"SCAR SCIENCE"

briefing of the
National Science Foundation Office of Polar Program
Office Advisory Committee
October, 2006

by
Mahlon "Chuck" Kennicutt
US Delegate to SCAR

Scientific Committee on Antarctic Research

SCAR & US Antarctic Science

Geographic Based, International, Interdisciplinary Science

Scientific Committee on Antarctic Research

SCAR's Missions

- **SCIENCE LEADERSHIP - Initiate, develop and coordinate high quality international scientific research in the Antarctic region**
- **SCIENTIFIC ADVICE - Provide objective and independent scientific advice to the Antarctic Treaty System (ATS) -**

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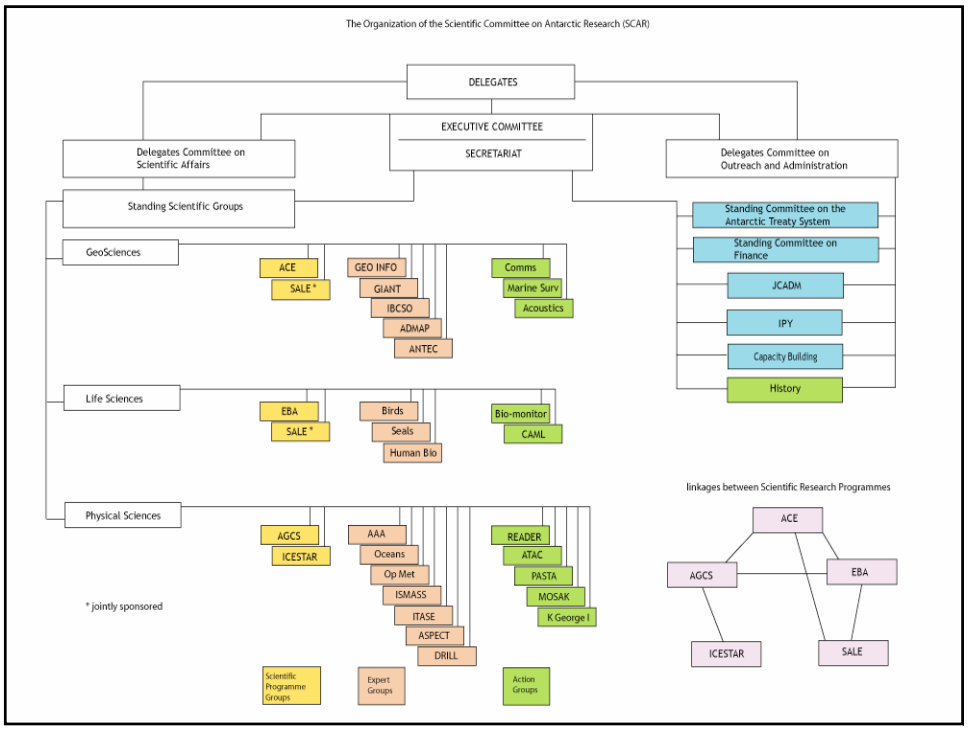

SCAR Organization

- President
- Secretariat - Executive Director
- *Executive Committee*
- *Delegate Committee on Scientific Affairs*
- Delegate Committee on Outreach and Administration
- Standing and Joint Committees

Scientific Committee on Antarctic Research

Accomplishment of SCAR's Science Mission

- Standing Scientific Groups
  - Expert Groups
  - Action Groups
  - Planning Groups
- Scientific Research Programs
- Scientific Partnerships
- Open Science Conference
- Thematic Symposia/Workshops

Scientific Committee on Antarctic Research

US SCAR Delegates

Chuck Kennicutt

Delegate

Terry Wilson

Delegate (Alternate)

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US SCAR Team

Life Sciences

Ruhl

Mayewski

Hulbe

Weatherwax

Reed

Murray

MultiCare

Goebel

Karentz

Physical Sciences

Geosciences

Powell

Bell

Lyons

Csatho

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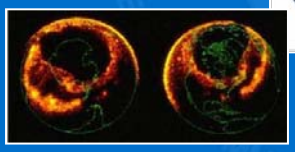
SCAR
Scientific Research Programs

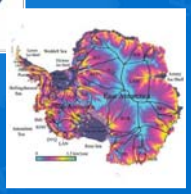
ACE

AGCS

EBA



ICESTAR



SALE

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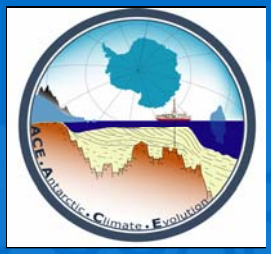
Antarctic Climate Evolution (ACE)



"An international research initiative to study the climate and glacial history of Antarctica through palaeoclimate and ice-sheet modeling integrated with the geological record."

http://www.ace.scar.org/

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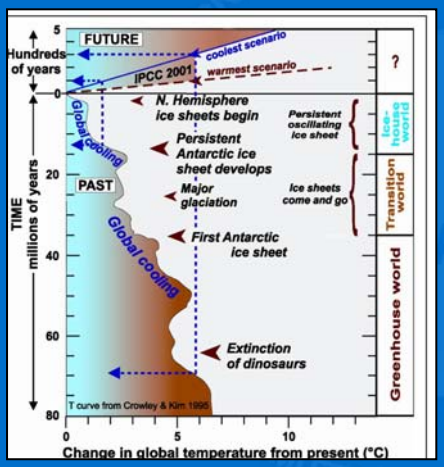
Antarctic Climate Evolution



To Understand:

- **the scale & rapidity of ice sheet & sea ice response to climate forcing**
- **sea level changes**
- **changes in heat sinks/insulators**

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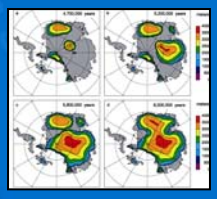
ANTARCTIC CLIMATE EVOLUTION

Modeling ice-sheet behavior in response to changes in:



- **climate**
  - **ice cores**
  - **sedimentary facies**
  - **seismic data**
- **paleo oceanographic conditions**
  - **paleo-ecology**
  - **climate proxies in ocean sediments**
- **paleo geography**
  - **recorded in landscape evolution**

Building hypotheses and testing through modeling of likely response to future global change

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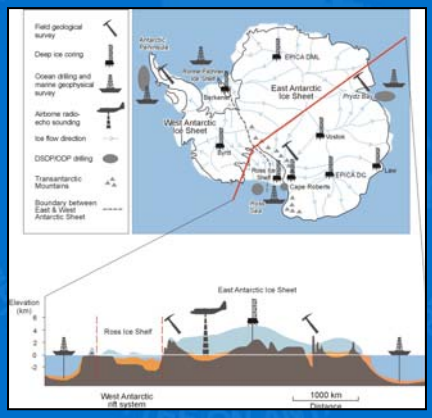
Antarctic Climate Evolution

Datasets contributing to ACE:
ANDRILL
SHALDRIL



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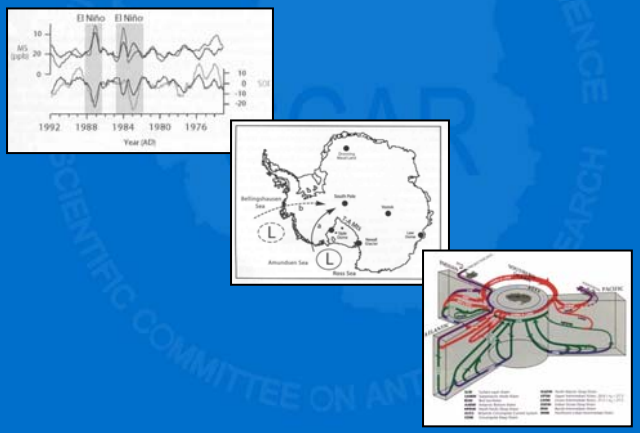
Antarctica and the Global Climate System (AGCS)

http://www.antarctica.ac.uk/met/SCAR_ssg_ps/AGCS.htm



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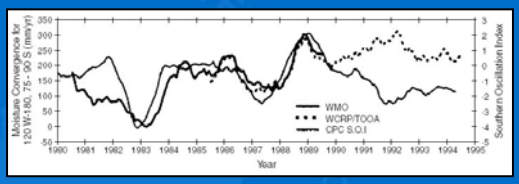
Theme 1 - Decadal Time Scale Variability

ENSO links with West Antarctic mass balance



Theme 2 - Global & Regional Signals in Ice Cores

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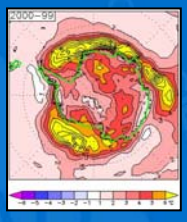
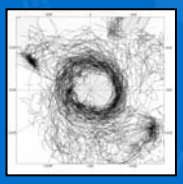
Theme 3 - Natural & Anthropogenic Forcings on the Antarctic Climate System

Prediction of Antarctica temperature changes by 2100



Theme 4 - The Export of Antarctic Climate Signals

Five years of Summer Storm Tracks



The Deep Ocean Conveyor Belt

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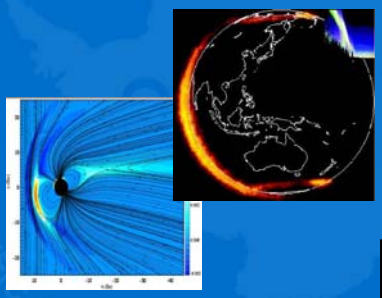
ICESTAR: Interhemispheric Conjugacy Effects in Solar-Terrestrial and Aeronomy Research

Linking Near-Earth Space to Polar Regions



http://www.siena.edu/physics/ICESTAR/

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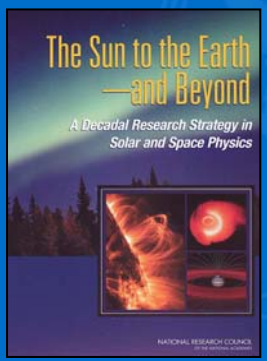
Challenge

Understand the geospace environment in the polar regions and its dynamical response to external forcing from solar activity



ICESTAR Goals

- **To identify and quantify mechanisms that control interhemispheric regional differences and/or commonalities in the electrodynamics of the Earth's magnetosphere iono-sphere system and aeronomy of the upper atmosphere over the Arctic and Antarctic**

and

- **To develop a "virtual data portal" linking together a large number of globally distributed geophysical databases, including both data serving applications and visualization tools; this will enable a systems view of the polar upper atmosphere and geospace**

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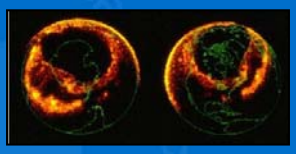
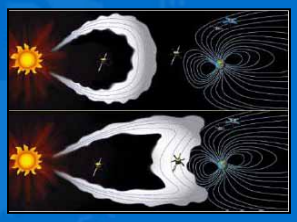
ICESTAR - Four Thematic Action Groups

- Similarities and differences between the Northern and Southern polar upper atmospheres
- Atmospheric consequences of the global electric circuit
- Dynamics of the inner magnetospheric particles, fields and the polar atmosphere
- Creating a data portal for all polar data sets and modeling results





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ICESTAR

ICESTAR

- Understanding the interactions between and collective behavior of the Earth system
- Providing a material link between the Sun and Earth through the polar regions

"To use the unique vantage point of the polar regions to develop and enhance observatories studying the Earth's inner core, the Earth's magnetic field, geospace, the Sun and beyond."

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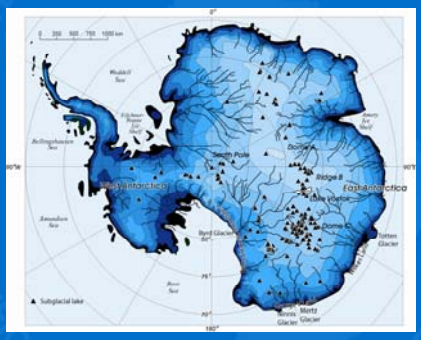
ICESTAR

Subglacial Antarctic Lake Exploration (SALE)



http://salepo.tamu.edu/

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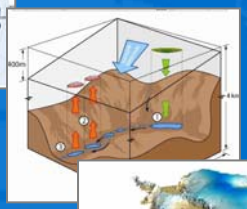
SALE- Scientific Themes

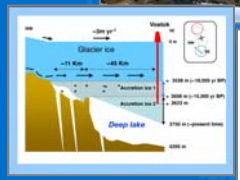
GEODYNAMICS OF LAKE EVOLUTION

SUBGLACIAL HYDROLOGY

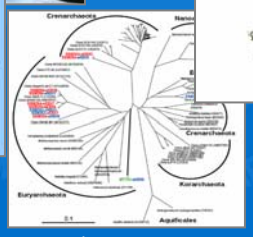


GLOBAL CLIMATE CONNECTIONS

PALEOCLIMATE RECORDS



ICE SHEET DYNAMICS



MICROBIOLOGICAL LIFE, EVOLUTION, AND ADAPTATION

LIMNOLOGY AND BIOGEOCHEMISTRY

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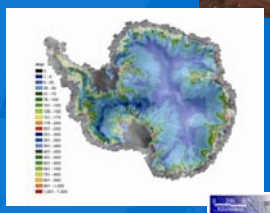
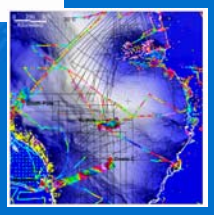
SALE Research

- Advance our understanding of the geological evolution of our planet's 5th largest continent.
- Encourage the development of the next generation of ice sheet models that will incorporate the subglacial environment as an important element of the system.





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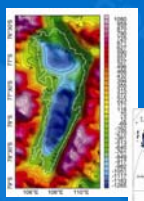
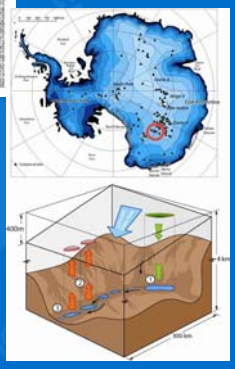
SALE Research

- Define the role of large volume discharges of subglacial water on
- Establish the phylogenetic and metabolic diversity of subglacial organisms and their evolutionary position in the Tree of Life.
- Lend clues to the seed organisms for these environments and to special adaptations generated by the interplay of tectonics, geology and climate.





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Evolution and Biodiversity in the Antarctic (EBA): The response of life to change

http://www.nioo.knaw.nl/projects/scarlsssg/eba/

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Evolution and Biodiversity in the Antarctic (EBA)

- Examine evolutionary history and adaptations
- Establish gene flow and population dynamics.
- Document organismal, ecosystems and diversity patterns
- Study environmental change, biodiversity and ecosystem function.

CENSUS OF MARINE LIFE

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Evolution and Biodiversity in the Antarctic (EBA)

- Circum-Antarctic Census of Marine Life
- Marine Biodiversity Information Network (MARBIN)

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SCAR Scientific Subsidiary Groups

- **LIFE SCIENCES**
  - **Expert Groups** -Birds, Seals, and Human Biology and Medicine
  - **Action Groups** - Best Practices in Conservation, Biological Monitoring, Census of Marine Life, Acoustics in the Marine Environment
- **GEOSCIENCES**
  - **Expert Groups** Geographical Information, Permafrost and Periglacial Environments, Geodetic Infrastructure of Antarctica, Antarctic Neotectonics, Antarctic Digital Magnetic Anomaly Project, International Bathymetric Chart of the Southern Oceans
  - **Action Group** -Acoustics in the Marine Environment, Sub-ice Geological Exploration

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SCAR Scientific Subsidiary Groups

- PHYSICAL SCIENCES
  - Expert groups – Antarctic Astronomy and Astrophysics, Operational Meteorology, Ice Sheet Mass Balance and Sea Level, Ice Drilling Technologies, Oceanography
  - Action Groups – Pan-Antarctic Observing Network, Contmination

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SCAR Scientific Partnerships

World Climate Research Program (WCRP)

Integrated Global Observing Strategy Partnership (IGOS)

Southern Ocean component Global Ocean Ecosystem Dynamics Program (SO GLOBEC)

International Antarctic Zone Program (iAnZone)

Scientific Committee on Solar Terrestrial Physics (SCOSTEP)

Scientific Committee on in Oceanic Research (SCOR)

Integrated Analyses of Circumpolar Climate Interactions and Ecosystem Dynamics in the Southern Ocean (ICED)

Integrated Partnerships in Ice Core Sciences (IPICS)

International Permafrost Association (IPA)

International Arctic Science Committee (IASC)

Ocean Biogeographical Information Service (OBIS)

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SCAR
Open Science Conference

"Antarctica in the Earth System"

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Thematic Symposia/Workshops

- SCAR Biology Symposium
- International Symposium on Antarctic Earth Sciences (ISAES)
- International Glaciological Symposium
- Various Thematic Workshops – SALE 2006, Ice Drilling, ACE, AGCS, ICESTAR, etc.

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http://usscar.tamu.edu/
http://www.scar.org/
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