	Secretariat Group
Wang Sisi	NRSCC	wangsisi@nrsc.gov.cn	China	Secretariat Group
Liu Yan	RADI	liuyan@nrsc.gov.cn	China	Secretariat Group
Li Han	NRSCC	lihan@nrsc.gov.cn	China	Secretariat Group

Chen Chunyang	NRSCC	chenchunyang@nrsc.gov.cn	China	Secretariat Group
Guo Jiahuan	NRSCC	guojiahuan@nrsc.gov.cn	China	Secretariat Group
Han Huipeng	ITS	hanhuipeng@nrsc.gov.cn	China	Secretariat Group

B. Confirmed Contributions

Contribution category	Description
Data	China Centre For Resources Satellite Data and Application, Satellite Environment Center, Ministry of Environment Protection of China, National Satellite Meteorological Centre, China Meteorological Administration, ESA and other organizations provide data support of GF-1, GF-2, GF-6, HJ-1A/1B, MODIS, FY4A, MSG3/4, FY3/MERSI & VIIRS, AVHRR, etc..
Resources	<ul style="list-style-type: none"> ✓ Multi-source data Synergized Quantitative remote sensing production system (MuSyQ), integrating multi-sensory data as MODIS, FY3/MERSI & VIIRS, MSG2/3, GOES13/GOES15, MST2/Himawari-8, AVHRR, HJ-1/CCD, GF-1, ZY-3, CBERS-04, Landsat/TM to produce various vegetation and radiation remote sensing products. ✓ A Chinese validation network in national scale where the core observation sites are the Huailai Station, the Hulunber Station, the Heihe Station, the Jingyuetan Station, Minqin Station, Daxing'anlin Station, Hainan Station, Pu'er Station and Dongting Lake Station. ✓ New software developed for image analysis on the Shenweитайhu Light Super Computer, Ranked the fastest in the world in 2016 and 2017
Projects and financials	<ul style="list-style-type: none"> ✓ "Report on Remote Sensing Monitoring of Global Ecosystems and Environment" supported by Ministry of Science and Technology, China (6 million CNY/yr); ✓ projects supported by the state key laboratory of Remote Sensing Sciences, Institute of Remote Sensing and Digital Earth, Chinese Academy of Sciences (5 million CNY /yr) ; ✓ "High Spatio-temporal Resolution Carbon Emission Monitoring and Application Demonstration of Beijing-Tianjin-Hebei Urban Agglomeration", supported by Chinese Ministry of Science and Technology, China. (8 million CNY /yr) ✓ "Research and Demonstration on Key Technologies of Space-Earth Integrated Cooperative Monitoring Emergency Response to Heavy and Extreme Disasters", supported by Chinese Ministry of Science and Technology, China. (8.5 million

	<p>CNY /yr)</p> <p>✓ “Key Parameters Development of Global Change Based on Domestic Satellite Data”, supported by Chinese Ministry of Science and Technology, China. (3.2 million CNY /yr)</p> <p>✓ Scientific Cognition and Cloud Sharing Platform for Global Change Big Data, supported by Chinese Ministry of Science and Technology, China. (7 million CNY /yr)</p>
--	---

Annexes

I. Acronyms and abbreviations

- Ministry of Ecology and Environment of the People’s Republic of China(MEE/China)
- Ministry of Science and Technology of the People’s Republic of China (MOST/China)
- National Remote Sensing Center of China (NRSCC/China)
- Institute of Remote Sensing and Digital Earth (RADI/CAS/China)
- Institute of Geographic Sciences and Natural Resources Research (IGSNRR/CAS/China)
- Northwest Institute of Eco-Environment and Resources (NIER/CAS/China)
- Research Institute of Forest Resource and Information Techniques (IFRIT/CAF/China)
- Satellite Surveying and Mapping Application Center (SASMAC/NASG/China)
- National Geomatics Center of China(NGCC/NASG/China)
- Second Institute of Oceanography (SIO/SOA/China)
- Institute of Telecommunication Satellite (ITS/CAST/China)
- Space Star Technology Co., Ltd (SSTC/China)
- Tsinghua University (THU/China)
- Beijing Normal University (BNU/China)
- Southwest Jiaotong University (SWJTU/China)
- Jiangsu Normal University(JSNU/China)

- Geosciences Australia (GA/Australia)
- University of Technology Sydney (UTS/Australia)
- International Institute for Applied Systems Analysis (IIASA/Austria)
- University of Chittagong (CU/Bangladesh)
- Jahangirnagar University (JU/Bangladesh)
- Suez canal university (SCU/Egypt)
- Joint Research Center (JRC/EU)
- European Space Agency (ESA/France)
- Dibrugarh University (DU/India)
- Indian Institute of Technology Karagpur (IIT/India)
- Polytechnic University of Milan (PUM/Italy)
- Delft University of Technology (TUD/Netherlands)
- Institute for Water Education (UNESCO-IHE/Netherlands)
- University of Twente (UT/Netherlands)
- Institute of Space Technology (IST/Pakistan)
- COMSATS Institute of Information Technology (COMSATS IIT/Pakistan)
- Estacion Experimental de Zonas Aridas, CSIC (CSIC/Spain)
- University College London (UCL/UK)
- University of Maryland (UMD/USA)
- United States Geological Survey (USGS/USA)
- National Oceanic and Atmospheric Administration (NOAA/USA)
- Massachusetts Institute of Technology (MIT/USA)
- Stanford University (SU/USA)
- Boston University (BU/USA)

- Asia-Pacific Space Cooperation Organization (APSCO)
- Institute of Atmospheric Physics, Chinese Academy of Sciences (IAP/ CAS/China)
- Korea Aerospace Research Institute (KARI/Korea)
- Environment and Climate Change Canada (ECCC/Canada)
- University of Maryland (UMD/USA)

II. Brief CV of Project Leader(s)

Zhang Songmei

Email: songmei.zhang@nrsc.gov.cn

Phone: (+86) 010-58881157

Fax: (+86) 010-58881167

Business Address: National Remote Sensing Center of China

No.8A, Liulinguannanli, Haidian District, 100036, Beijing,

P. R.China

EDUCATION

1999/09 – 2002/07 Jilin University

Ph.D. Degree in Stratigraphy and Paleontology

1994/09 – 1997/07 Changchun University of Science and Technology

M.A. Sc Degree in Stratigraphy and Paleontology

1983/09 – 1987/07 Changchun Institute of Geology

B. Eng Degree

WORK EXPERIENCES

2017/05- present National Remote Sensing Center of China,
Ministry of Science and Technology of the P.R. China
Deputy director-general

2008/03 - 2017/05 National Remote Sensing Center of China,

Ministry of Science and Technology of the P.R. China

Division Chief

2006/06 - 2008/03

National Disaster Reduction Center,

Ministry of Civil Affairs of the P.R. China

Assistant of Commander-General

2005/05 –2006/06

Institute of Resource, Beijing Normal University

Associate Professor

2002/10 –2005/05

Institute of Resource, Beijing Normal University

Postal Doctor Research, major in Natural Geography

1997/07 –2002/10

College of Earth Science, Jilin University

Lecturer, Assistant