The Role of Science and Technology in GEOSS

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Earth Observation Summit, 31 July 2003

http://www.earthobservationsummit.gov/images/eos_group.gif

Apollo 17, 7 Dec 1972

Declaration: Develop coordinated and sustained Earth observation system or systems, minimize data gaps, exchange observations with minimum time delay and minimum cost, assist developing countries.

http://www.earthobservationsummit.gov/declaration.html

Kaguya, 6 Apr 2008

Global Earth Observation System of Systems

GEOSS has nine interconnected societal benefit areas (SBAs). Each SBA requires many observation data and decision-support tools. Each data set and tool can serve many SBAs.

Building Together What Cannot Be Built Alone

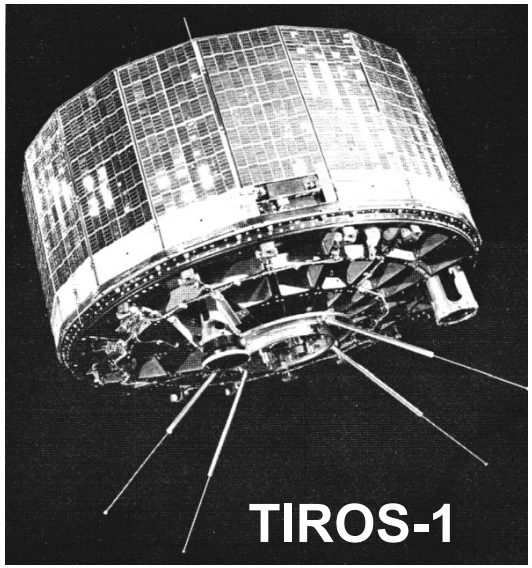
The Role of Science and Technology in GEOSS (2008)
http://www.earthobservations.org/documents/committees/stc/the_role_of_science_and_technology_in_geoss.pdf

GEOSS occurs in a changing global environment

- global greenhouse gas emission is increasing
- global stratosphere ozone is recovering
- global aerosol amount is increasing
- global deforestation is increasing
- global air pollution is increasing
- global biodiversity is declining
- global warming is increasing
- global land ice is decreasing
- global sea ice is decreasing
- global ocean is acidifying
- global sea level is rising

Halpern IAC1Oct08

Satellites provide global observations with high space-time resolutions.

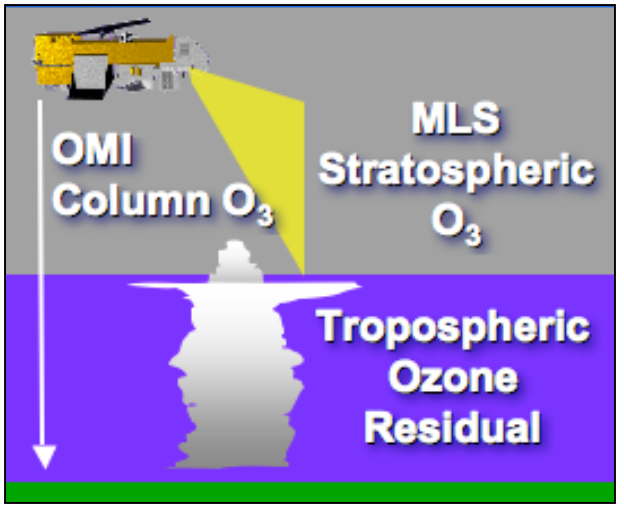


GEOSS Societal Benefit Area: Health

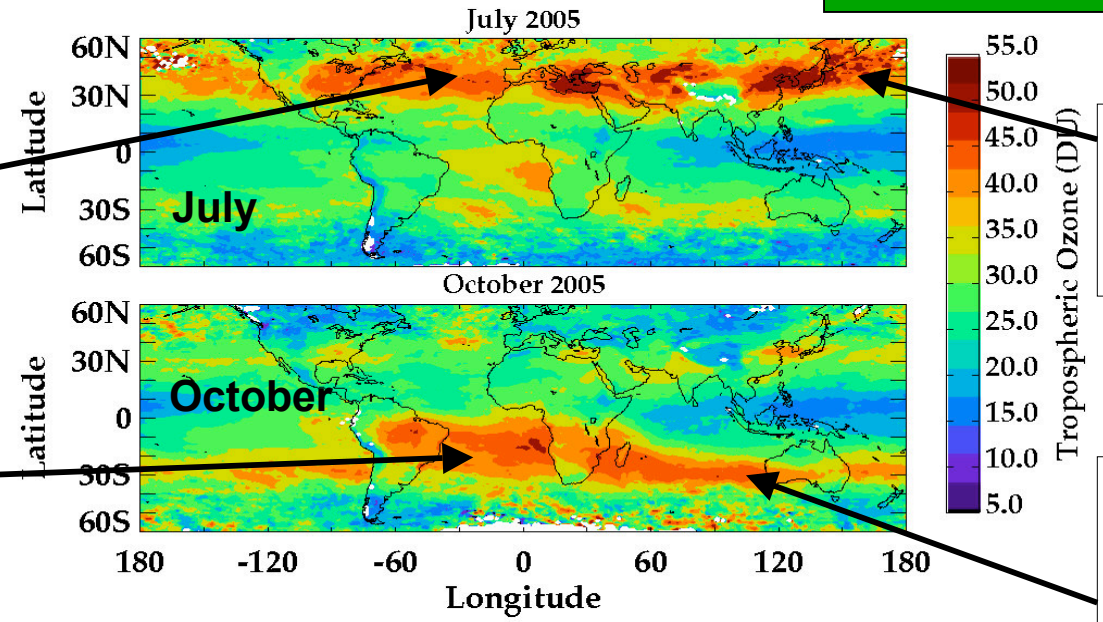
Air Pollution Intercontinental Transport

- NH pollution in summer
- SH biomass burning in spring

NASA Aura



July and October 2005



Pollution from North America reaches Europe

Pollution from China reaches North America

Pollution from South America fills the South Atlantic

Pollution from Africa spreads to Australia

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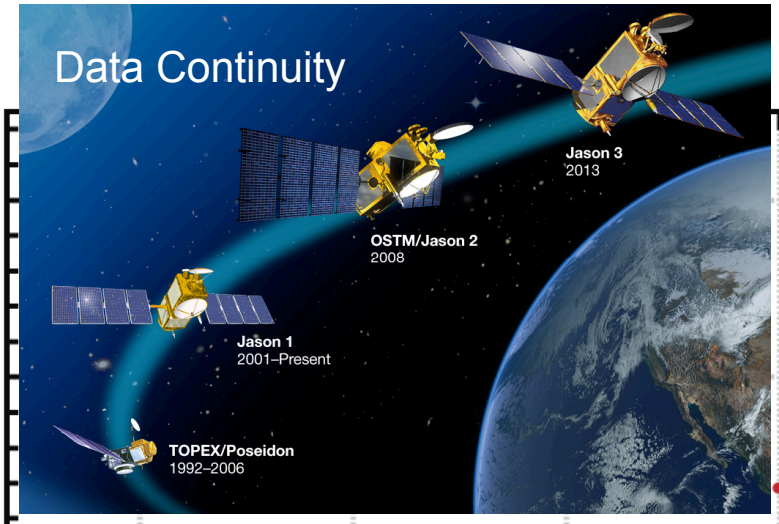
Ziemke et al. (2006)

GEOSS Societal Benefit Area: Climate



Sea Level Anomalies (mm)

30
20
10
0
-10
-20

1994 1996 1998 2000 2002 2004 2006

year

3.3 mm per year

Thermal Expansion	1.4
Mountain Glaciers	0.9
Greenland Ice Melt	0.5
Antarctic Ice Melt	0.4
Land water storage	-0.6

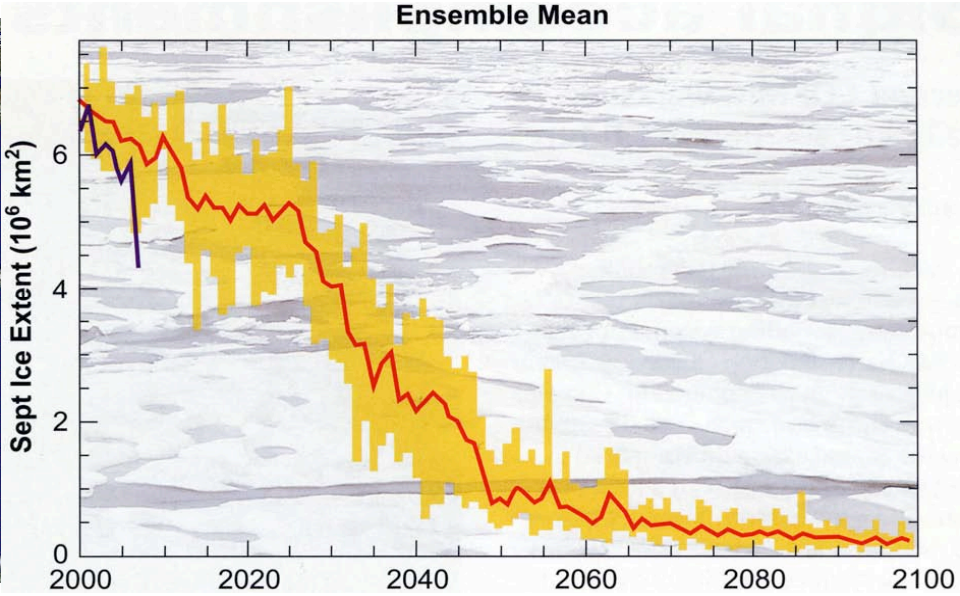
1993-1999: 2.75 mm/yr

2000-2007: 3.76 mm/yr

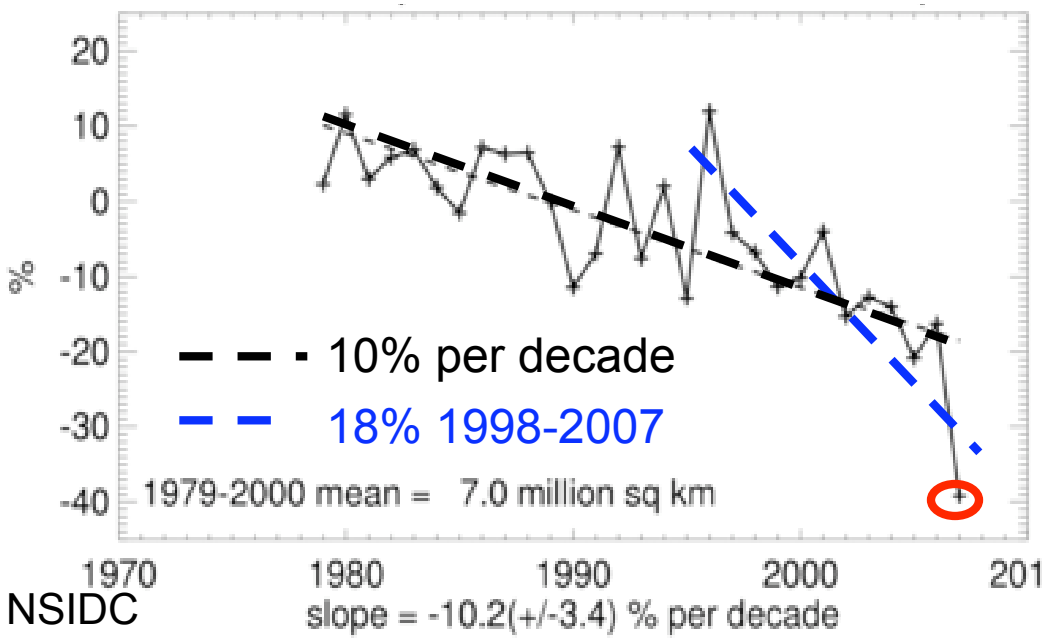
IPCC FAR Fig. 5.14

GEOSS Societal Benefit Area: Climate

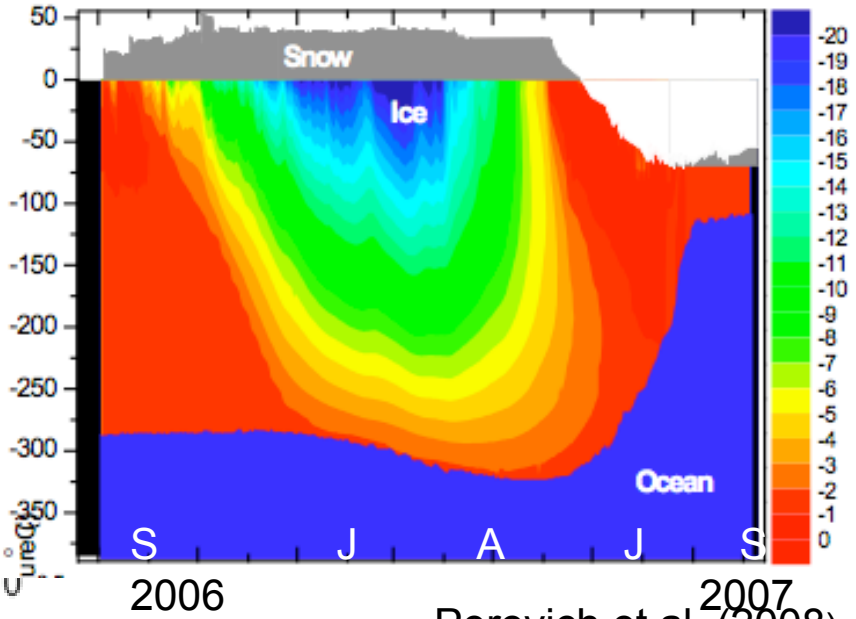
NSIDC



Holland et al. (2008)

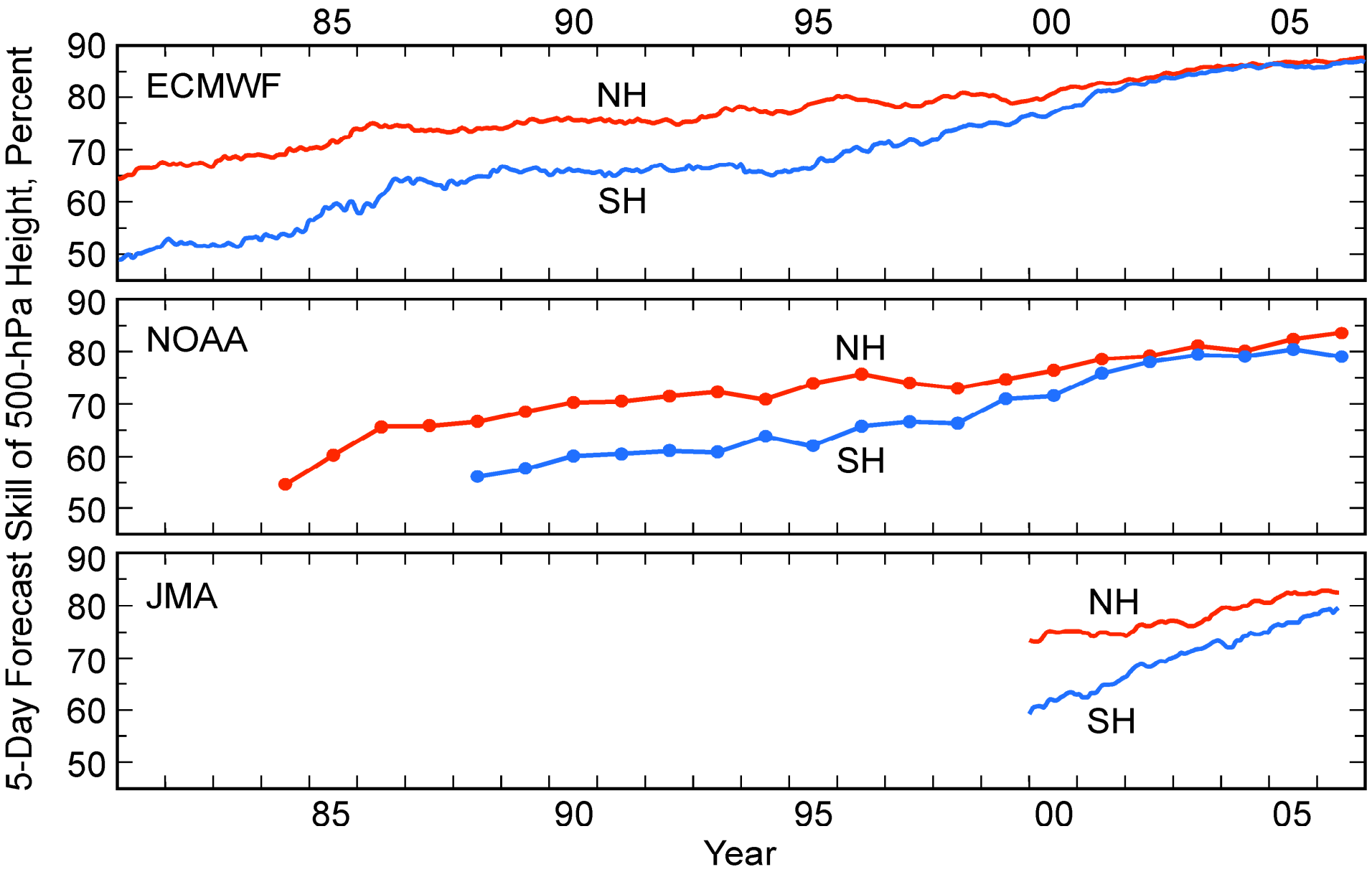


NSIDC



Perovich et al. (2008)

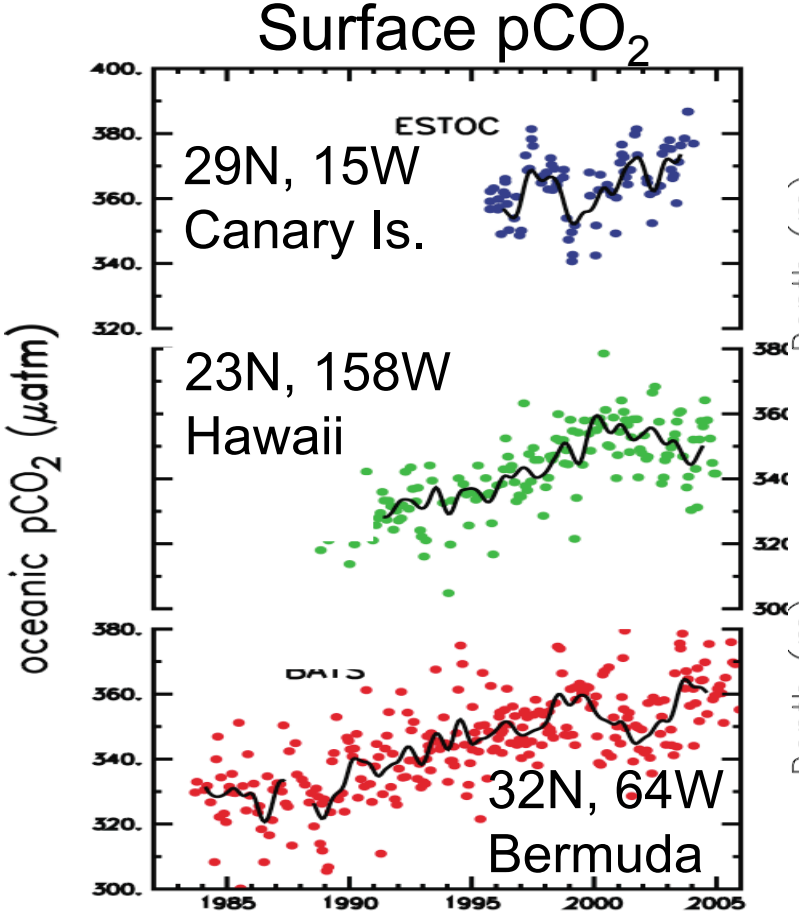
GEOSS Societal Benefit Area: Weather

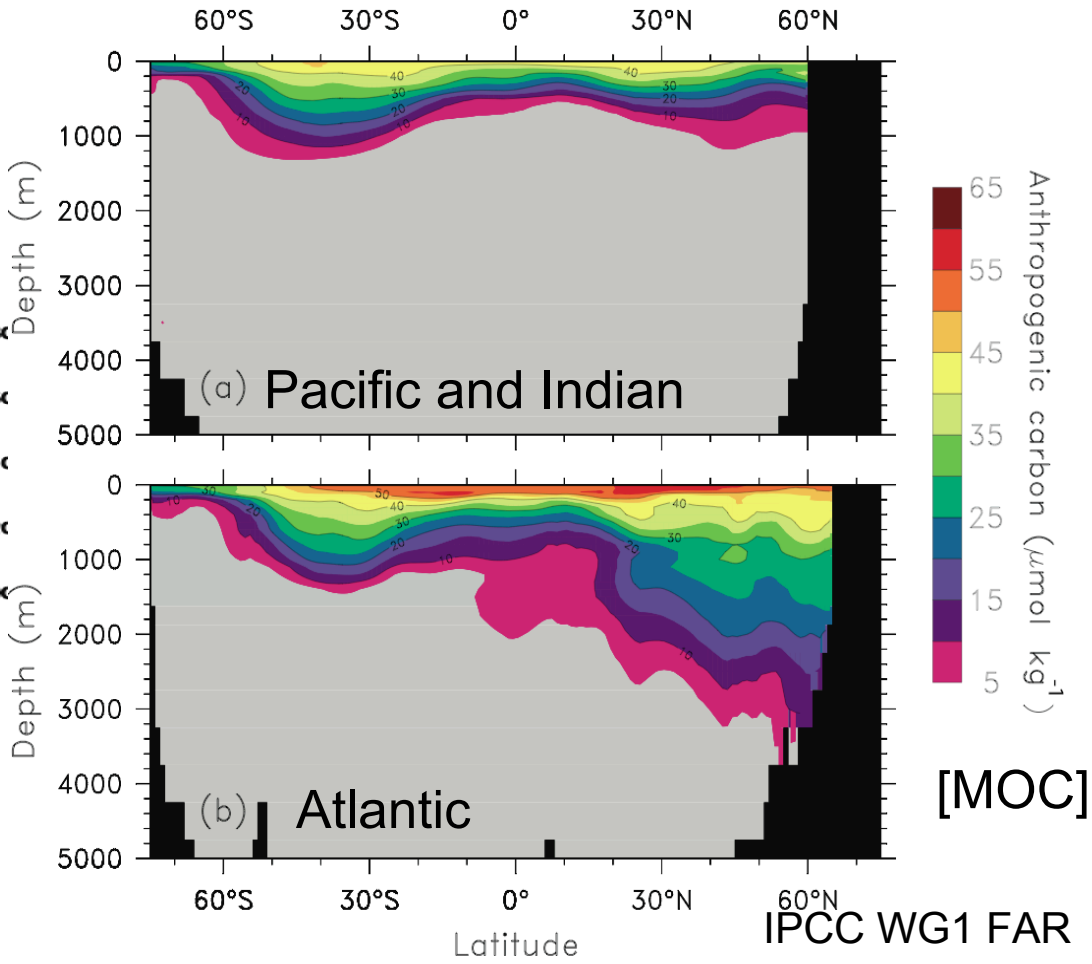


The Role of Science and Technology in GEOSS (2008)

GEOSS Societal Benefit Area: Ecosystems

- Pteropod comprise 45% of salmon diet
- pH decrease leads to shell dissolution
- 10% increase in water temperature leads to 3% drop in salmon body weight
- 10% decrease in pteropod production leads to 20% drop in salmon weight



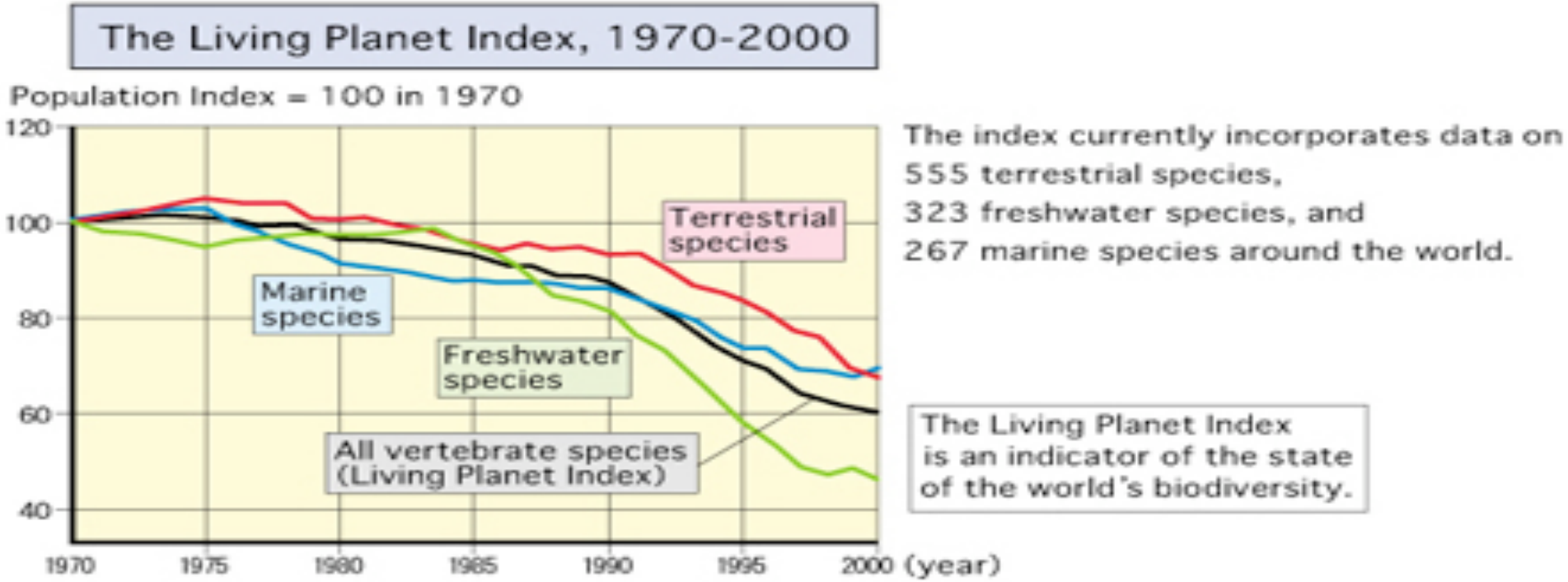


[MOC]

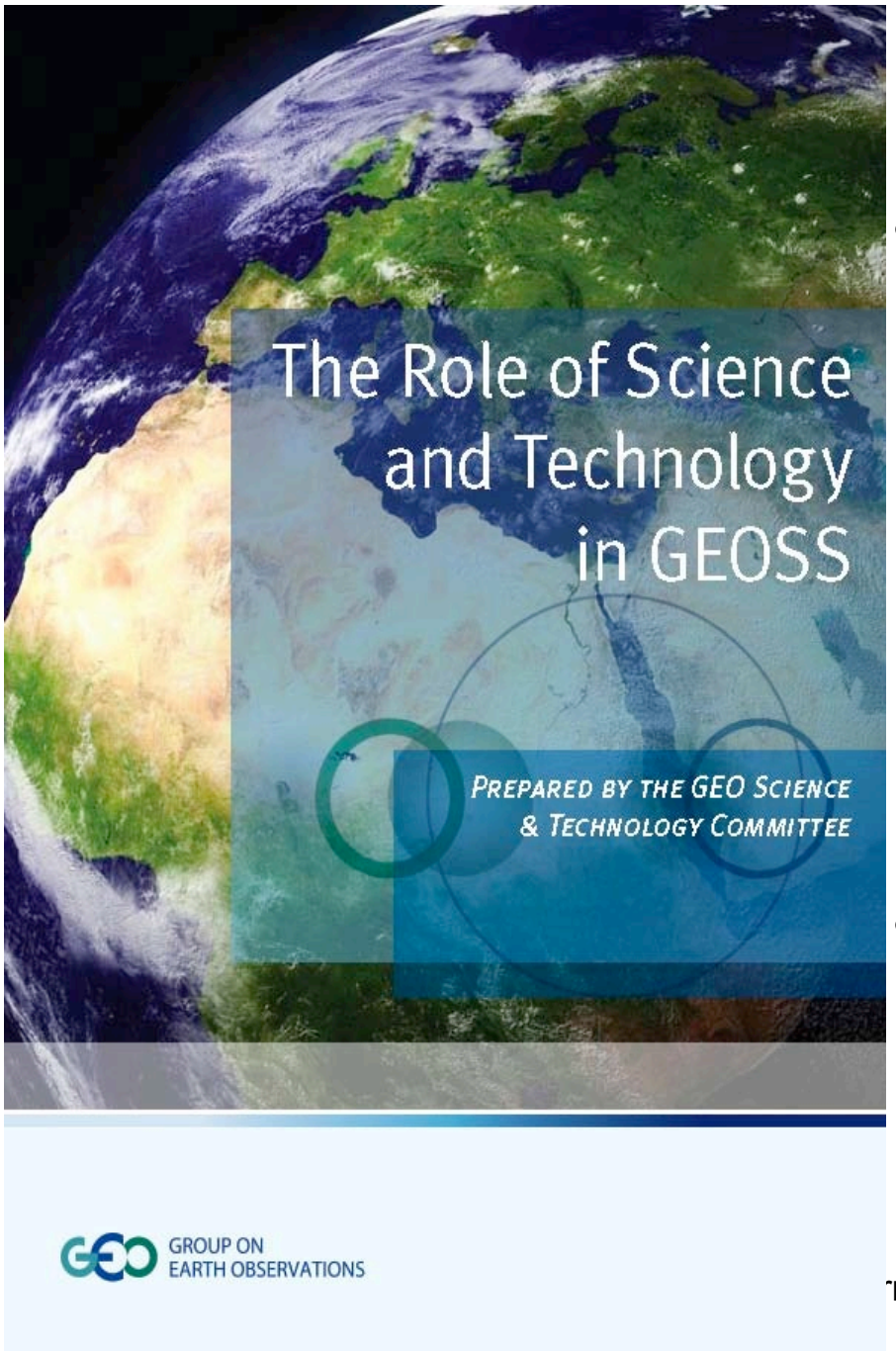
IPCC WG1 FAR

GEOSS Societal Benefit Area: Biodiversity

1992 Convention on Biological Diversity
Reduce the rate of loss of biodiversity by 2010



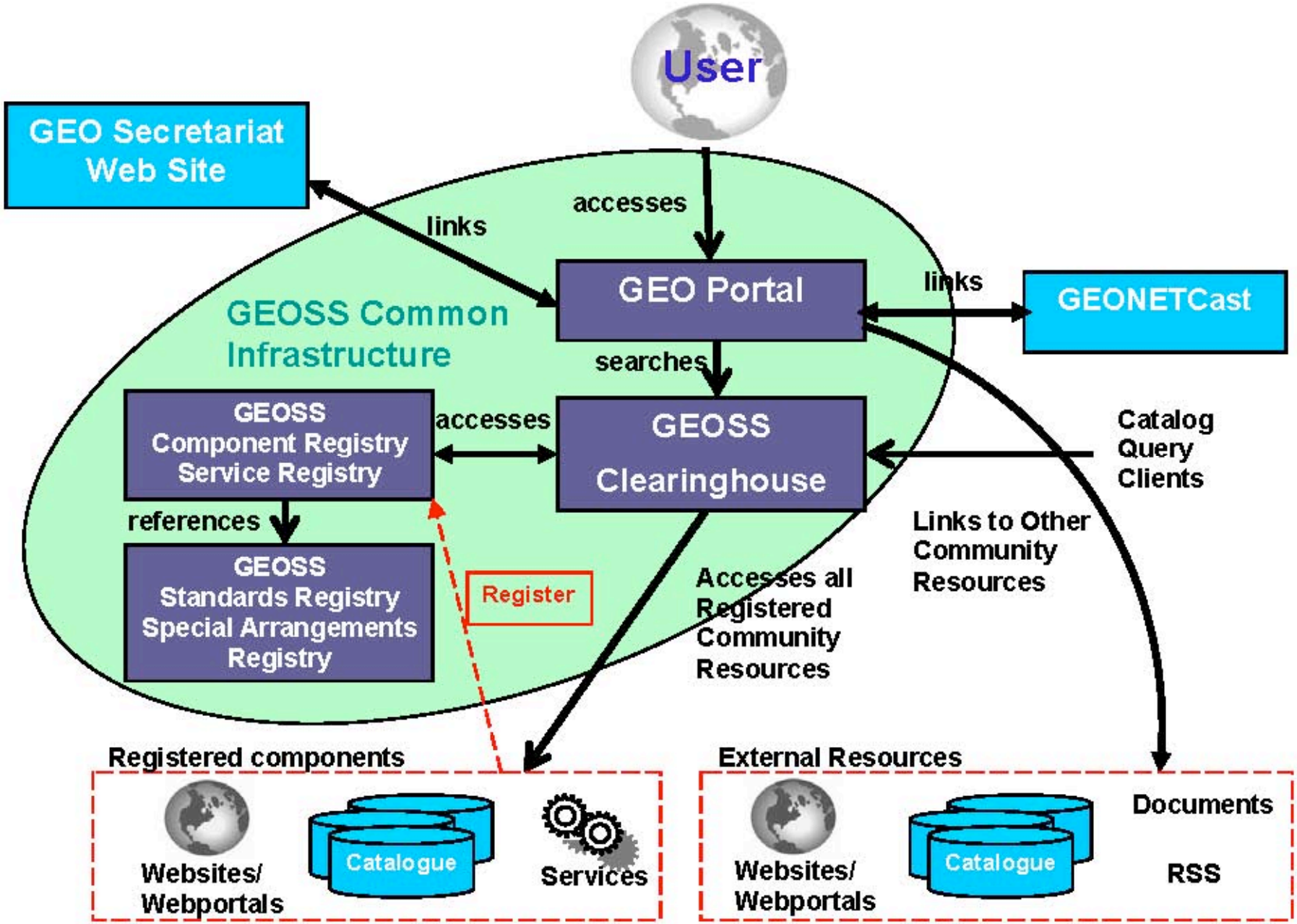
- No widely accepted and globally available set of measurements
- GEO BON: global partnership to help collect, manage, analyze, and report on biodiversity
- GEO BON: network to record genes, species and ecosystems



GEO Science and Technology Committee

- STC Vision
  - ➢ build GEOSS through science and technology
  - ➢ develop GEOSS to improve understanding of the global integrated Earth system
  - ➢ engage S&T community to develop and use GEOSS
- STC Activities
  - ➢ GEO Tasks
  - ➢ GEO Common Infrastructure
  - ➢ GEO Data Sharing Principles
  - ➢ GEOSS S&T Roadmap

GEOSS Common Infrastructure



GEO Data Sharing Principles and Implementation

- Full and open exchange of data
  - ➢ include metadata and data products
  - ➢ recognize international and national policies
    - ❖ establish coordination of vague policies and procedures
    - ❖ establish compliance through technical controls on data access
  - ➢ encourage reuse and re-dissemination without restrictions
  - ➢ attribute significant data sources and authors
- Minimum time delay
- Minimum cost
  - ➢ no shared cost for system development and data collection
  - ➢ no cost for metadata
  - ➢ online cost recovery mechanisms
  - ➢ encourage no cost for developing countries
  - ➢ encourage no cost for “research” and “education”
  - ➢ no cost for reuse of data and data products

GEOSS 10-Year Implementation Plan (Third Earth Observation Summit, February 2005, Brussels)
White Paper on the GEOSS Data Sharing Principles (CODATA Review Draft, May 2008, Paris)

STC Statement: GEOSS Data Sharing Principles

• GEOSS Data Sharing Principles implementation should include provisions that are key to science, e.g., highest quality data, highest accuracy data, minimum cost for data sharing, minimum time delay for data sharing, and sharing of raw data and calibration metadata as appropriate for selected GEOSS SBAs

• The principle of “free and open access” is fully supported

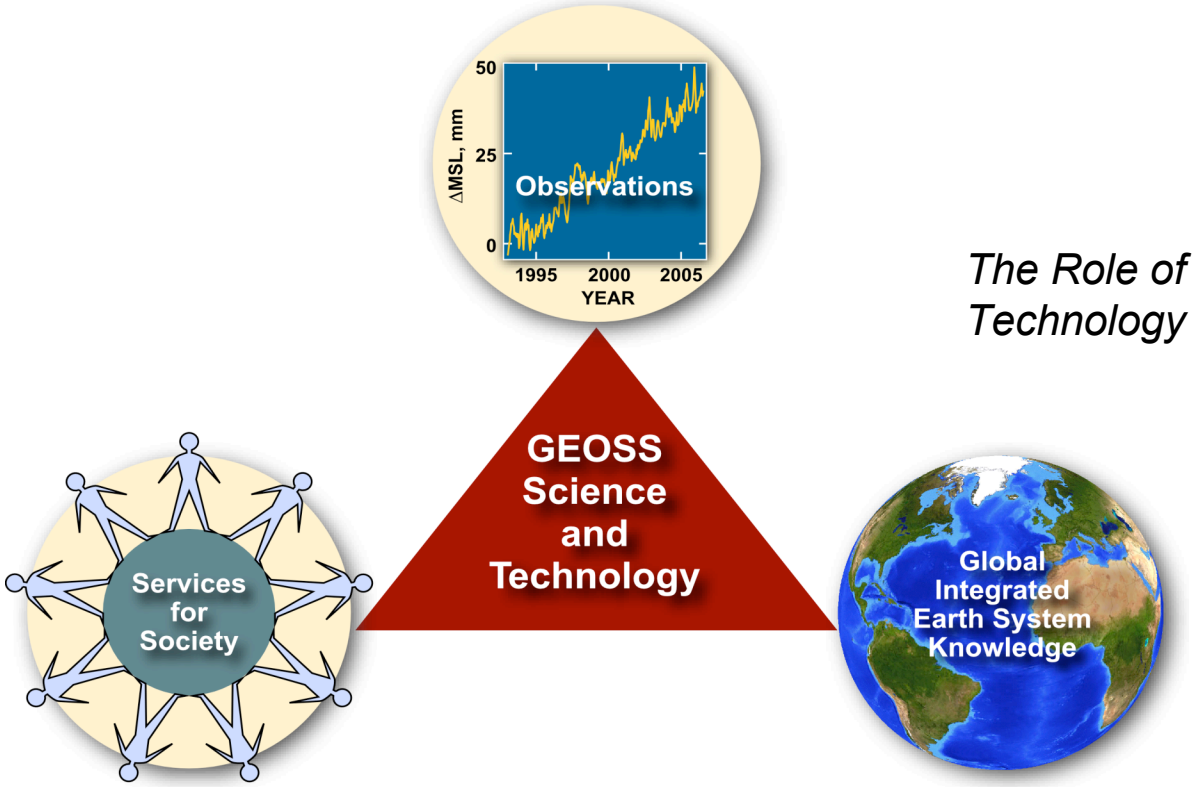
• The challenge for GEO is to agree and make available a framework that, implementing the will of GEO Members and Participating Organizations, will allow implementation of the principle of “free and open access”, whilst acknowledging the voluntary nature of contributions to GEOSS and recognizing "relevant international instruments and national policies and legislation”

• GEOSS Data Sharing Principles implementation should incite the community to “take concrete steps towards…” rather than just “encourage to…”

STC Goal 2009-2011: GEOSS Roadmap

- Utilize GEOSS to study global integrated Earth system
  - Generate new knowledge
    - Illuminate interactions between Earth components
    - Facilitate analyses and re-analyses
  - Improve interoperability between observations and models
  - Optimize global observations for scientific challenges
    - develop well-calibrated, high-accuracy, stable observations
    - sustain observations for time duration commensurate with science
    - minimize observation gaps
    - record data at highest space and time resolutions
    - integrate in-situ and satellite observations
    - harmonize observations recorded by different instruments
- Develop technology to reduce cost of observations
- Develop technology to record new observations
- Develop computing capability and capacity for models comparable to space - time resolutions of observations
- Engage government agencies to incorporate GEOSS

GEO Science and Technology Committee



The Role of Science and Technology in GEOSS (2008)

- Enables science and technology for GEOSS SBAs
- Enables GEOSS for science and technology
- Enables success of GEO
  - ➢ *The Role of Science and Technology in GEOSS* (2008)
  - ➢ Roadmap on role of GEOSS in understanding the global integrated Earth system