

## Vision and Mission of “IEEE in the North and South Poles”

Antarctica is the “continent of every continent,” where representatives from each region on Earth perform continuous scientific and technical activities that benefit the future of the planet and its inhabitants.

The Arctic is a place where all continents that were once kept apart by a sea of ice are now connected through waters that global warming is rendering navigable. The persisting ice cover decline will allow increasing amounts maritime navigation.

Both Antarctica and the Arctic epitomize the concept of a truly global effort, the ideal meeting point of people, solutions, vision for the future of humanity. IEEE is the world’s largest technical profession organization with more than 423,000 members in over 160 countries. Since IEEE is a truly global organization, seeking to unite technical communities, advanced concepts and disciplines across the globe for the benefit of humanity, IEEE is working to identify ways in which it can most productively contribute to the activities in a location that so closely mirrors its own mission.

The IEEE in the North and South Poles (INSP) ad hoc committee started its activities in 2017, and during its first year of existence it has already triggered and supported a number of activities that will continue/expand in 2018:

- InuCube: a Cubesat project led by the University of Manitoba to educate, raise awareness of the challenges of the Arctic, and to perform some basic Earth Observations.
- The Young Professionals in Space (YPinSpace) bootcamp to train students and recent graduates in space techniques and technologies, with a focus on Earth Observation and in particular in cryospheric applications. After a successful first edition in Bangalore, India, in November 2017, the next edition will take place at the Universitat Politècnica de Catalunya in Barcelona, Spain in July 2018: <https://www.ypinspace.com/young-professionals-in-space-in-barcelona/>
- The IEEE GRSS Student Grand Challenge: a competition of 5 international teams of students to create an end-to-end drone-based Earth Observing system and mobile phone app with focus in cryospheric applications.
- The IEEE Dataport: an on-line, perpetually free-of charge repository of data sets up to 2TB to be used for research and other scientific studies: <https://iee-dataport.org/topic-tags/north-and-south-poles-0>
- The IEEE Access Special Section: a dedicated special section entitled “Addressing Economic, Environmental and Humanitarian Challenges in the Polar Regions” in the new full open access IEEE journal, featuring a high impact factor (3.244 in 2016), is accepting submissions. This Special Section in IEEE Access welcomes contributions from a wide range of topics dealing with the emerging challenges in polar regions:

<http://ieeaccess.ieee.org/special-sections/addressing-economic-environmental-humanitarian-challenges-polar-regions/>

The topics of interest include, but are not limited to: environmental changes experienced by the polar regions (cryosphere, land, oceans, and atmosphere); remote and in situ sensors, and their associated technologies; sensor networks for weather and climate modelling; development of working environments for feature extraction from imagery; convolutional neural networks in image feature extraction and analytics; telecommunication technologies; transportation techniques and technologies, including drones and other autonomous vehicles; ecological, security and health issues associated with an increased human presence in an isolated environment; economic exploitation of the polar regions, including fisheries and oil exploration; educational and outreach activities concerning the changes that polar regions are undergoing.

- The organization of the Antarctic and Southern Ocean Forum (ASOF) 2017. In 2018, ASOF 2018 is being organized as well as its North Hemisphere counterpart, the Arctic and Northern Ocean Forum (ANOF) 2018 workshop, to gather scientists, engineers and decision makers with the following interests:

#### Autonomous Observing

- ROV/AUV/ASV technology
- Communications gateways e.g. surface vehicles
- Control system development
- Deep autonomy / under-ice navigation – gliders, Argo floats
- Atmospheric sampling from land and sea (autonomous balloons, Lidar, Cloud radar and atmospheric profilers), weather stations, moorings
- Intelligent sensing / sampling
- Autonomy in a polar environment.

#### Observation Technologies

- Atmospheric lidar, cloud radar and atmospheric profilers
- Miniaturization, automation and ruggedization of instrumentation, (multiple deployment of low cost samplers)
- Long-term instrument stability, self-calibration
- Problems of high latitude and long range operation
- Ice profiling instruments, englacial & sub-glacial instrument deployment, new drilling technology/methods
- Acoustics at high latitudes – navigation, data and tomography
- Advanced drifter technology,
- Airborne deployment of oceanographic instruments
- Mission risk assessment

#### Sustained measurements

- Oceanographic mooring technologies
- Remote sensing and satellite calibration
- Animal borne sensors – developments, data streams and methods

### Biology and biomass

- Fisheries and mid-water acoustics
- Genomics sampling and sensing

### Data Science

- Data Storage – long-term monitoring, swappable data
- Data Transfer – real time monitoring; event triggering
- Data processing for new under-ice data sets
- Instrument communications and tracking

Last, but not least, IEEE seeks its participation in other international fora such as the Arctic Council, where it can contribute with its technical expertise, or in the Arctic University. To graphically illustrate how each IEEE Society can contribute to address the “Arctic Challenges” within the scope of each Society/Council, a series of short videos (3-5 min) will be created in English and Spanish.