Towards harmonisation of polar infrastructure access

GEOCRI – GEO Cold Regions Initiative

Information Service and Forum for Collaboration for Cold Regions

Yubao Qiu (qiuyb@aircas.ac.cn)

GEOCRI Community

1st August 2019 @ Grand Hotel Plovdiv, Bulgaria

What are GEO and GEOSS?

Organisation (GEO)

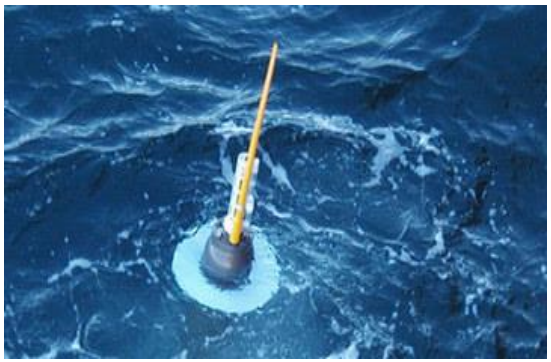
- Group on Earth Observations
- Member States
- Participating Organisations
- GEO Plenary, Ministerial Summit
- GEO Secretariat

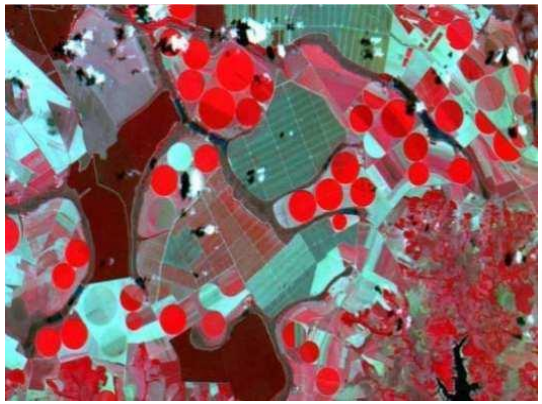
Implementation (GEOSS)

- Work Programme (3 yrs)
- GEO Flagships
- GEO Initiatives
- GEO Community Activities
- GEO Foundational Tasks

How does GEO work?

Data





community

Analysis

Agreements

PARIS2015
UN CLIMATE CHANGE CONFERENCE
COP21·CMP11

UN World Conference on
Disaster Risk Reduction
2015 Sendai Japan

GEO New Features

Sharing and Brokering Data

Eight SBAs

Data Driven

User Driven

Space agencies

Data

Software

Results

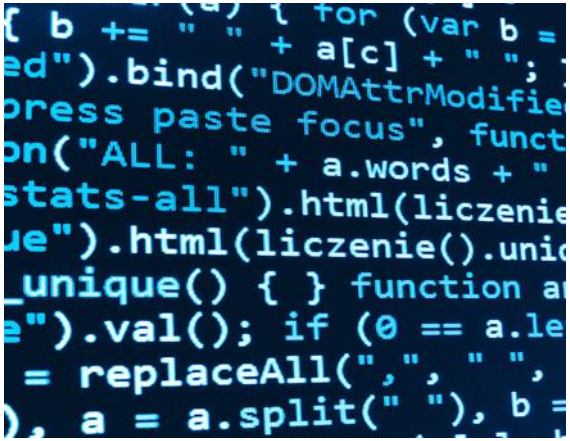
Users

Cloud platforms

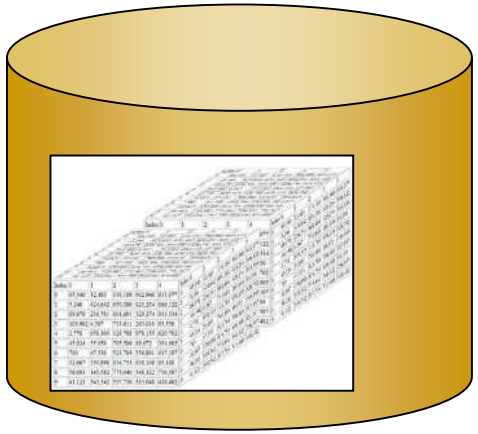
Cloud Based

Empowered global experts

Reusable, shared knowledge



Cloud platforms

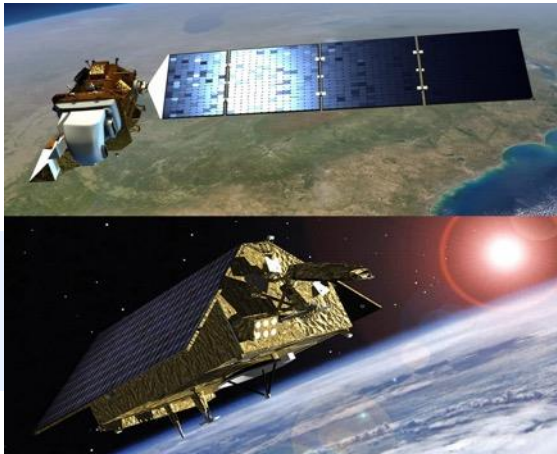


APIs

APIs

In-situ observations

Multi-satellite data

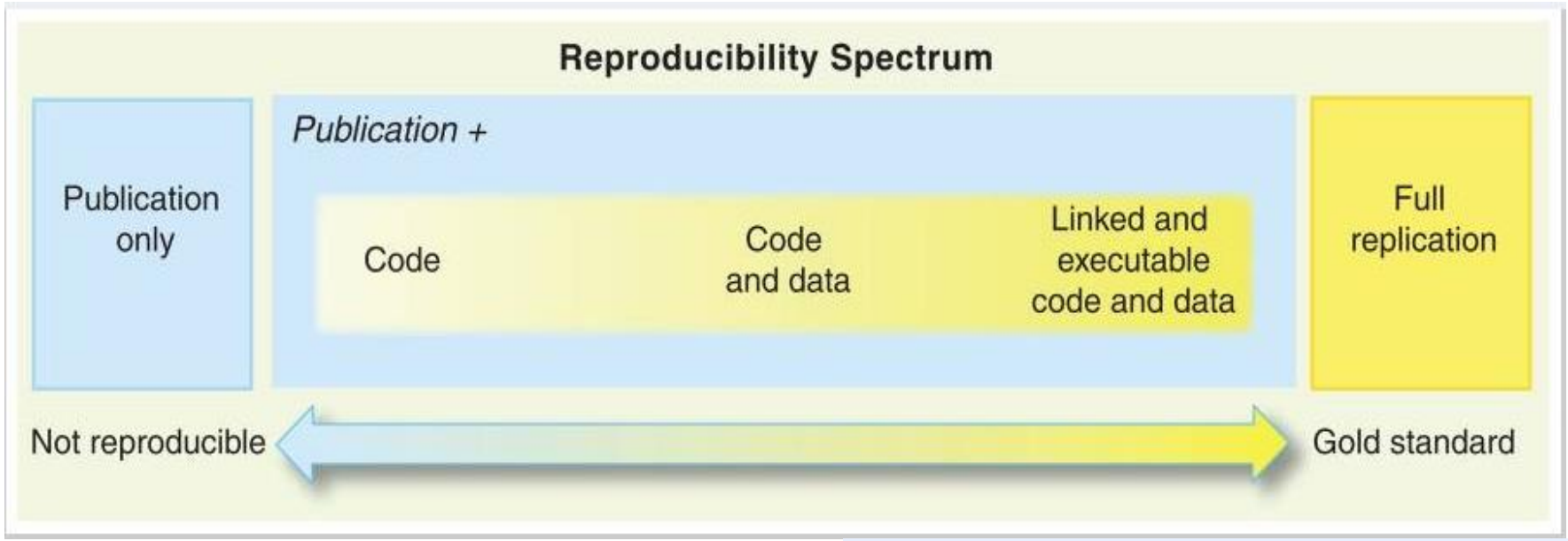


GEO New Features

The first 15 years of GEO: focus on provision of open data

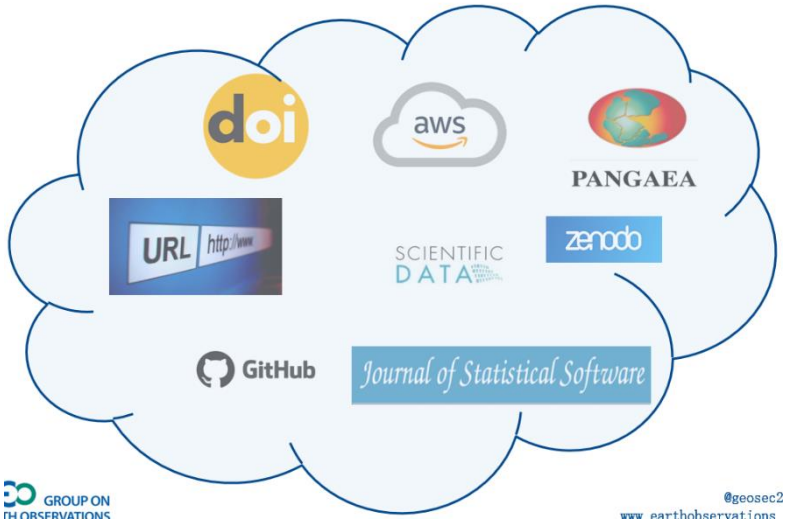
The future: focus on results based on open Science

Achieving reproducible knowledge



Exposing all parts of an application

image: Peng (Science, 2011)



The Web as a repository

What is GEO Cold Regions Initiative?

- A GEO Initiative, Work plan for 2017-2019 (networking and startup development)
- Earth's Cold Regions – especially the Tripoles vision
- Forum for collaboration, contributors from 15 countries and organisations
- Cross-cutting initiative
  - Geographic: Arctic, Antarctic, High-Latitude Oceans, Himalaya-Third Pole and High-Mountain areas
  - Domains: Terrestrial, Atmospheric, Marine
  - Scales: from in-situ to remote sensing
  - Disciplines: from earth sciences to social sciences
  - SBAs, SDGs, Sendai Framework and Paris Agreement

Why GEO Cold Regions?

Facing the applications to SBA

- **Cold Regions** are the most vulnerable environments, and **affect the whole Earth system** via feedback mechanisms

- Current **Environmental and Socio-Political Challenge**s, influence more than 100 countries

- Need for **Earth observations and information services combining both Scientific and Societal aspects** to support decision making and achieving societal benefits and SDGs

Climate & Weather
Biodiversity & Ecosystems
Sustainable Development
Indigenous Communities & Traditional Practices and Livelihoods
Health
Agriculture, Fisheries, Hunting
Food Security
Water

International Relations & Cooperation
Hazards
Infrastructure & Transport
Energy
Extractive industries
Forestry
Shipping
Tourism
Environmental Protection

GEOCRI Mission and Objectives

Mission: Develop a **user-driven approach** for Cold Regions **information services to complement** the current mainly science-driven efforts, and **foster the collaboration for improved Earth observations** and information on a global scale.

Objectives:

1. **Integrating, Brokering and Promoting Earth Observations over the Cold Regions**
2. **Advocating and Practicing Data Sharing**
3. **Building Community Portal and related Services**
4. **Strengthening Capacity building and Partnerships**

The Priorities Identifying Activities

1) *Infrastructure*

- *Satellite Stations*
- *In-situ Network*
- *Observatories*

2) *Community Data Portal*

- *Inventory*
- *Formatted Data (observations, simulation)*
- *Value-added Data Products*
- *Open Data (MetaData)*

3) *Essential Variables*

- *Variables*
- *Indicators*

Information Service

- *Supporting open Science*
- *SBAs (key area)*
- *Global Policies (SDGs etc.)*

Earth Observations	Data and Infrastructure	Information Technique	Societal Impacts

Earth System Science and Policies

Examples of current activities

GEOCRI Community Data Portal Development

- **Data Management** compatible to GEO DM Principle
- Utilisation of **GEOSS Data Infrastructure** for Community Portal in the GEOSS framework
- Data sharing, End-User services & products
- Collaboration, synergy and interoperability with other **international organisations and initiatives** (SAON/SOOS/WDS/CODATA/RDA…)

Essential Cold Regions Variables Development

- **Science Driven with Societal impact and implications**
- **Compatible to the existing EVs and Indicators**
- Connections between the **data and indicators** for policy and evaluation purposes
- Deliverables: **White paper & potential journal articles**
- Relevance for **the Cold Regions**
- Relevance for the **SBAs**: SDGs, Paris Agreement, Sendai Framework

Research Infrastructures and Capacity Building Development

- **Integration** of observations, modelling and data across regions and scales
- **Sharing best practises** to improve infrastructure access and efficient use

Collaboration - examples

- Within GEOCRI
- Within GEO
- With other organizations and networks

Projects : Advisor Board and Contributors

- **EU H2020 INTAROS (Norway)**
- **China Most funded MARIS (China)**
- **iCUPE** (Arctic Environment Monitoring)
- **KEPLER**(Key Environmental monitoring for Polar Latitudes)

GEO-GNOME
GEOGLOWS

SAON
SUSTAINING ARCTIC OBSERVING NETWORKS

IEEE Ad Hoc Committee on North & South Poles

Arctic Data Committee (ADC)

Polar Data Committees

SCARDM

POLDER

DBAR-HIMAC
High Mountain and Cold Regions

MAC Hi 2017

HiMAC Workshop
- ✓ ***HiMAC2017***
- ✓ ***HiMAC2018***

GEO CRI Data Flow Diagram

Mission: Develop a **user-driven approach** for Cold Regions **information services to complement** the mainly current science-driven effort, and foster the collaboration for improved *Earth observations and information* on a global scale.

Inputs EO Data

GCW The Global Cryosphere Watch
S**AON** Inventory of arctic observational projects as a contribution to EU PolarNet; (CBM) atlas.
CAFF/CBMP: Arctic Biodiversity Data Service (ABDS) as biodiversity data sharing and as a source of data for ecosystem-based management, interoperability with partners such as GBIF, OBIS and PDC.
INTERACT
PEEX Pan-Eurasian Experiment (PEEX) – A Framework Program on the Land–Atmosphere–Ocean–Society Interactions of the Changing Arctic–Boreal Environments
SIOS https://www.sios-svalbard.org/
IADC http://mainnode.src.cnr.it/cnr/
(**SOTP**) Snow Observations over Tibetan Plateau
ESA – MOST / NRSCC
CCT-IP Climate Change Integrated Project
TW-1A:(Chinese cubesat named polar sea ice observation in both Polar Regions
Chinese Water Cycle Mission (WCOM):
(**CMP) CRA**) Cryosphere Monitoring Programme of the Arctic Observing and Research for Sustainability and of the Mountains as Sentinels of Change
(**ADS**) Arctic Data Archive System
The **Year of Polar Prediction (YOPP)**
Third Pole Environment (TPE)A data portal http://en.tpedatabase.cn
The **Barcelona Expert Center (BEC)** http://satice.icm.csic.es
GMOS Observational programme for mercury Pollution & Environmental Protection
JAMSTEC
WDCDGG (World Data Center-D for Glaciology and Geocryology
INTAROS (Integrated Arctic Observation system)

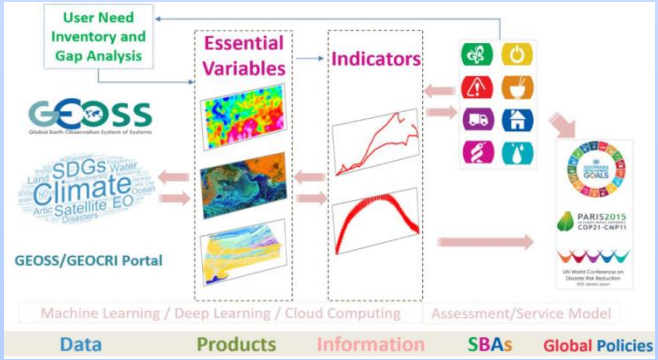
End Users

Cold region Earth observation user communities include scientists, policy-makers,industry, business and commerce, students, and local communities.

Outputs Products and Services

Community Portal Development **–**

- **Improve discoverability, accessibility and usability of cold regions Earth observation data** and information by advocating broad open data policies and strengthened capacity building;
- **Support existing observation networks and systems in cold regions**, sharing expertise and knowledge, as well as integrating observation products into GEOSS via the GEOSS Common Infrastructure (GCI);
- **Contribute t**o identify the gaps for observations and data/information services over cold regions;
- **Facilitate** full integration and interoperability of in situ and remotely sensed Earth observations in cold regions across all environmental, ecological and human domains;
- Increase the ability of all users and potential users to benefit from cold region Earth observations, including policy makers, researchers, local communities and industry, through ongoing capacity building;
- **Strengthen partnerships between cold region Earth observation providers**, users, funders and other stakeholders to increase efficiencies and ensure needs and requirements are effectively met.



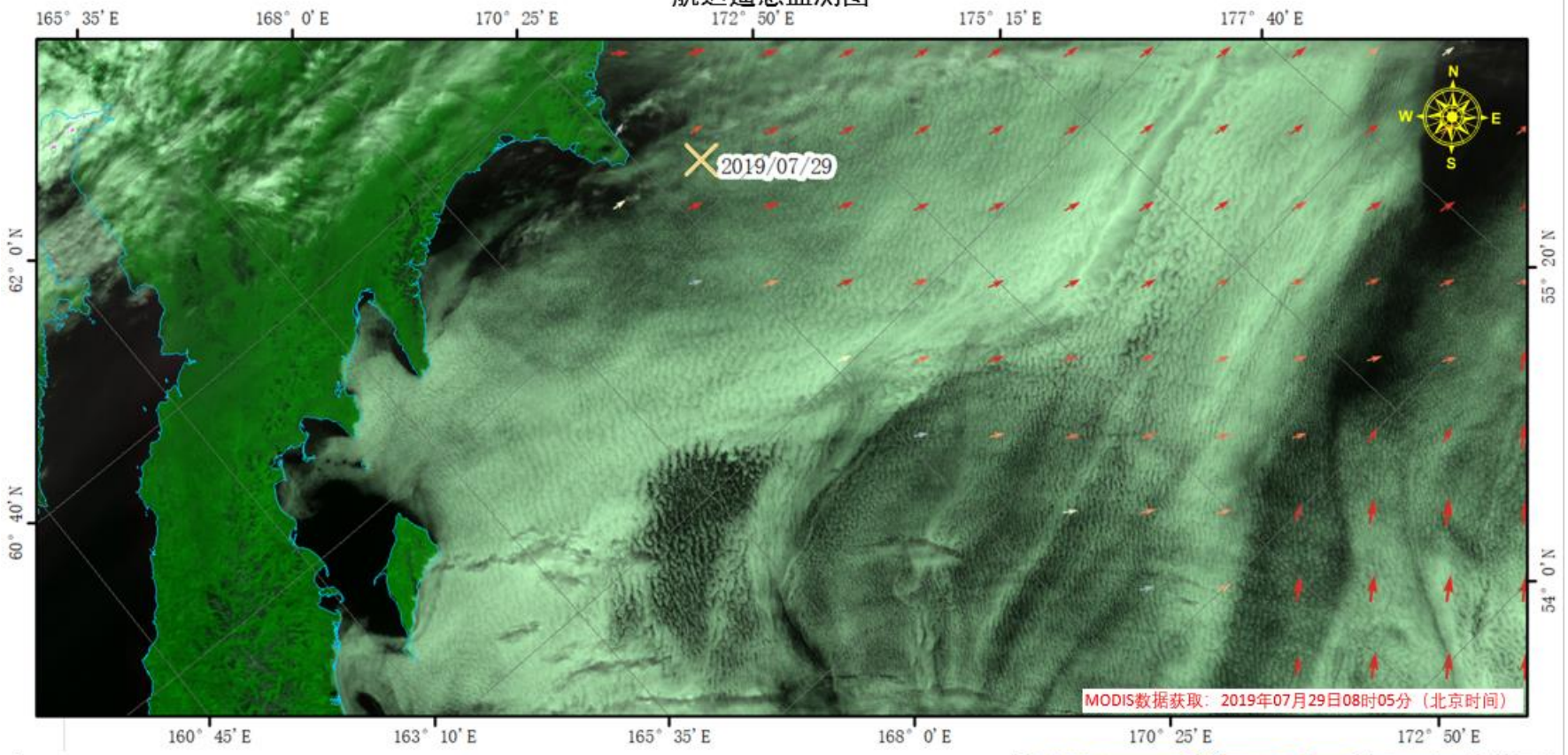
2) Development of Essential Variables for Cold Regions (GEO CRI efforts – addressing the indicator)

- Science Driven or Societal impact: applications for societal and economy development
- Compatible to the existing EVs, and Indicators
- Interface between the data and indicators for evaluation process
- Deliverables: White paper published
- ***3) Integration: In-situ, Remote Sensing, Model, and its Data Integrating***

服务编号：CASS001

MMSI：413492850

航运遥感监测图

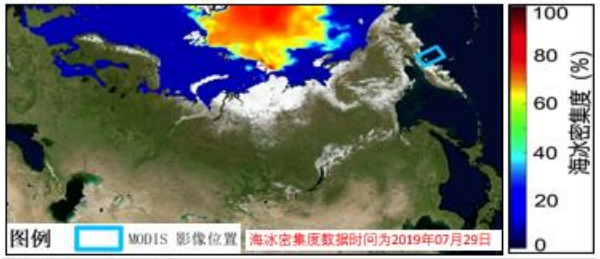


解译标志　陆地　水体　云层

0　50　100　200 Kilometers

风速信息　32　24　16　8　0 (m/s)

图例　船只位置　海岸线



船只监测区域海况

地图显示了船只正沿俄罗斯东部穿过白令海。目前船只位于白令戈夫斯基海域附近，预计一周左右进入有海冰区域。船只航行区域正经过5级东北风，距离最近海岸为52公里。北极航运服务将持续提供航运信息。

数据源

- 上图数据来自MODIS/Aqua卫星影像，采用GCS WGS 1984地理坐标系，空间分辨率为500 m；
- 右图区域海冰密集度数据取自于CMEMS北极海冰产品(Arctic Ocean Physics Analysis and Forecast)，空间分辨率12.5 km，显示了当天北极地区海冰密集度分布。
- 风场数据为2019年07月28日遥感获取海表面风向与海表面风速空间分辨率12.5 km，由CMEMS的全球海洋产品获取；

发布日期：2019年07月29日

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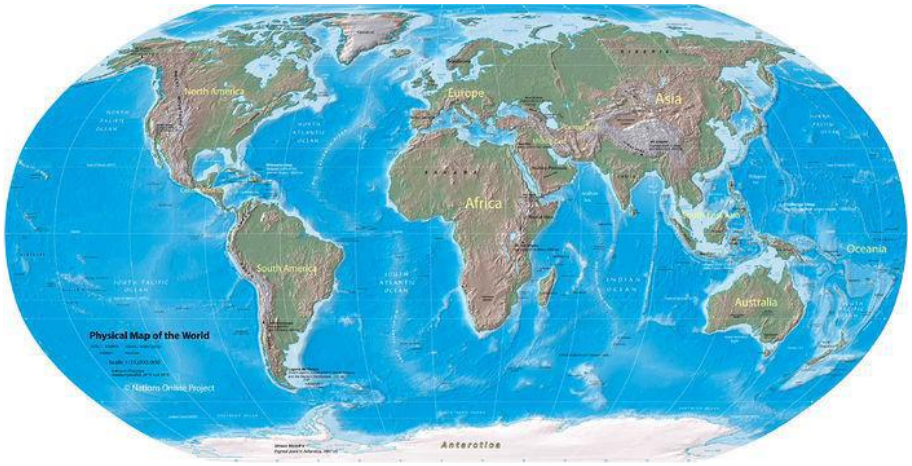
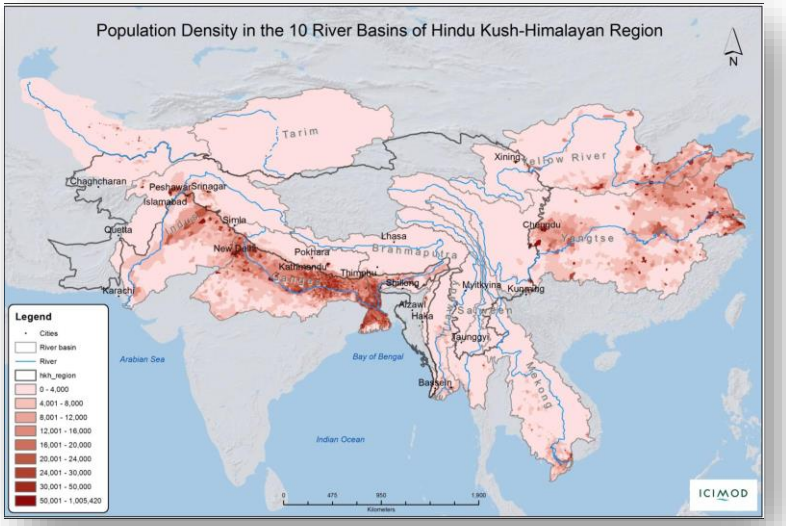
北极航道遥感监测©2019中科院数字地球实验室

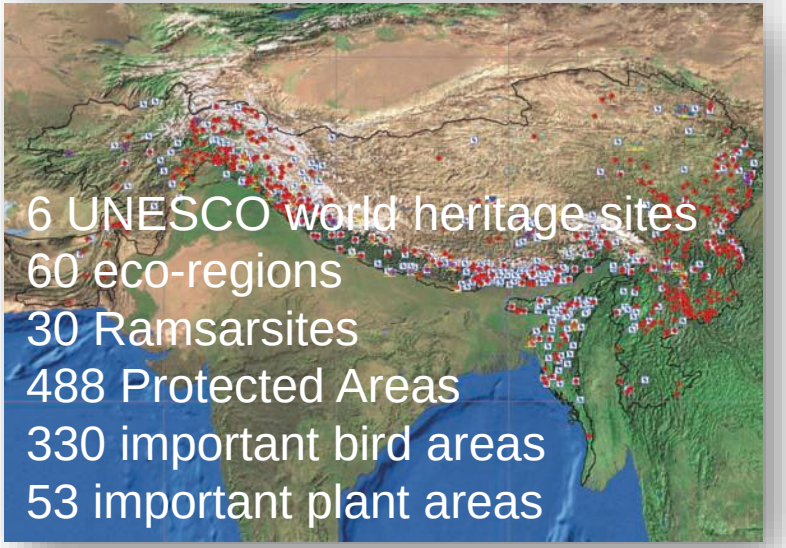
MARIS Project

DBAR-HIMAC

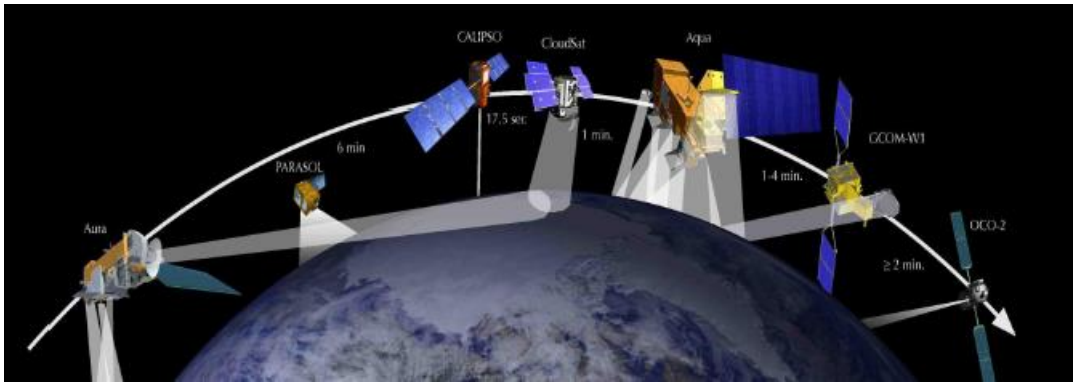
High Mountain Asia Regions

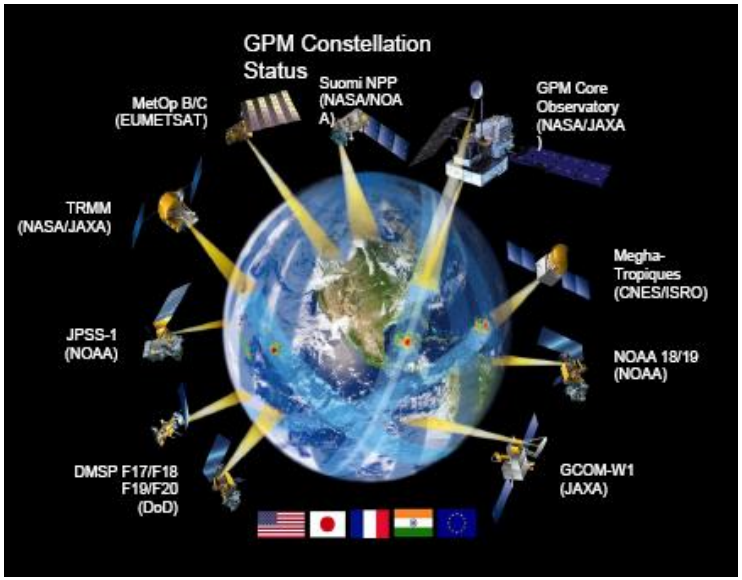


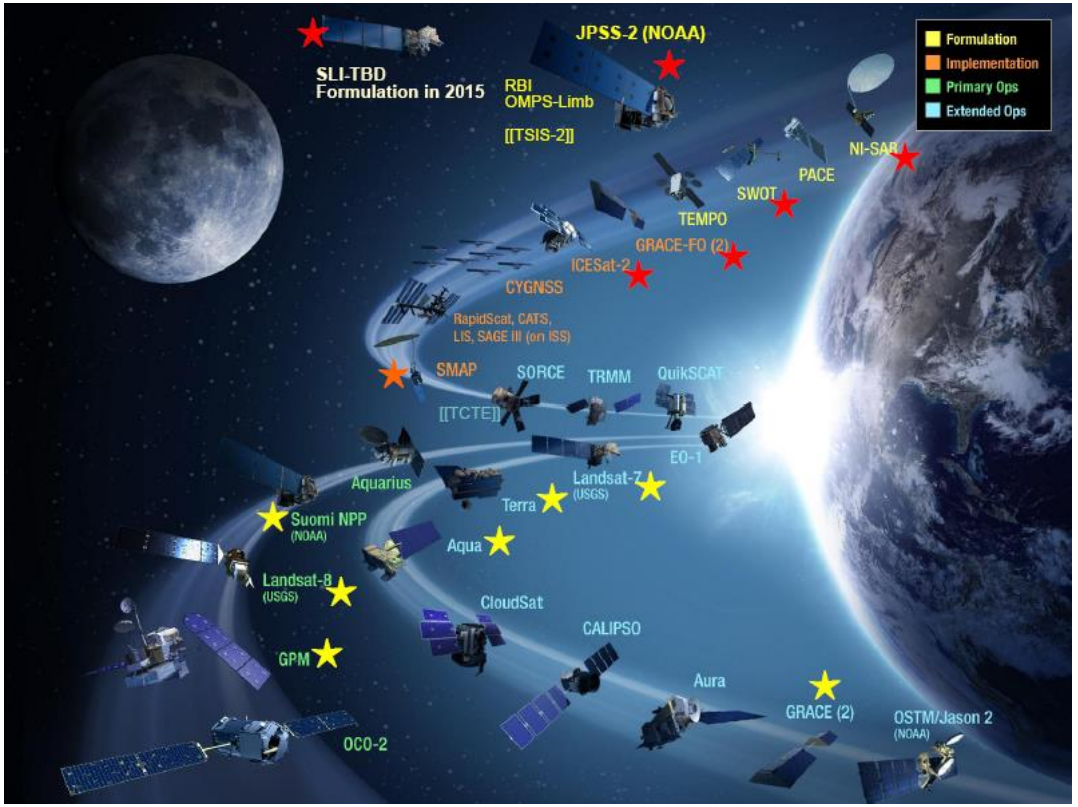




Satellite


CALIPSO
CloudSat
Aqua
17.5 sec
1 min.
6 min
PARASOL
1-4 min.
GCOM-W1
Aura
OCO-2
≥ 2 min.


GPM Constellation Status
MetOp B/C (EUMETSAT)
Suomi NPP (NASA/NOAA)
GPM Core Observatory (NASA/JAXA)
TRMM (NASA/JAXA)
Megha-Tropiques (CNES/ISRO)
JPSS-1 (NOAA)
NOAA 18/19 (NOAA)
DMSP F17/F18 F19/F20 (DoD)
GCOM-W1 (JAXA)


JPSS-2 (NOAA)
SLI-TBD Formulation in 2015
RBI
OMPS-Limb
[[TSIS-2]]
Formulation
Implementation
Primary Ops
Extended Ops
NI-SAR
PACE
SWOT
TEMPO
GRACE-FO (2)
ICESat-2
CYGNSS
RapidScat, CATS, LIS, SAGE III (on ISS)
SMAP
SORCE
TRMM
QuikSCAT
[[TCTE]]
EO-1
Aquarius
Landsat-7 (USGS)
Terra
Suomi NPP (NOAA)
Aqua
Landsat-8 (USGS)
CloudSat
CALIPSO
GPM
Aura
GRACE (2)
OSTM/Jason 2 (NOAA)
OCO-2

Satellites

Satellite		1988	1990	1997	1999	2000	2002	2003	2004	2007	2008	2009-2010	2011	2012	2020
Meteorological Satellites	FY-1	FY-1A	FY-1B		FY-1C		FY-1D								
	FY-2			FY-2A		FY-2B			FY-2C	FY-2D	FY-2E			FY-2F	12 Satellites
	FY-3										FY-3A	FY-3B			
	Operation Status						FY-1D		FY-2C	FY-2D	FY-2E FY-3A	FY-3B		FY-2F	
Ocean Satellites	HY-1						HY-1A			HY-1B					10 Satellites
	HY-2												HY-2A		
	Operation Status									HY-1B			HY-2A		
Resource Satellites	CBERS-01				CBERS-01										6 Satellites
	CBERS-02							CBERS-02		CBERS-02B					
	ZY												ZY-102C	ZY-3	
	Operation Status							CBERS-02		CBERS-02B			ZY-102C	ZY-3	
Environmental and Disaster Monitoring Satellites	HJ-1										HJ-1A HJ-1B			HJ-1C	5 Satellites
	Operation Status										HJ-1A HJ-1B			HJ-1C	
Navigation Satellites	Beidou									Beidou-1		Beidou-2,3,4,5,6,7	Beidou-8,9,10	Beidou-11,12,13,14,15,16	Global Coverage

Network of Satellite Stations

Events

HiMAC2018 Workshop Topics

2018 International Workshop on Observations and Understanding of Changes in High Mountain and Cold Regions (HiMAC2018)

Welcome to the 2nd International Workshop on

Observations and Understanding of Changes in High Mountain and Cold Regions (HiMAC2018)

29-30 October 2018, FMI Arctic Space Centre, Sodankylä, Finland

CALL FOR ABSTRACTS:

Please send abstracts to: himac2018@fmi.fi by September 28, 2018

We kindly invite you to register by 12 October 2018:
https://www.webropolsurveys.com/S/69A6BC66C570CC37.par

Organizers:
Arctic Space Centre, Finnish Meteorological Institute (FMI)
Digital Belt and Road Program (DBAR)
Institute of Remote Sensing and Digital Earth (RADI), Chinese Academy of Science (CAS)

Co-Organizers:
Ad hoc committee for IEEE at the North and South Poles (INSP)
GEO Cold Regions Initiative (GEOCRI)
Pan-Eurasian Experiment (PEEX)
International Society for Digital Earth (ISDE)

The HiMAC2018 unities research in Earth's cold regions. The new satellite system are needed for filling the Arctic and High Asia monitoring, address the challenges on the data/variables gaps.

HiMAC2018, FMI, Finland

29-30, Oct @ Sodankylä, Finland

HiMAC2018 Workshop Topics

The HiMAC2018 workshop is organized around three themes,

- **Earth observations and data products for Arctic and high mountain cold region**
  - Ongoing initiatives addressing main observational gaps
  - Essential variables for the societal benefit areas over High Mountains and Cold Regions
  - Present capabilities and data products from Earth Observing satellites
- **New Earth Observing satellite systems for tracking variables in the Earth three poles (Arctic, Antarctic, High Asian areas)**
  - Upcoming observation systems/ Planned gap-filling satellite concepts
  - Role of ground-based reference observations in development of geophysical retrieval algorithms and validation
- **The role of variables in tracking climate, ecology and biogeochemical processes in the three poles.**
  - Links of cryosphere processes to carbon cycle.
  - Arctic ecology in changing climate
  - Linkage between Arctic warming and the mid-latitude weather and climate.

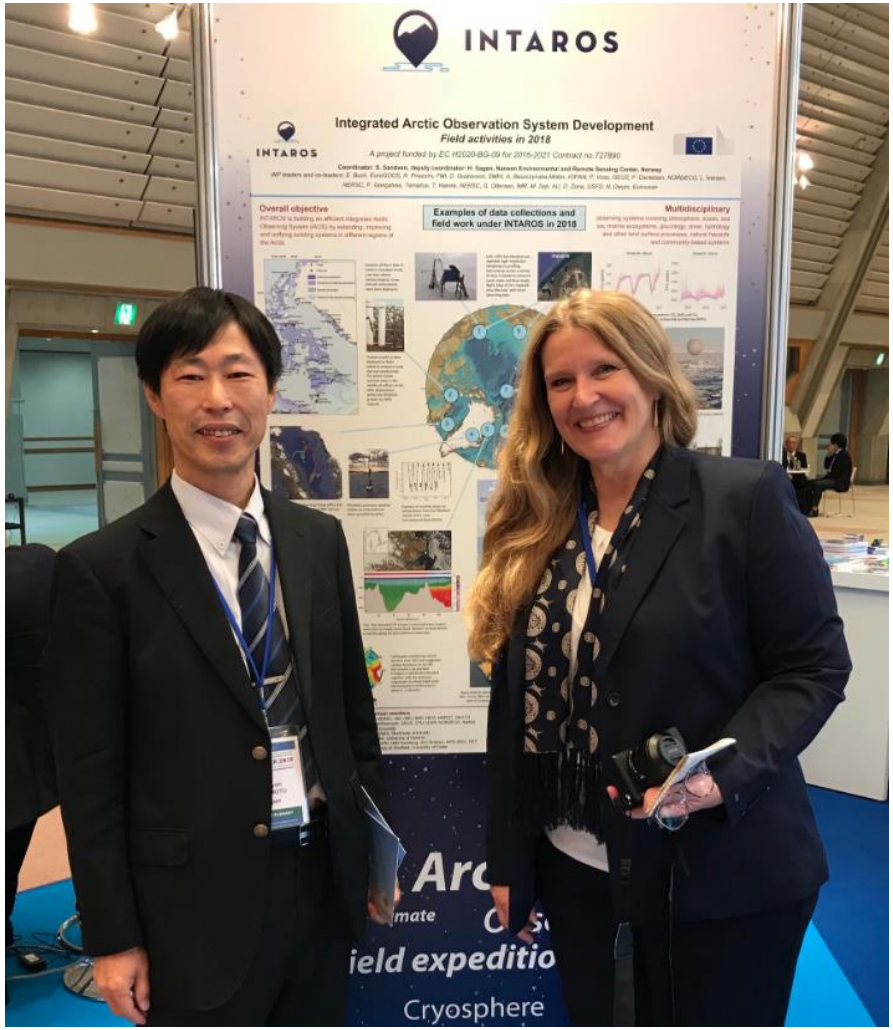
GEOCRI@POLAR2018

GEOCRI Side Meeting

Essential Variables and their potential to achieve societal benefits

Six of the co-leads to GEOCRI were gathering in POLAR2018 side event.

GEOCRI@GEO Plenary



@IntarosProject and learned a lot from Hiroyuki Enomoto from NiPR, Japan at the exhibition of #GEOWeek18 #arctic #coldregion

GEOCRI@GEO Plenary

GEO Cold Regions Side Event in Japan, a good organization from Japan.

Side Event: GEO Cold Regions Initiatives

Mon 29 October from 13:30 to 15:30 in Room C1

This side event introduces the current works of GEO Cold Regions Initiative for 2017-2019 This initiative has the geographic coverages are Arctic, Antarctic, high-latitude oceans, and Himalaya-third pole and high-mountain areas. This side introduces also coordination of observation for Arctic and Antarctic, and international /national projects.

Agenda

13:30-13:50: GEOCRI idea, plan and current activities (Introduction) (Hiroyuki Enomoto, NIPR/Hannele Savela, University of Oulu/Yubao Qiu, RADI)

13:50-14:10: On the current activities of SAON and the IASC-SAON Arctic Data Committee (Peter Pulsifer, Univ. Colorado, by telepresentation)

14:10-14:30: IEEE North South Pole Initiatives (Siri-Jodha Singh KHALSA, Univ. Colorado)

14:30-14:50: Arctic Data archiving system/contribution to GEO (Hironori Yabuki, NIPR Japan)

14:50-15:10: Enabling Access to Arctic Location Based Information - the Arctic SDI (Heli Ursin, National Land Survey of Finland)

15:10-15:30: Other activities and Discussion

Organizers National Institute of Polar Research, Japan

Contact Hiroyuki Enomoto (enomoto.hiroyuki@nipr.ac.jp)

Essential Cold Regions Variables Development

Task Team : Essential Cold Regions Variables
Support for Information for Cold Regions

- Science Driven with **Societal impact and implications**
- User oriented applications to **support priorities of SBAs**
- **Compatible** to the existing EVs and Indicators
- How much the Satellite could address
- Connections between the **data and indicators** for policy and evaluation purposes
- Relevance for **the Cold Regions and its human activities**
- Relevance for the **SBAs**: SDGs, Paris Agreement, Sendai Framework
- Deliverables: **White paper & potential journal articles recently**

ECRVs Meeting in Delft, Netherland

GEOCRI Essential Cold Regions Variables Meeting

Delft, Netherlands (Pending)

Discussion ???, 2019



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Massimo Menenti : m.menenti@tudelft.nl

Team Building : Data Scientist / Earth Science /Poles Scientist / *Relevant GEOSS Projects* / Policy and Decision Makers / Private Sectors…

Deliverables : Team / Road Map / Implementation Framework with the compatible to the existing efforts / Networking with Policy or user requirement Community;

Call for engagement in IP2020-2022

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