



ESA–MOST China Dragon 4 Cooperation

→ **ADVANCED TRAINING COURSE IN OCEAN  
AND COASTAL REMOTE SENSING**

12 to 17 November 2018 | Shenzhen University | P.R. China

# Training Course Overview



**History**

**Lecturers & Organisers**

**The Participants**

**Objectives of the course**

**Daily Programme**

**Logistics**





# Earth's changing climate – importance of ocean observations

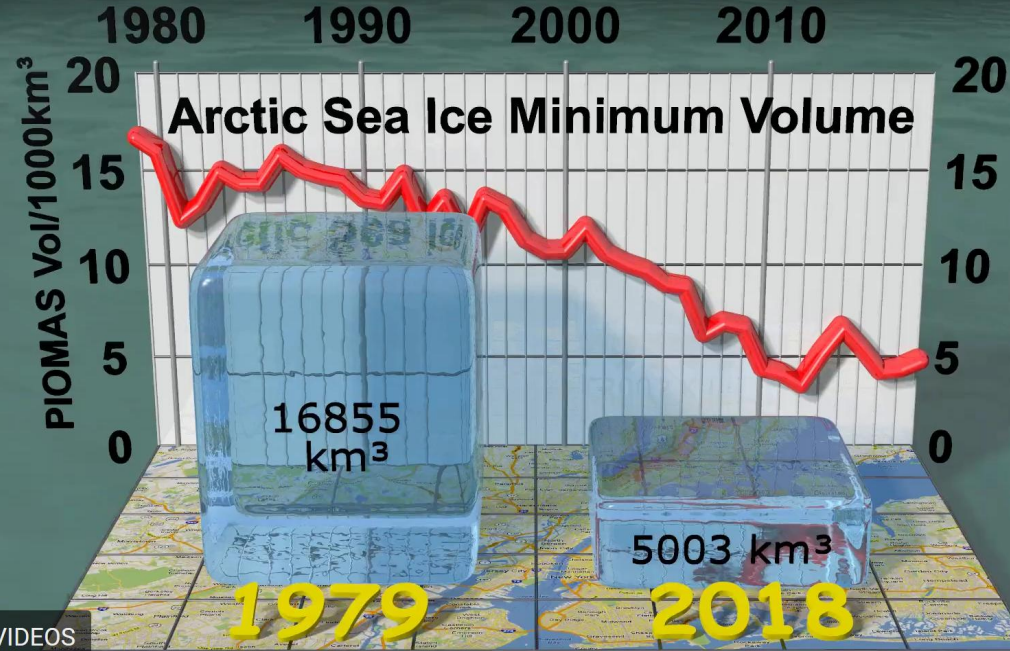


## Now at a critical moment

**Recent IPCC report states that** "Climate-related risks to health, livelihoods, food security, water supply, human security, and economic growth are projected to increase with global warming of 1.5°C and increase further with 2°C."

**Climate is becoming more unpredictable** with extreme weather events US, Wales, France & Majorca, Italy – loss of life & economic activity

Arctic Sea Ice Minimum Volumes 1979-2018



MORE VIDEOS

Source: <http://psc.apl.washington.edu/wordpress/research/projects/arctic-sea-ice-volume-anomaly/>  
Created by: Andy Lee Robinson <https://youtube.com/ahaveland> Oct 2018

▶ 🔊 0:31 / 0:33

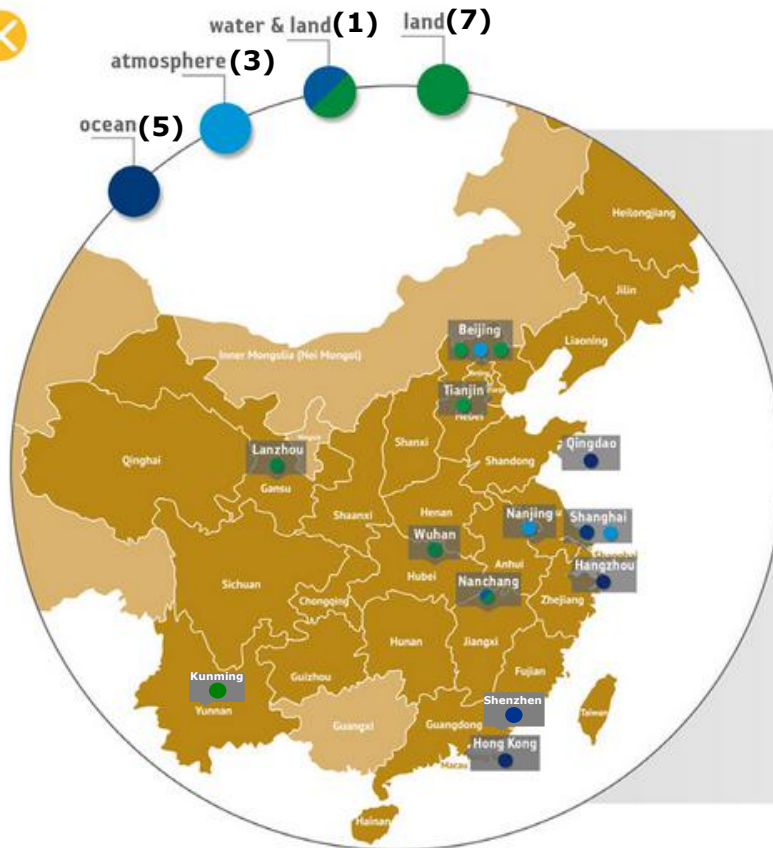
YouTube



# Dragon Advanced Training Courses



- Since 2004, 16 training courses 
- **With Shenzhen TC, 1060** young scientists have been trained in China
- Courses taught by leading Dragon scientists with hands on EO data processing using **ESA open source** toolboxes
- Up to 2018 Over **400** post graduate young scientists have been awarded higher degrees by research, i.e. at M.Sc. and Ph.D. level

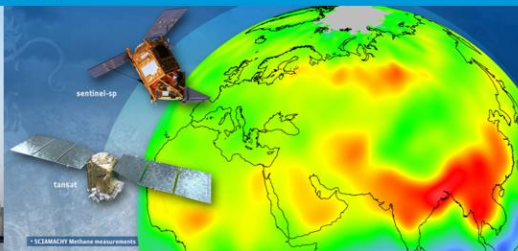


year	category	city	institution	participants
2004	Ocean	Qingdao	OUC, Qingdao	78
2005	Land	Beijing	CNU	103
2006	Atmosphere	Beijing	PKU	55
2007	Ocean	Hangzhou	SOED, SIO	64
2008	Land	Wuhan	LIESMARS	60
2009	Atmosphere	Nanjing	Nanjing University	60
2010	Land	Lanzhou	CAREERT	80
2011	Ocean	Shanghai	SKLEC, ECNU	58
2012	Land	Beijing	MITL, IECAS	70
2013	Ocean	Hongkong	ISEIS, CUHK	45
2014	Water & Land	Nanchang	KL-PLWWR, JXNU	100
2015	Land	Tianjin	TJNU	80
2016	Atmosphere	Shanghai	SARI, CAS	60
2017	Land	Kunming	YNNU	80
2018	Ocean	Shenzhen	SZU	60





**ESA-MOST DRAGON 4 COOPERATION** Advanced training course in Atmospheric Remote Sensing  
2016年中欧合作“龙计划”高级大气遥感国际培训班



**Lecturers:** 12 scientists in atmospheric RS

• **Sentinel 5-P & TanSAT missions & data**

**Participants:** 60 trainees, MSc. & Ph.D. level

• **Theory, retrievals & applications in atmospheric RS**







**Lecturers:** 23 scientists in optical, thermal & SAR RS

- ESA & Sentinels EO data, SNAP & POLSARPRO toolboxes

**Participants:** 98 trainees, MSc., Ph.D. & Post Doc. level

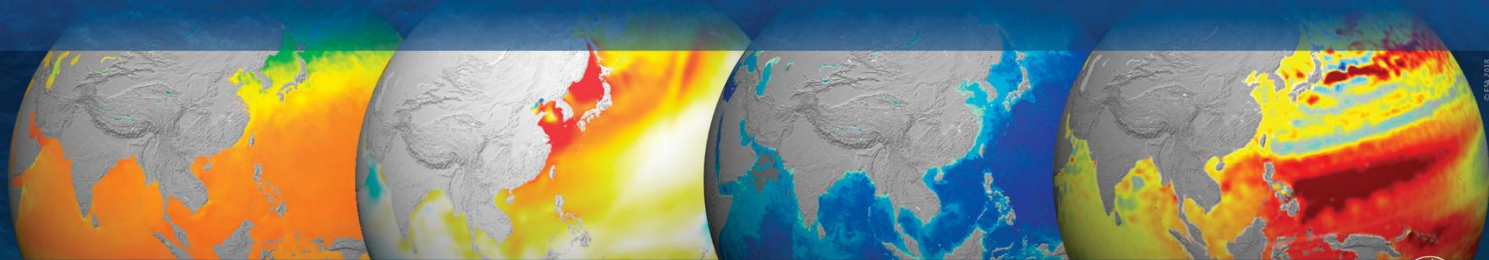
- Applications in land RS





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# ADVANCED TRAINING COURSE IN OCEAN AND COASTAL REMOTE SENSING



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Hosted by



### LECTURING TEAM

#### Sea surface temperature from thermal EO data

• Francesco Nencioli	Plymouth Marine Laboratory	UK
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#### Climate change in polar and other regions

• Cheng Xiao	Beijing Normal University	China
• Bai Yan	Second Institute of Oceanography, SOA	China
• Johnny Johannessen	Nansen Environmental and Remote Sensing Center	Norway

#### Ocean colour from optical EO data

• Tang Danling	South China Sea Institute of Oceanology, CAS	China
• Tom Jackson	Plymouth Marine Laboratory	UK

#### Sea surface height from radar altimeters

• Marie-Hélène Rio	ESA-ESRIN	Italy
• Marco Restano	Serco c/o ESA-ESRIN	Italy
• Yang Jungang	First Institute of Oceanography, SOA	China

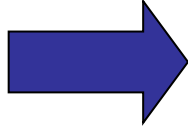
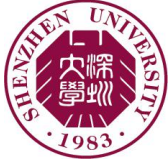
#### Ocean retrievals using EO data

• Yin Xiaobin	Beijing Piesat Information Technology Co. Ltd.	China
• Zhang Xi	First Institute of Oceanography, SOA	China
• Zhu Jiasong	Shenzhen University	China
• Shen Fang	East China Normal University	China
• Roberto Sabia	Telespazio-Vega c/o ESA-ESRIN	Italy

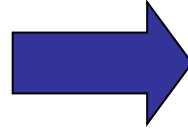
#### Geophysical parameters retrieval from SAR

• Meng Junmin	First Institute of Oceanography, SOA	China
• Yang Jingsong	Second Institute of Oceanography, SOA	China
• Werner Alpers	University of Hamburg	Germany
• Fabrice Collard	Ocean Data Lab	France
• Sylvain Herliédan	Ocean Data Lab	France
• Lucile Gaultier	Ocean Data Lab	France

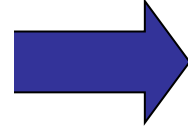




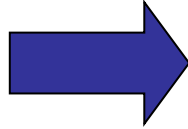
**Prof. Wu Guofeng, Wang Chisheng & Wang Dan**



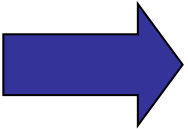
**Dr. Zhang Songmei, Profs. Li Zengyuan & Gao Zhihai, Dr. Wang Sisi, Dr. Zhang Chi**



**Yves-Louis Desnos & Eric Doyle**



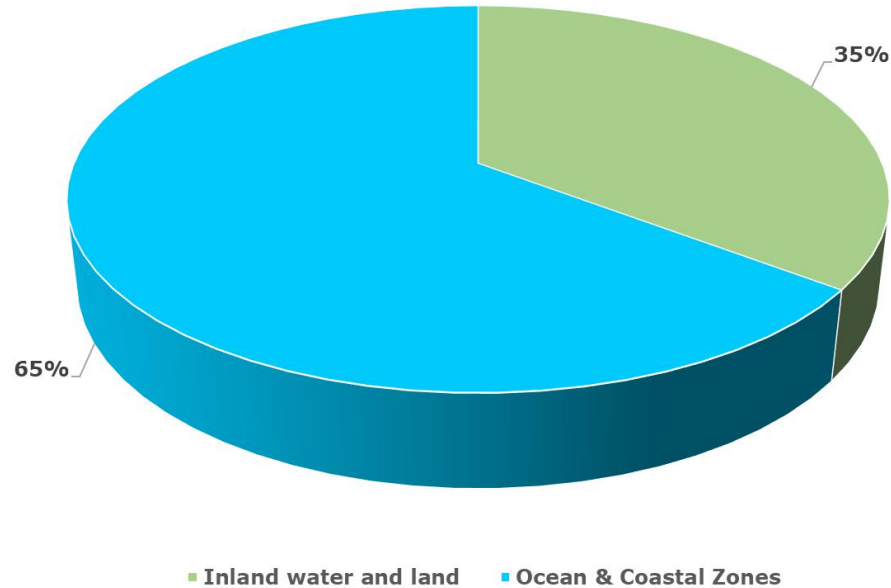
**Dr. Andy Zmuda & Ms. Irene Renis**



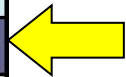
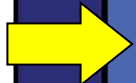
**Prof. Bob Su, Drs. Yijian Zeng & Ju Dunping, Ms. Wang Lichun,**



# 54 course participants – background



	MONDAY 12 Nov. 2018	TUESDAY 13 Nov. 2018	WEDNESDAY 14 Nov. 2018	THURSDAY 15 Nov. 2018	FRIDAY 16 Nov. 2018	SATURDAY 17 Nov. 2018
	EO missions & Sea Surface Salinity Retrievals (SSS)	Geophysical parameters from RAs	Ocean colour (OC), Sea Surface Temperature (SST) & synergy	Wind & Wave / Current Interaction	Polar regions & climate change	Applications Case Studies in Chinese Coastal Zones & Closing
AM	Registration	Lecture Radar altimetry principles and data processing Marie-Hélène Rio	Lecture 1. OC & Intro. to S3 OLCI Tom Jackson	Lecture Principles of SAR measurements of oceanic phenomena and atmospheric phenomena over the ocean from space Werner Alpers	Lecture Polar oceans and climate change from space Johnny Johannessen	09:00 to 09:45 Applications of active microwave data for CZ monitoring in China Zhang Xi
	Opening session	Lecture Introduction of HY-2 Radar altimeter and its data processing Jungang Yang	2. OC retrievals in Chinese CASE 2 waters Tang Danling	Lecture Principles of wind waves and wave current interaction from space Werner Alpers	Practical Monitoring the polar oceans from space Johnny Johannessen	09:45 to 10:30 Applications of EO optical and thermal data for CZ monitoring in China Shen Fang
	Photo-call & break	coffee break	coffee break	coffee break	coffee break	10:30 to 11:00 coffee break
	ESA & Copernicus EO Programmes E. Doyle	Prac. 1 RA data & processing BRAT & SARvatore Marco Restano	OC Prac. Tom Jackson & Tang Danling	Prac. 1 Wind waves and wave currents from space Lucile Gaultier (ODL)	Practical Climate impact and the polar oceans Johnny Johannessen	11:00 to 11:45 Ship and UAV observations for coastal monitoring Zhu Jiasong
	ESA & Copernicus EO missions for ocean RS Marie-Hélène Rio					11:45 to 12:30 CERTIFICATES CEREMONY & CLOSE
	Chinese EO missions for ocean RS					
lunch break	lunch break	lunch break	lunch break	lunch break		
PM	Lecture SSS from S3 OLCI Yin Xiaobin	Lecture From altimeter sea level anomalies to ocean surface currents Marie-Hélène Rio	Lecture SST & SLSTR Francesco Nencioli	Lecture Advanced SAR & doppler Johnny Johannessen	Lecture Estimating Ocean Acidification from Space Roberto Sabia	
	Practical SSS using SNAP & S3 OLCI data Yin Xiaobin	Lecture Applications of RA in China Seas Jungang Yang & Meng Junmin	SST Practical Francesco Nencioli	Lecture Apps. in China seas including waves & currents Yang Jingsong & Meng Junmin	Lecture Marine Inorganic Carbon from Space Bai Yan	
	coffee break	coffee break	coffee break	coffee break	coffee break	
	Lecture SSS from SMOS Roberto Sabia	Prac. 2 Advanced RA processing (SAVinvatore) Marco Restano	SST Practical cont. & synergy OC & SST Francesco Nencioli & Tang Danling	Prac. 2 Waves & currents interaction. Impact on ocean circulation Lucile Gaultier (ODL)	Practical Estimating Marine CO2 Fluxes From Space Bai Yan	
	Practical SSS using SNAP & SMOS data Roberto Sabia					
Social Event	Poster Session			Social Event		

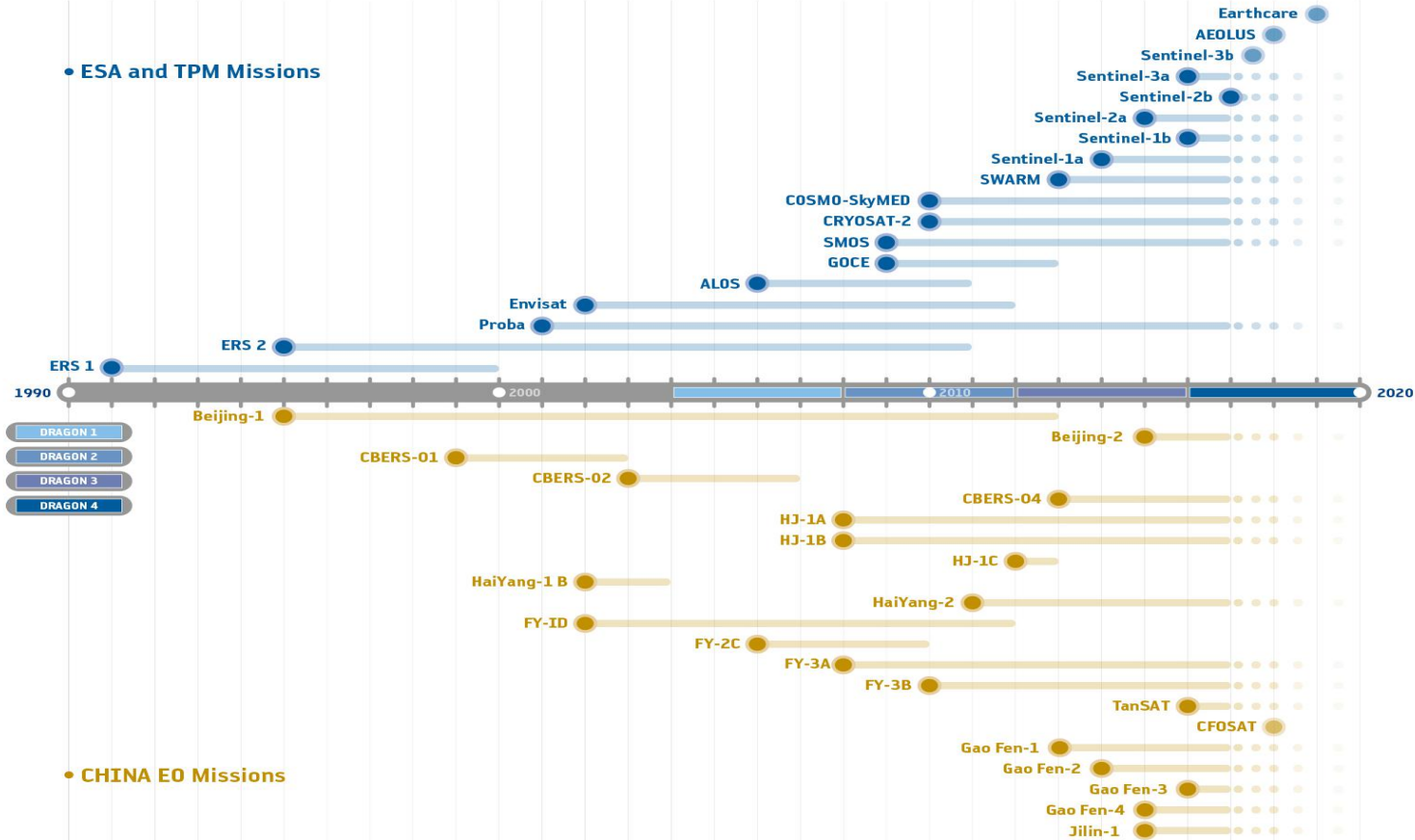




# China, ESA and Copernicus EO missions



## • ESA and TPM Missions



## • CHINA EO Missions

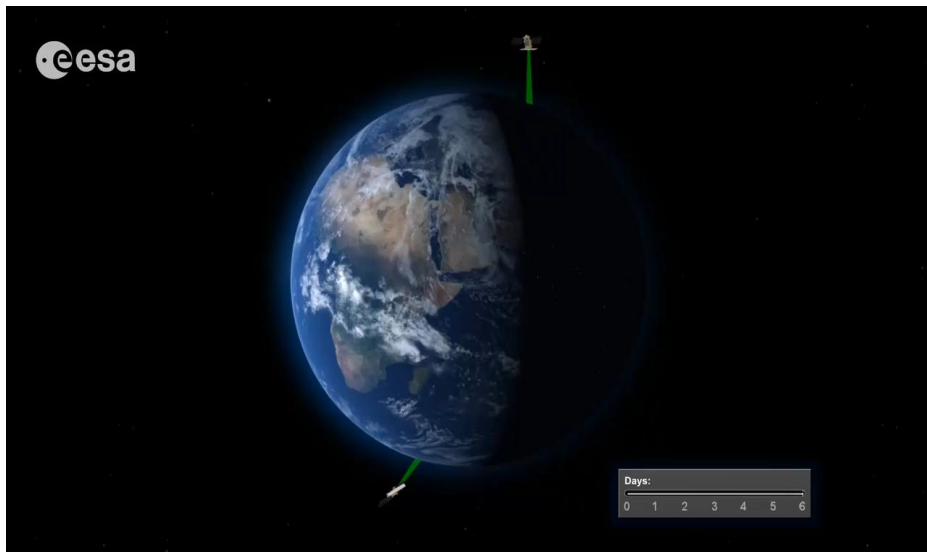
# S1 & S2 temporal revisit



S1 A & B operating 180 degrees apart, global coverage every 6 days



S2 A & B operating 180 degrees apart global coverage every 5 days





# S-3 temporal revisit instrument dependent



S3 A & B SLSTR operating 180 degrees apart, global coverage **every 1 day**, swath 1400km of the nadir instrument (1km data)



S3 A & B OLCI operating 180 degrees apart, global coverage **every 2 days**, swath 1270km of the nadir instrument (300m data)



# Access to Copernicus Sentinels 1,2, & 3 ESA, Earth Explorers & ESA TPM Data & Products



EO data	Data type	Data Policy	User Registration
1. ESA HIGH BIT RATE	ASAR, ERS SAR & ALOS PALSAR	FREE & OPEN Via On The Fly (OTF) system	<p>ESA EO Single Sign On (SSO) account  <a href="https://eo-ssoidp.eo.esa.int/idp/umss-o20/registration">https://eo-ssoidp.eo.esa.int/idp/umss-o20/registration</a></p>
2. ESA LOW BIT RATE	ENVISAT(AATSR,MERIS,ASAR GM) & ERS (SAR,ATSR,RA) Products Information <a href="https://earth.esa.int/files/regproducts">https://earth.esa.int/files/regproducts</a>	FREE & OPEN	
3. ESA TPM	See list at: <a href="https://tpm-ds.eo.esa.int/collections/">https://tpm-ds.eo.esa.int/collections/</a>	<b>FREE</b> BUT some of them limited by quota and users restrictions and may require a scientific proposal. Details at: <a href="https://earth.esa.int/web/quest/pi-community/apply-for-data/3rd-party">https://earth.esa.int/web/quest/pi-community/apply-for-data/3rd-party</a>	
4. Copernicus Sentinels 1, 2 & 3	SAR, MSI, OLCI, SLSTR, SRAL  OLCI-SLSTR Synergy (S3 Pre ops hub in schhub.copernicus)	FREE & OPEN	<p><b>Data hubs</b>  <a href="https://scihub.copernicus.eu/">https://scihub.copernicus.eu/</a>                      SRAL over water  <a href="https://coda.eumetsat.int/#/home">https://coda.eumetsat.int/#/home</a></p>
5. ESA Earth Explorers Missions	GOCE CRYOSAT-2 SMOS SWARM	FREE & OPEN <b>NO REGISTRATION FROM JUNE 2018.</b> Download from EE mission corresponding repository: <a href="http://eo-virtual-archive1.esa.int/Index.html">http://eo-virtual-archive1.esa.int/Index.html</a> <a href="https://smos-ds-02.eo.esa.int/oads/access/">https://smos-ds-02.eo.esa.int/oads/access/</a> <a href="https://swarm-diss.eo.esa.int/">https://swarm-diss.eo.esa.int/</a> <a href="http://science-pds.cryosat.esa.int/">http://science-pds.cryosat.esa.int/</a>	



→ SNAP | Sentinels Application Platform

Done loading modules.



→ S-1 SAR Tools

→ S-2 MSI Tools

→ S-3 OLCI & SLSTR Tools

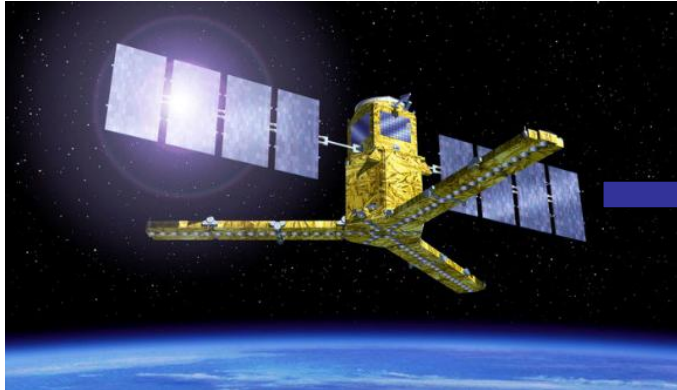
**\*\* SNAP is available on the web for down load \*\***

[step.esa.int](http://step.esa.int)

Major OS supported:

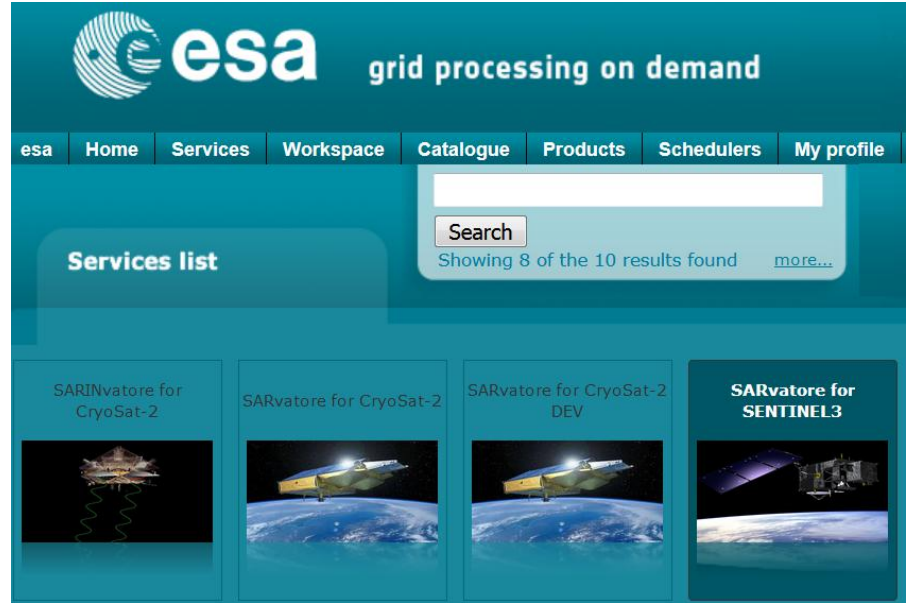
- Windows
- LINUX
- MAC OS

→ SMOS tools





<http://www.altimetry.info/toolbox/>



## ***GPOD SARvatore services:***

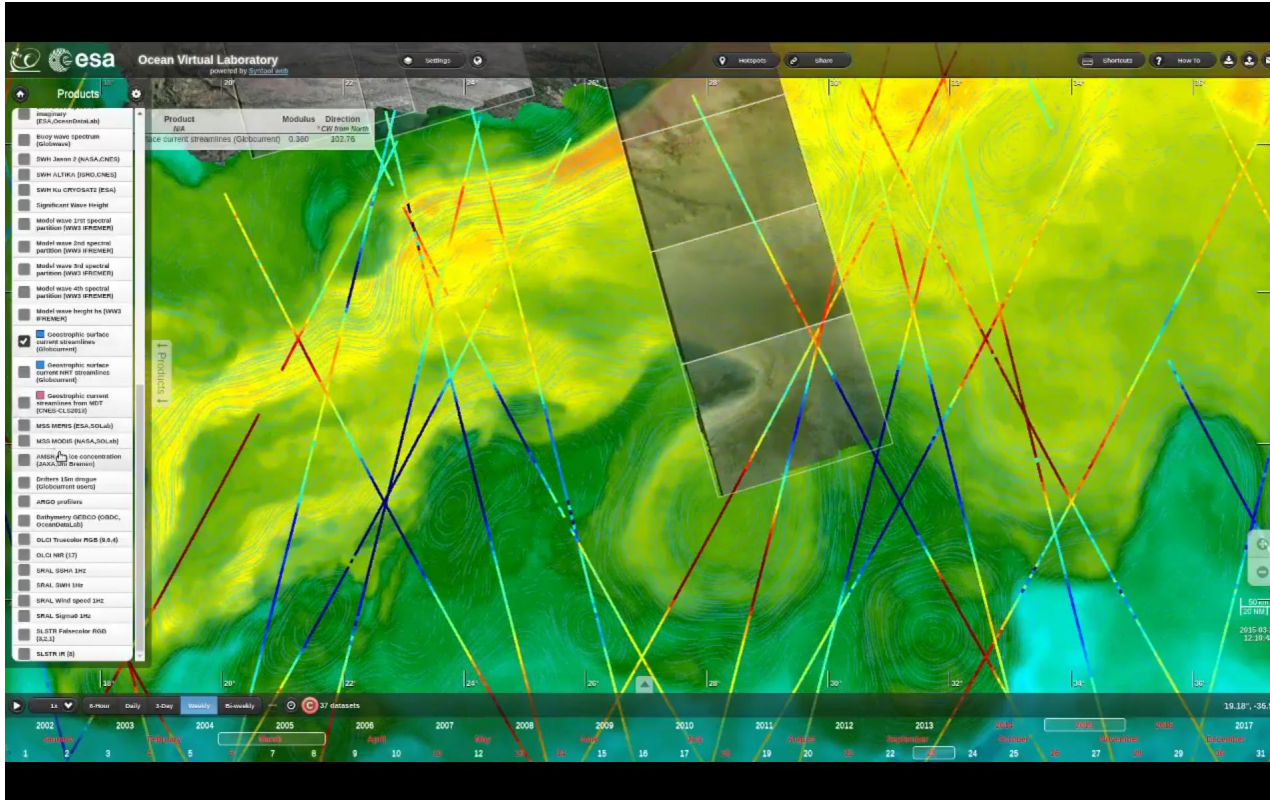
[https://gpod.eo.esa.int/services/CRYOSAT\\_SAR/](https://gpod.eo.esa.int/services/CRYOSAT_SAR/)

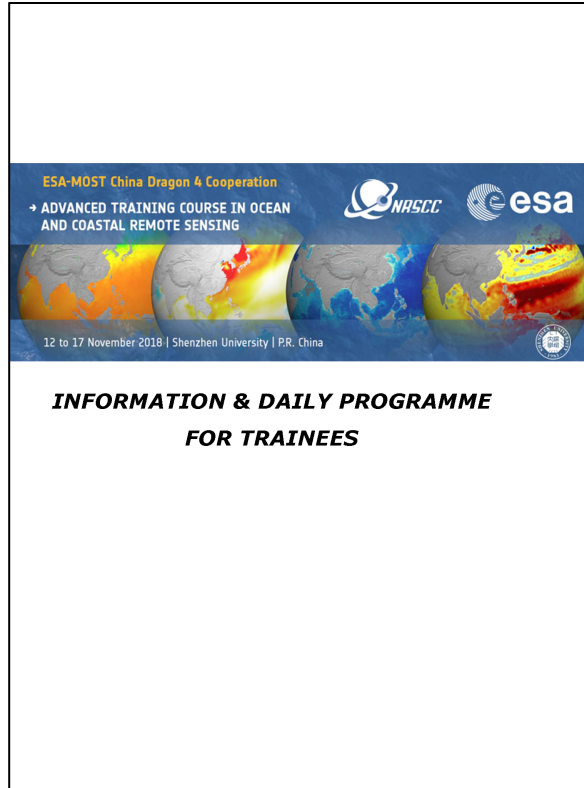
[https://gpod.eo.esa.int/services/CRYOSAT\\_SAR/](https://gpod.eo.esa.int/services/CRYOSAT_SAR/)

[N/](https://gpod.eo.esa.int/services/CRYOSAT_SAR/)

[https://gpod.eo.esa.int/services/SENTINEL3\\_SA](https://gpod.eo.esa.int/services/SENTINEL3_SA)







## Contents:

- List of lecturers
- Organising committee
- Daily programme with venues
- Travel information
- Social events
- Local information about Shenzhen

**18:30 to 20:00 Tuesday 13 Nov. 2018**

- **Mounting of posters,**  
Monday 12 & Tuesday 13  
November 2018
  - AM / Lunch / PM breaks
- **Final list is in poster area,  
from Monday AM. Please  
check to find your poster  
board**
- Boards are labelled, please  
mount on the correct board
- Please take time to view the  
posters during the week
- Opportunity to exchange  
contacts and ideas

- Both sessions will be adjudicated by lectures & organisers with 1 award for best poster in each category
- **Ocean & Coastal Zones session 33 posters in 6 Categories**
  - Corrections, retrievals & validation
  - SAR, InSAR & POLSAR mapping & applications
  - Altimetry & ocean dynamics
  - Coastal zones mapping & monitoring
  - Optical measurements, mapping & applications
  - Remote sensing for environmental monitoring applications
- **Lakes & land session 18 posters in 4 Categories**
  - Optical mapping, change detection & retrievals
  - SAR, InSAR & POLSAR mapping & applications
  - Lake monitoring & retrievals
  - Land and inland water temperature, fluxes & exchanges





## BEST POSTER AWARD

For the excellent poster paper in

presented at the

ESA–MOST China Dragon 4 Cooperation

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**Dr. Wang Qi'an**

Director General of National  
Remote Sensing Center of China

**Prof. Li Qingquan**

President of Shenzhen University,  
Shenzhen University, China

**Dr. Maurice Borgeaud**

Head of EO Science, Applications  
& Climate Department  
European Space Agency

- **Awards for best posters & prizes**
- **Awards during Saturday's closing session**
- **Support your poster presentation on Tues. evening**



## CERTIFICATE OF ATTENDANCE

This certificate is awarded to

**Hu Jiyuan**

*Wuhan University*

in recognition of attendance at the

ESA–MOST China Dragon 4 Cooperation

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Director General of National  
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**Prof. Li Qingquan**  
President of Shenzhen University,  
Shenzhen University, China

**Dr. Maurice Borgeaud**  
Head of EO Science, Applications  
& Climate Department  
European Space Agency

1. To get a certificate, attendance is mandatory for **all** lectures and practical classes
2. Not enough to attend one or two lectures or to pick and choose from the programme
3. Attendance lists will be in circulation
4. Certificates will be awarded during the closing ceremony **Saturday 17 November 2018**

Exit this survey

## ESA-MOST Dragon 4 Advanced Training Course in Ocean and Coastal Remote Sensing

Please take the time to answer a few questions on the course, its organisation and contents. Please tick the appropriate boxes.

\* 1. Have you used ESA and/or Copernicus Sentinels Earth Observation data prior to this course? 

Yes

No

\* 2. Are you likely to use ESA and/or Copernicus Sentinels Earth Observation data following the course? 

Yes

No

\* 3. How will you go about accessing ESA and/or Copernicus Sentinels EO data and what research will you undertake? 

## On-line Course Evaluation

- To provide feed back to improve for the future
- 10 minutes to complete
- The questionnaire is anonymous
- Receive link by email
- Please complete by **17:30 on Thurs. 15 November**
- Summary will be provided on Saturday closing session



## Contents

- Overview programme (.pdf)
- Daily programme (.pdf)
- Lecturers' presentations (.pdf)
- Practical Sessions Instructions (.pdf)
- All open source software
- All course datasets
- Technical publications (all .pdf)
  - ESA SP-1322/1 /2 /3 Sentinels 1, 2 and 3
  - Earth Explorers' Brochures / Info
  - NRSCC EO missions info.

**Wishing you a successful training week!**

**Any questions...?**