GEO XV Side Event
GEO Cold Regions Initiative

IEEE Technical Activities Board Ad-hoc Committee: IEEE In the North and South Poles (INSP)

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GRSS | OES | DBAR-HIMAC High Mountain and Cold Regions | IEEE

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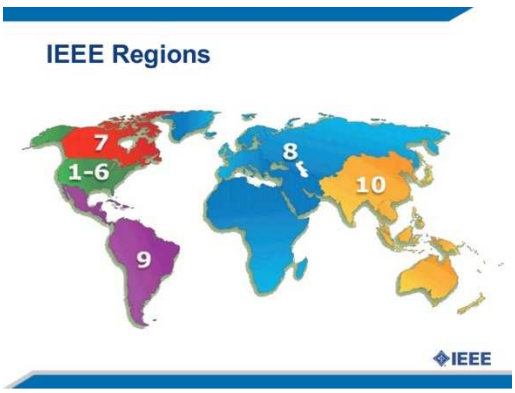
What is the IEEE?

A GEO Participating Organization since 2005

- Largest Technical Professional Society in the World
  - More than 417,000 members in over 160 countries, more than 50% of whom are from outside the United States
  - Has 39 technical Societies and seven technical councils
- Has produced over 1,300 active standards
- Publishes ~ 200 transactions, journals, and magazines
- Sponsored >1,800 conferences in 98 countries in 2017



Dedicated to advancing technology for the benefit of humanity

2

The Earth's Polar Regions

Size of Polar Antarctica
Including all islands and ice shelves, Antarctica covers 13,661,000 km².

Size of Polar Arctic
The area can be defined as north of the Arctic Circle (66° 33'N)

Areas defined by
- geography,
- weather,
- climate,
- population,
- culture,
- history, and
- resources.

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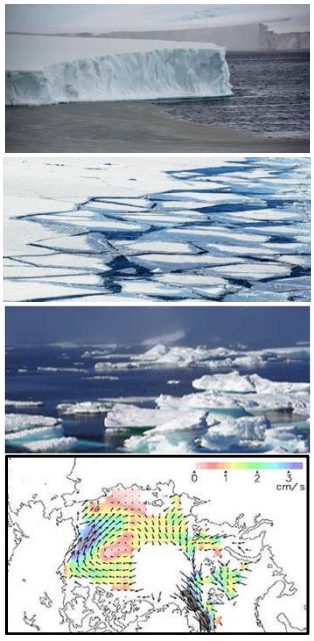
Polar Sea Ice Monitoring

Variable	Requirement
Sea ice thickness	25 km horizontal resolution 24 h revisit time 10 cm accuracy*
Sea ice type	10 km horizontal resolution 3 h revisit time 0.25 / Classes*
Sea ice cover	12 km horizontal resolution 3 h revisit time 5% accuracy**
Sea ice surface temperature	5 km horizontal resolution 3 h revisit time 0.1 K accuracy**
Sea ice motion	25 km horizontal resolution 3 h revisit time 1 km / day*
Ocean imagery and water leaving radiance	4 km horizontal resolution, 24 h revisit time*



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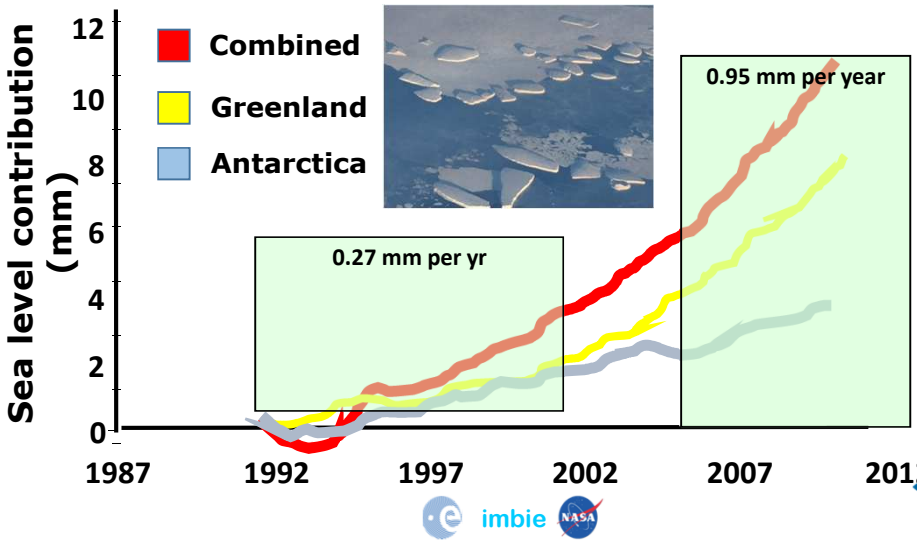
Rapid Changes in the North and South Poles

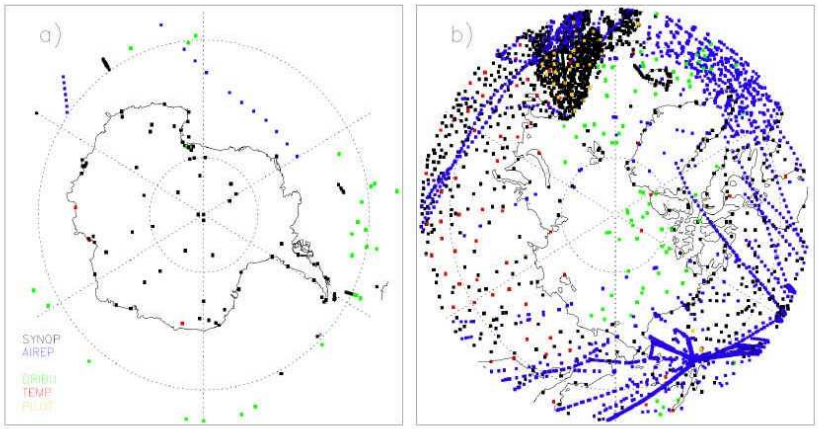
- *Arctic ice coverage declining at substantial rate in the past 39 years.*
- *Antarctic sea ice coverage increasing slightly, but climate drivers are much different than for the Arctic.*
- *Sea ice extent in both polar regions continues to be well below typical values for the past several decades.*

NASA

Increased Ice Sheet Mass Losses and Sea Level Rise



Gaps in the Observing Systems



Synop, AIREP, DRIBU, TEMP and PILOT

P. Bauer (ECMWF)

Polar data coverage of conventional observations in the ECMWF operational analysis on a particular winter day

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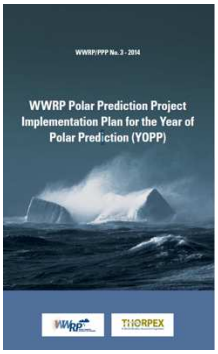
Filling the Gaps - Observations and Modeling

YOPP
YEAR OF POLAR PREDICTION



WMO 2016 Executive Council Decision on YOPP

- ***Increasing the frequency of routine synoptic and radiosonde observations;***
- ***Provide logistical support to planned field campaign activities;***
- ***Promote possible additional observations;***
- ***Provide access to remote-sensing observations over and near the Polar Regions;***

Promote cooperative international research enabling development of improved weather and environmental prediction services for the polar regions, on time scales from hourly to seasonal

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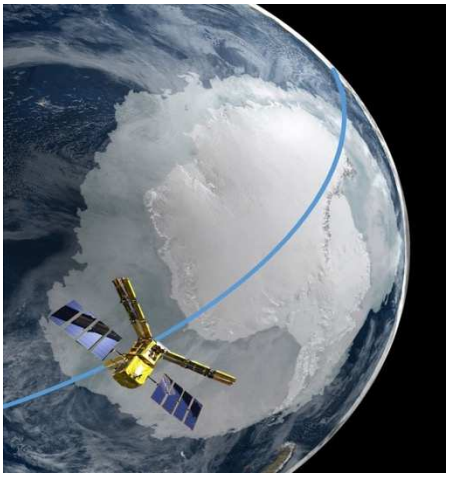
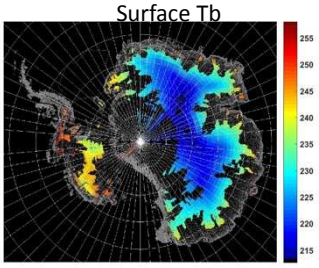
CryoSMOS - Estimation of Internal Ice-sheet Temperatures

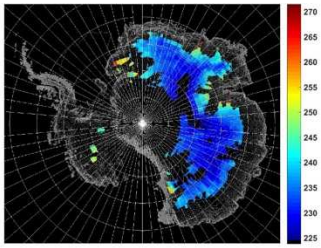


2017 IEEE International Geoscience and Remote Sensing Symposium
July 23–28, 2017 Fort Worth, Texas, USA

Surface Tb



1000m Tb



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IEEE Ad Hoc committee composition

INSP: Includes these IEEE Societies & Councils

- *IEEE Education Society*
- *IEEE Society on Social Implications of Technology*
- *IEEE Aerospace and Electronic Systems Society*
- *IEEE Geoscience and Remote Sensing Society*
- *IEEE Intelligent Transportation Systems Society*
- *IEEE Oceanic Engineering Society*
- *IEEE Vehicular Technology Society*
- *IEEE Power and Energy Society*
- *Sensors and Nanotechnology Councils*

GRSS AESS ITSS SSIT OES VTS

IEEE Education Society

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IEEE in the North and South Poles – INSP Objectives

1. ***Meet external organizations** presently active in both the North and South poles, to **better understand** the **challenges and issues they face**, and the **role** that **IEEE can play**.*
2. ***Define how to involve other IEEE OUs**, transforming the topic into an IEEE-wide self-sustainable initiative: new Community of IEEE members.*
3. *Deliver a **proposal** to **best partner** with existing research groups to contribute to existing activities, and **how IEEE can forge new and appropriate opportunities of support.***

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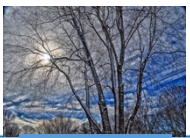
IEEE in the North and South Poles - INSP Current Drivers

1. ***New in-situ and remote sensors** or networks of sensors,*
2. ***Communications** and data from EO sensors for processing and application,*
3. *communication and **Transportation** issues of local communities,*
4. ***Climate change and ecological issues** associated to an increased human presence in a, so far, pristine environment, and*
5. ***Education and research** on the changes that these regions are undergoing and associated engineering challenges.*


New sensors


Communications


Transport


Ecological issues


Education

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IEEE in the North and South Poles - INSP Current Initiatives

InuCube for polar monitoring

Young Professional in Space - CanSat bootcamp

GRSS Student Grand Challenge: drone-based EO & App

IEEE DataPort - Bringing Polar datasets to a common interrogation server

IEEE ACCESS Special Section on IEEE in the North and South Poles

InuCube Initiative

- ***Multi-society CubeSat to study atmospheric parameters. Impacting the cryosphere (e.g. "black carbon")***
- ***Limited accuracy may prevent real science, but educational and outreach impact can be significant***
- ***Application for a "free" launch***
- ***Include as priority working with countries with no current access to space***

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Young Professional in Space – "Sat bootcamp"

- *Build a high altitude weather balloon from commercial off-the-shelf parts*
- *Launch the balloon, track it, and recover the payload.*
- *This program will be developed to be deployed in YPINSPACE.*
- *IEEE provides curriculum, content, experiments, equipment, kits and components as a customizable educational bootcamp of 2 to 4 days spanning a total of 20 - 32 hours.*

GRSS Student Grand Challenge: drone-based EO & App

Teams of two countries

Drone or RPAS for observation of the Polar Regions

Smartphone app to display the results

- *The proposal consists of the design and implementation of an end-to-end observing system to address a problem linked to the observation of the "POLAR" regions.*
- *2 teams will be selected*
- *These teams will each receive a research grant to develop the Project*
- *At least one of the team must have a demonstrated experience in the field, and will act as coordinator.*
- *Participation of a University or company mentor and/or sponsor is welcome.*

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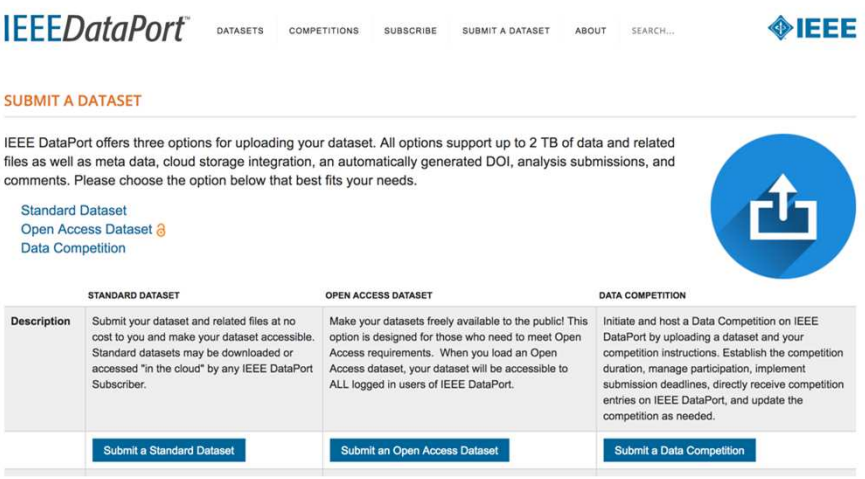
IEEE DataPort

- Like IEEEXplore for data sets
- DoI assigned
- Can be cited in publications



https://ieee-dataport.org/topic-tags/north-and-south-poles-0

IEEE Section Congress – Sydney, August, 2017

IEEE Ad Hoc Committee on IEEE at the North and South Poles (INSP)

brilliant minds BRIGHTFUTURES IEEE SECTIONS CONGRESS 2017 SYDNEY, AUSTRALIA 11 - 13 August 2017.

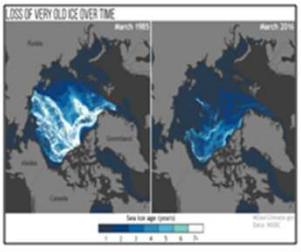
GLOBAL CHANGE IN THE POLAR REGIONS

Promoting IEEE contributions through instrumentation, technical, scientific and educational support to Arctic and Antarctic Agencies and Organisations.

INSP opportunities being investigated

- ICE CUBE and Drone EO monitoring
- Bringing polar datasets to a common interrogation server - *IEEE DataPort*
- Climate and weather measurement and prediction
- Improving communication networks
- Sensor web instrumentation
- Transport navigation

Congress Participation
↕
ANTARCTIC FORUM
↕
IGNITE PRESENTATION
↕
EXHIBITION BOOTH



'IEEE should play a role in the activities and challenges that take place in polar regions'

IEEE - Antarctic and Southern Oceans Forum 2018

Over 50 snow and ice researchers and scientists attended

"The need for technology transfer in the Southern Ocean is particularly clear, where scientists can benefit from new sensors and platforms, while engineers can benefit from complex design requirements".

"The Southern Ocean community needs to meet more often with the IEEE community. This can be done through **cross-invitation** to meetings and with **inclusion of inter - disciplinary sessions** at reciprocal events". Damien Guihen University of Tasmania.

HiMAC2018 - Observations and Understanding of Changes in High Mountain and Cold Regions

Earth Three Poles are the most sensitive regions to the global temperature and its induced environmental changes, and then it influences the human activities and modulates the societal developments and Benefits. The sound ***Big Earth Data*** and **new *Frontier Technology*** are much required, the planetary data management, algorithm and tools to support and address the sustainable development.

Academician, Prof Guo Huadong, RADI-CAS

The HiMAC2018 unities research in Earth's cold regions. The new satellite system are needed for filling the Arctic and High Asia moniting, and data/variables supporting.

FMI, Finland

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:

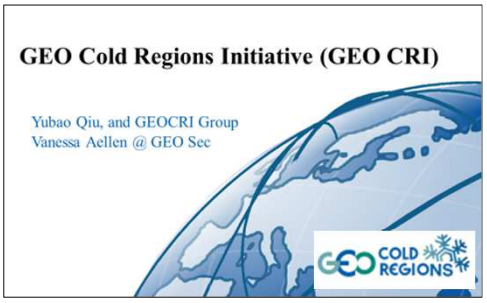
Please send abstracts to: himac2018@fmi.fi by September 28, 2018

We kindly invite you to register by 12 October 2018:
https://www.webropolsurveys.com/S/69A68C66C570CC37.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)

GEO GROUP ON EARTH OBSERVATIONS



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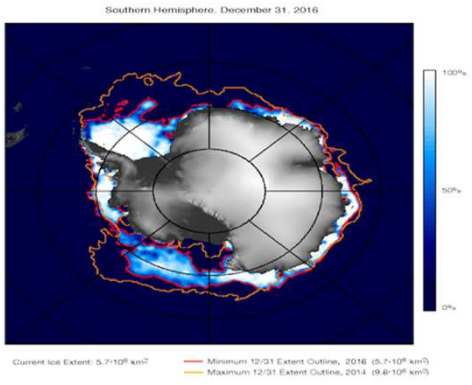
Thanks

Inputs, contributions, and participation are welcome!



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