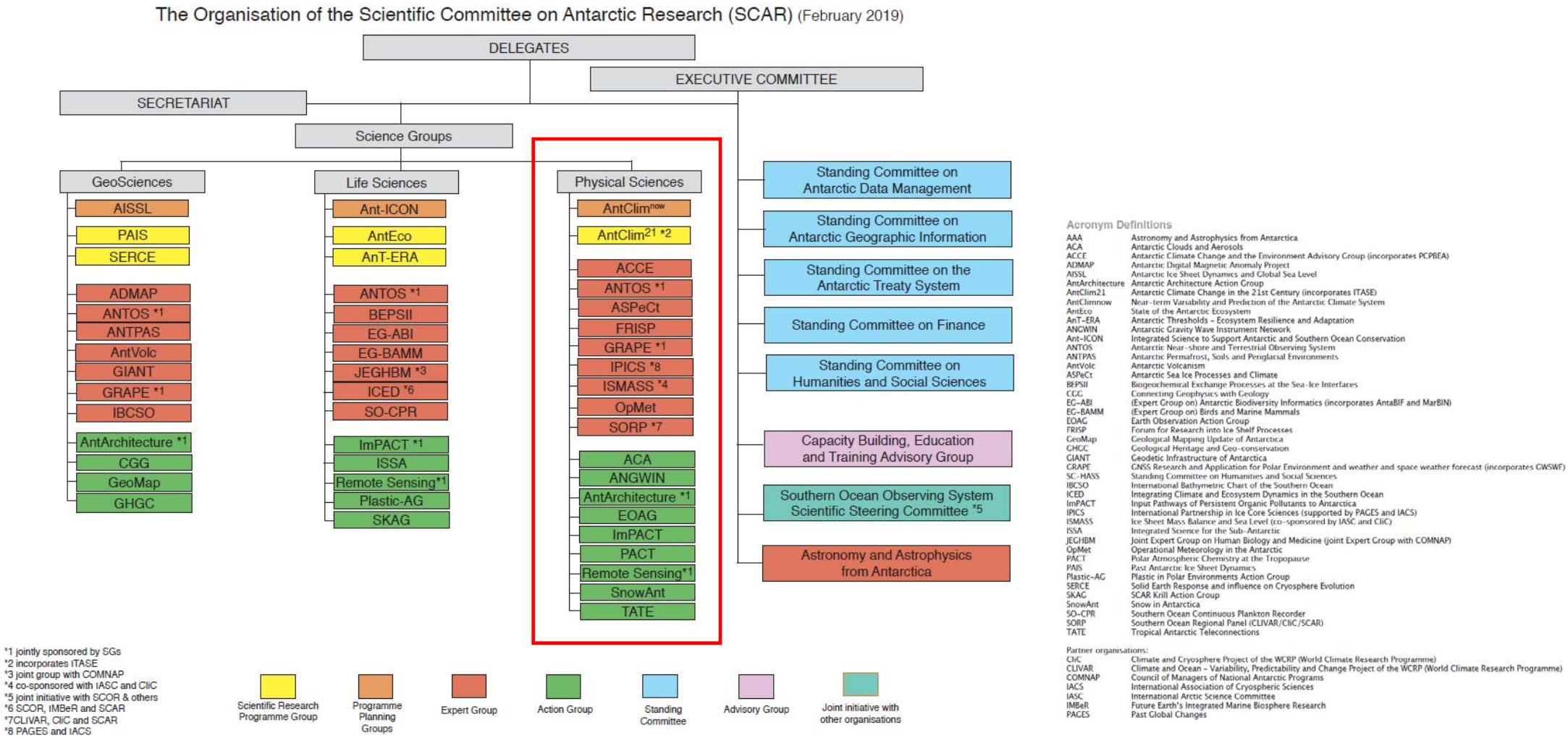
Physical Science Group

Kenichi Matsuoka (Glaciologist, Norwegian Polar Institute)
Wojciech J. Miloch (Physicist, University of Oslo)

Overall “science group” structure in SCAR



Acronym Definitions

AAA	Astronomy and Astrophysics from Antarctica
ACA	Antarctic Clouds and Aerosols
ACCE	Antarctic Climate Change and the Environment Advisory Group (incorporates PCPBEA)
ADMAP	Antarctic Digital Magnetic Anomaly Project
AISSL	Antarctic Ice Sheet Dynamics and Global Sea Level
AntArchitecture	Antarctic Architecture Action Group
AntClim21	Antarctic Climate Change in the 21st Century (incorporates ITASE)
AntClimnow	Near-term Variability and Prediction of the Antarctic Climate System
AntEco	State of the Antarctic Ecosystem
AnT-ERA	Antarctic Thresholds – Ecosystem Resilience and Adaptation
ANGWIN	Antarctic Gravity Wave Instrument Network
Ant-ICON	Integrated Science to Support Antarctic and Southern Ocean Conservation
ANTOS	Antarctic Near-shore and Terrestrial Observing System
ANTPAS	Antarctic Permafrost, Soils and Periglacial Environments
AntVolc	Antarctic Volcanism
ASPeCt	Antarctic Sea Ice Processes and Climate
BEPSII	Biogeochemical Exchange Processes at the Sea-Ice Interfaces
CGC	Connecting Geophysics with Geology
EG-ABI	(Expert Group on) Antarctic Biodiversity Informatics (incorporates AntaBIF and MarBIN)
EG-BAMM	(Expert Group on) Birds and Marine Mammals
EOAG	Earth Observation Action Group
FRISP	Forum for Research into Ice Shelf Processes
GeoMap	Geological Mapping Update of Antarctica
GHGC	Geological Heritage and Geo-conservation
GIANT	Geodetic Infrastructure of Antarctica
GRAPE	GNSS Research and Application for Polar Environment and weather and space weather forecast (incorporates GWSWF)
SC-HASS	Standing Committee on Humanities and Social Sciences
IBCSO	International Bathymetric Chart of the Southern Ocean
ICED	Integrating Climate and Ecosystem Dynamics in the Southern Ocean
ImPACT	Input Pathways of Persistent Organic Pollutants to Antarctica
IPICS	International Partnership in Ice Core Sciences (supported by PAGES and IACS)
ISMASS	Ice Sheet Mass Balance and Sea Level (co-sponsored by IASC and CliC)
ISSA	Integrated Science for the Sub-Antarctic
JEGHBM	Joint Expert Group on Human Biology and Medicine (joint Expert Group with COMNAP)
OpMet	Operational Meteorology in the Antarctic
PACT	Polar Atmospheric Chemistry at the Tropopause
PAIS	Past Antarctic Ice Sheet Dynamics
Plastic-AG	Plastic in Polar Environments Action Group
SERCE	Solid Earth Response and influence on Cryosphere Evolution
SKAG	SCAR Krill Action Group
SnowAnt	Snow in Antarctica
SO-CPR	Southern Ocean Continuous Plankton Recorder
SORP	Southern Ocean Regional Panel (CLIVAR/CliC/SCAR)
TATE	Tropical Antarctic Teleconnections

Partner organisations:

CliC	Climate and Cryosphere Project of the WCRP (World Climate Research Programme)
CLIVAR	Climate and Ocean – Variability, Predictability and Change Project of the WCRP (World Climate Research Programme)
COMNAP	Council of Managers of National Antarctic Programs
IACS	International Association of Cryospheric Sciences
IASC	International Arctic Science Committee
IMBeR	Future Earth's Integrated Marine Biosphere Research
PAGES	Past Global Changes

Terms of Reference

- take a strategic view of scientific research requirements
- share information, and identify research areas where current research is lacking;
- coordinate proposals for future research
- establish links and/or partnerships with other relevant international organizations
- identify research areas or fields that might be best investigated by a SCAR Scientific Research Programme
- establish Action Groups and Expert Groups
- make funding requests
- provide scientific advice
- inform other SCAR Subsidiary Bodies and the SCAR Secretariat well
- encourage submission of data and metadata.

Physical Science Group (PSG)

- Chief Officer:
  David H. Bromwich, Ohio State Univ. (atmospheric sciences)
- Deputy Chief Officer:
  Adriana Maria Gulisano, Instituto Antarctico Argentino (upper atmosphere sciences)
- Secretary:
  Steve Colwell, British Antarctic Survey (atmospheric sciences)

- At least one representative is required from each SCAR member country. Most countries have the representative(s).

Scope

- Within the physical realm, processes at the interfaces between **ice**, **ocean**, **land** and **atmosphere** are critical to our ability to describe and predict the response to **climate change**.
- Outstanding uncertainties will require continued research directed at
  - improving understanding of **ice sheet dynamics**, **extracting climate records** from the ice sheet,
  - exploring processes and changes in **sea-ice** and **ocean circulation**, and
  - improving understanding of **atmospheric dynamics** and **chemistry** and the **role of the ozone hole** in Antarctic climate.
- A distinct component of physical sciences research in Antarctica is based on the unique properties of the continent that favour its use as a platform for **astronomical and solar-terrestrial observations**.

Research programme and action/expert groups

- **Scientific Research Programme**
  - focus high priority topical areas and run for 8 years.
  - A new cycle starts this year, subject to the final approval by deligates

- **Action Groups**
  - address one specific issue and are short-term, usually with a lifetime of between two and four years.

- **Expert Groups**
  - have a broader focus and a longer lifetime of around six to eight years, with the option of renewal

These activities are often associated with multiple science groups with a single lead science group.

Former, current, and future Scientific Research Programme:

- Astronomy and Astrophysics from Antarctica – AAA
  - Ended, not an expert group.
- Antarctic Climate Change in the 21st Century, AntClim21
  - Ongoing, and will be followed up AntClimNOW

- Near-term Variability and Prediction of the Antarctic Climate System (AntClimNOW)
- INStabilities and Thresholds in ANTarctica (INSTANT)
  - A sort of follow-up programme of ongoing “Past Antarctic Ice Sheet Dynamics” (PAIS) under Geoscience Group.
- AntClimNOW and INSTANT have been developed by program developing groups, and their final proposal is subject to delegate’s approval.

Action Groups (2-4 years long)

- Antarctic Clouds and Aerosols – ACA
- ANtarctic Gravity Wave Instrument Network - ANGWIN
- Earth Observation Action Group - EOAG
- Input Pathways of persistent organic pollutants to AntarCTica - ImPACT
- *Remote Sensing of Birds and Animals - Remote Sensing*
- Snow in Antarctica – SnowAnt
- Tropical Antarctic Teleconnections – TATE

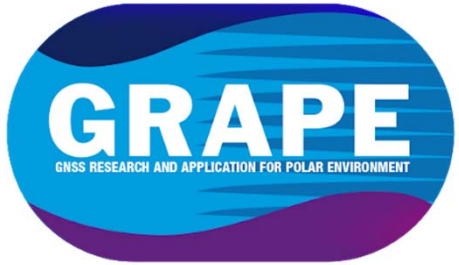
Expert groups (longer duration)

- Antarctic Climate Change and the Environment – ACCE
- Antarctic Near-shore and Terrestrial Observing System – ANTOS
- Antarctic Sea-ice Processes and Climate – ASPeCt
- Forum for Research into Ice Shelf Processes – FRISP
- GNSS (Global Navigation Satellite System) Research and Application for Polar Environment – GRAPE
- Ice Sheet Mass Balance and Sea Level – ISMASS
- International Partnership in Ice Core Sciences – IPICS
- Operational Meteorology in the Antarctic – OpMet
- Southern Ocean Region Panel – SORP

Example: GRAPE (2012-2020)

GNSS Research and Application for Polar Environment

GRAPE focuses on data sharing, expertise exchange and increasing the awareness of scientific capabilities.



Goals:

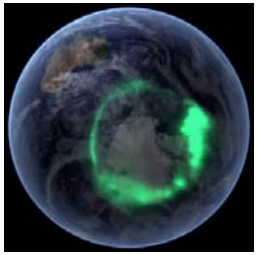
- Create and maintain distributed networks of specialized GNSS receivers particularly at high latitudes.
- Identify and quantify mechanisms that cause scintillation and control interhemispheric differences, asymmetries and commonalities in scintillation occurrence and intensity as a result of the geospace environment conditions.
- Develop ionospheric scintillation climatology, tracking and mitigation models to improve prediction capabilities of space weather.
- Retrieve tropospheric precipitable water vapor (PWV) for input to weather forecast models and to develop regional PWV climatology for atmospheric sensing in remote areas.

Recent Norwegian activities under PSG

- Present FRISP proposal for an expert group (2018)
- Nominate Quantarctica as a SCAR product, which is now primarily associated with SCADM (2016)
- Participate in Southern Ocean Regional Panel (2015-2018)
- Request budget for “IceRises Workshop”, and use SCAR’s endorsement to generate the full budget for the workshop (2012)

Recent Norwegian activities under PSG

- Participate in the GRAPE White Paper on the Polar atmosphere and Geospace, September 2020.
- Participate in the application for the Proposal Planning Group (PPG) RESOURCE “Radio Sciences Research on AntarCtic AtmosphEre” – follow up of GRAPE after 2020.
- Coordinate a community research paper related to GRAPE/RESOURCE work - outcome of online workshop.



White Paper

Polar atmosphere and Geospace: Present knowledge, infrastructures and future research directions

Authors: N. Bergeot[1], L. Alfonsi[2], P.J. Cilliers[3], G. De Franceschi[2], E. Correia[4], C-F Enell[5], M.J. Engebretson[6], I. Häggström[5], G. Heygster[7], K. Kauristie[8], M. Kosch[3], C. Lee[9], E. Macotela[10], F. Marcucci[11], W. J. Miloch[12], J. Morton[13], M. Negusini[11], E. Pottiaux[1], P.R. Shreedevi[14], P. Prikryl[15], L. Spogli[2], J.A.E Stephenson[16], O. Troshichev[17], R. Van Malderen[18], S. Zou[19], and the GRAPE EG members.