# SOME possible contributions of ice tethered platforms to various international programmes (trying to be active, provocative and positive… and to have a broader view…)

Vladimir E. Ryabinin,
Joint Planning Staff for the WCRP
VRyabinin@wmo.int

# THE TASK

- Take a large almost round rotating sphere 8,000 miles (12,800 km) in diameter.
- Surround it with a murky viscous atmosphere of many gases mixed with water vapour, aerosols, etc..
- Tilt its axis so that it wobbles back and forth with respect to the source of heat and light.
- Freeze it at both ends and roast it in the middle.
- Cover most of the surface with a flowing liquid that sometimes freezes and which feeds vapour into that atmosphere as it shifts up and down to the rhythmic pulling of the moon and the sun.
- Condense and freeze some of the water vapour into clouds of imaginative shapes, sizes and composition.
- Then try to predict the future conditions of that system for each place over the globe.



Kevin Trenberth

CLIVAR 1995 →

WGNE
WGCM
WGSF
IPAB
WGSAT

CliC 2000 →

WG Obs Assim

Model-ling Panel

**Coordinated Observation and Prediction of the Earth System**

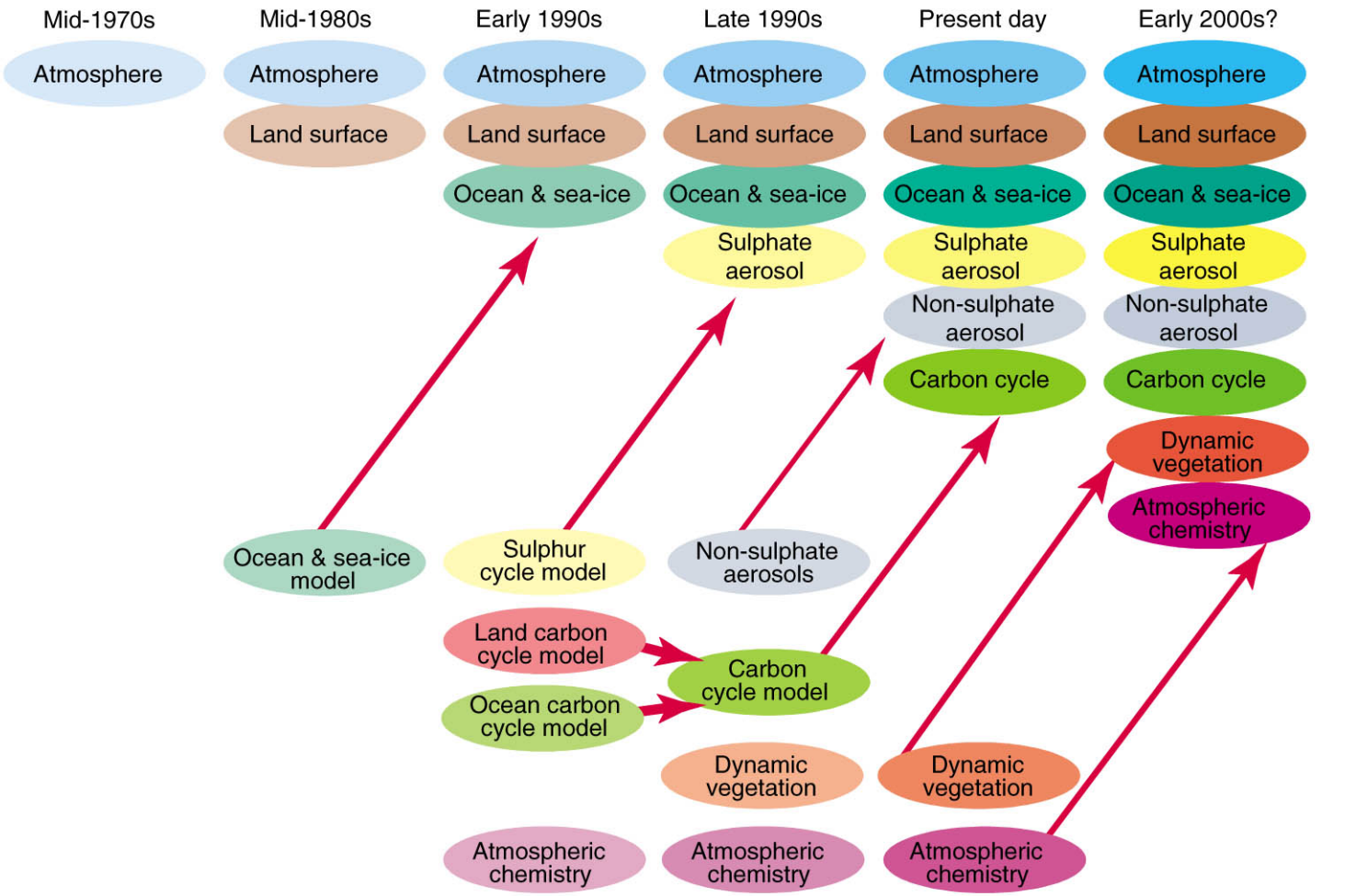
GEWEX 1988 →

SOLAS 2001 ->

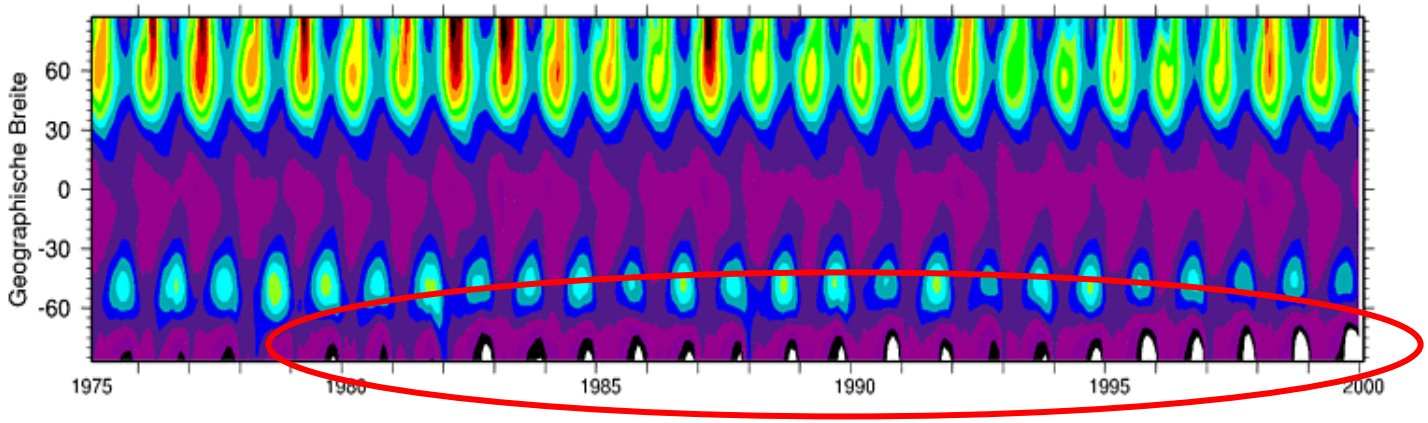
SPARC 1992→

# (deficiencies of )
# Global Observing Systems
# starting with intro to
# Atmospheric Chemistry

# The Development of Climate models, Past, Present and Future



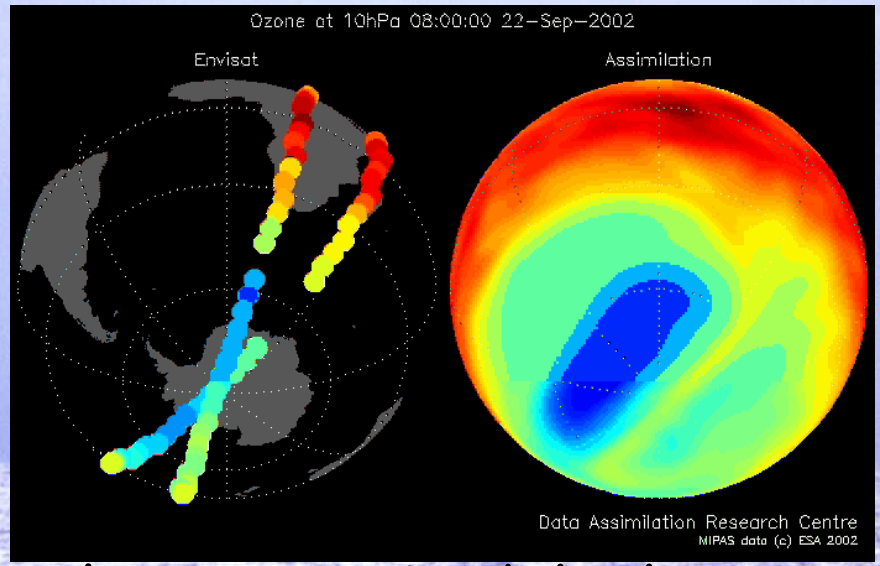
Courtesy
Volker Grewe




# The SH polar vortex split of Sep 2002

MIPAS
ozone

Courtesy
Alan Geer

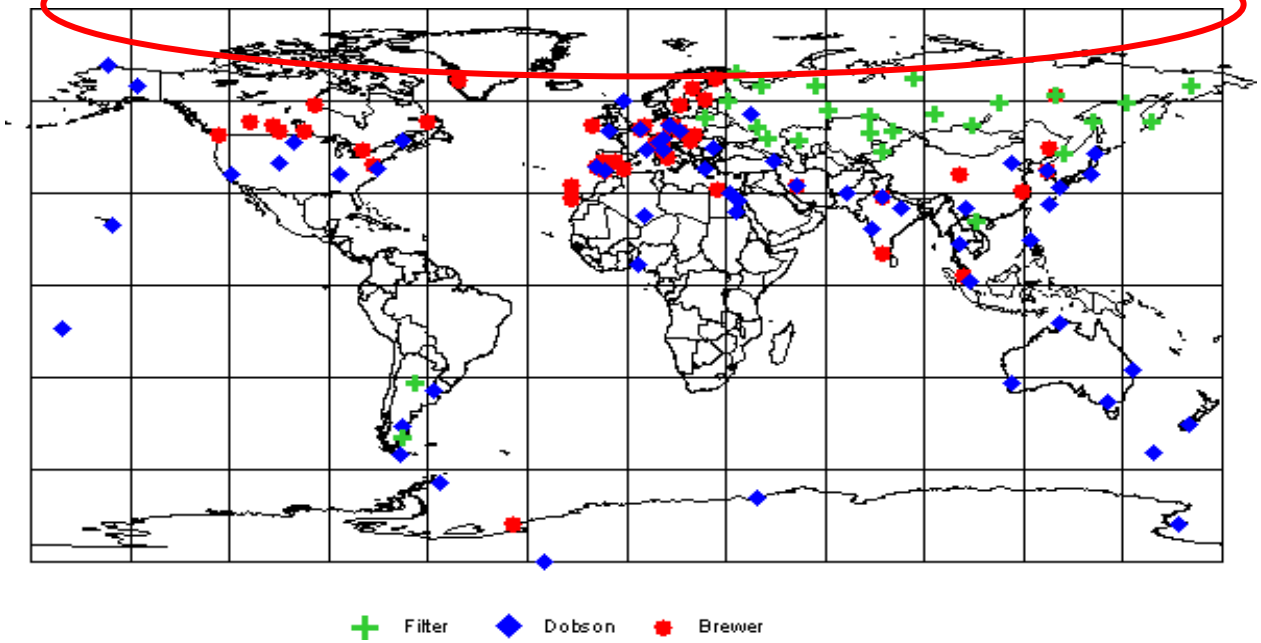



DARC
analyses

Blue: low ozone; Red: high ozone; 10 hPa

# ESTIMATED GLOBAL COLUMN OZONE NETWORK: 2003

Stations with data submitted since at least 1 Jan 1999

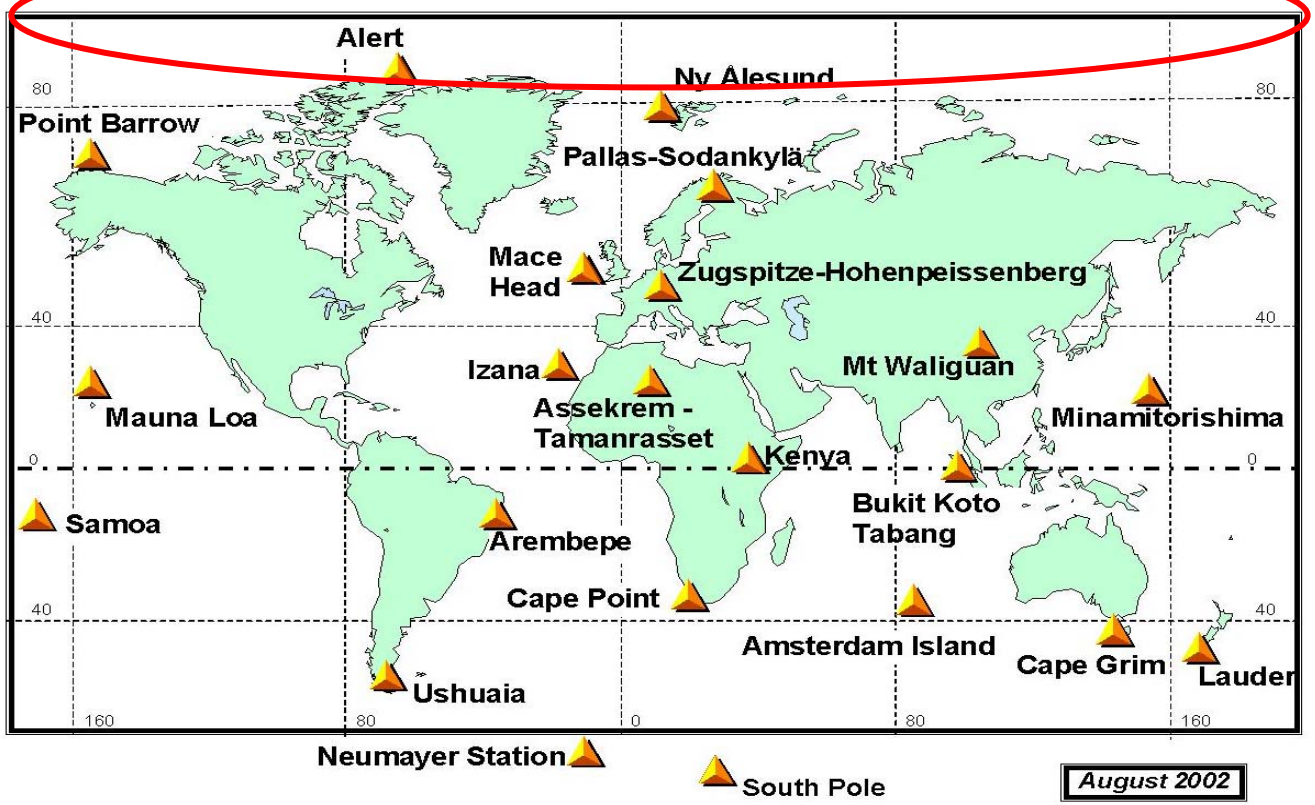


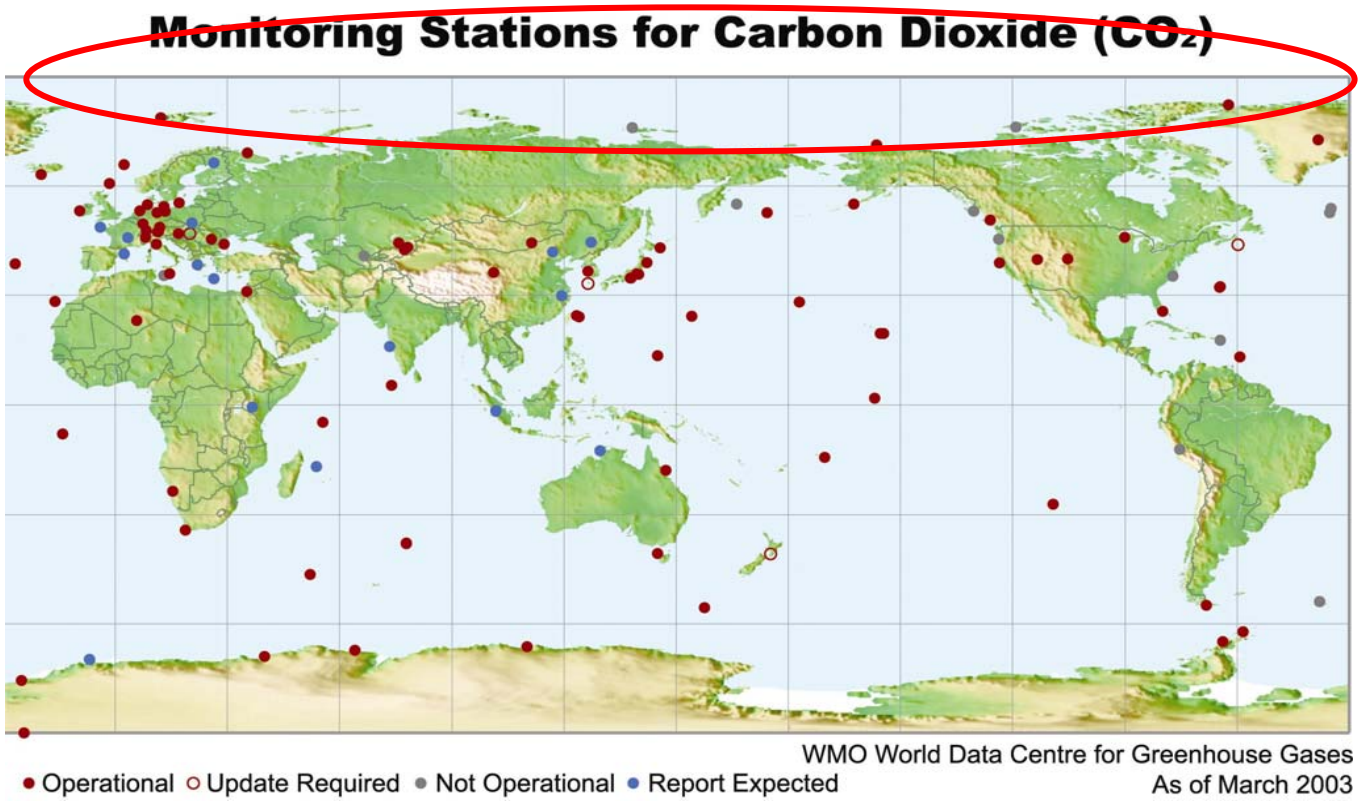

**Compliments of WOUDC, Toronto Ed Hare Manager. Note that this map changes constantly as data is submitted to the data centre. Suggestions to correct any omissions are welcome by GAW. The symbols represent different instrument types.**

# GAW GLOBAL MONITORING STATIONS:

# COMPREHENSIVE MEASUREMENTS LONG TERM

## However: The GAW Network is Much Bigger When Regional Stations Are Included



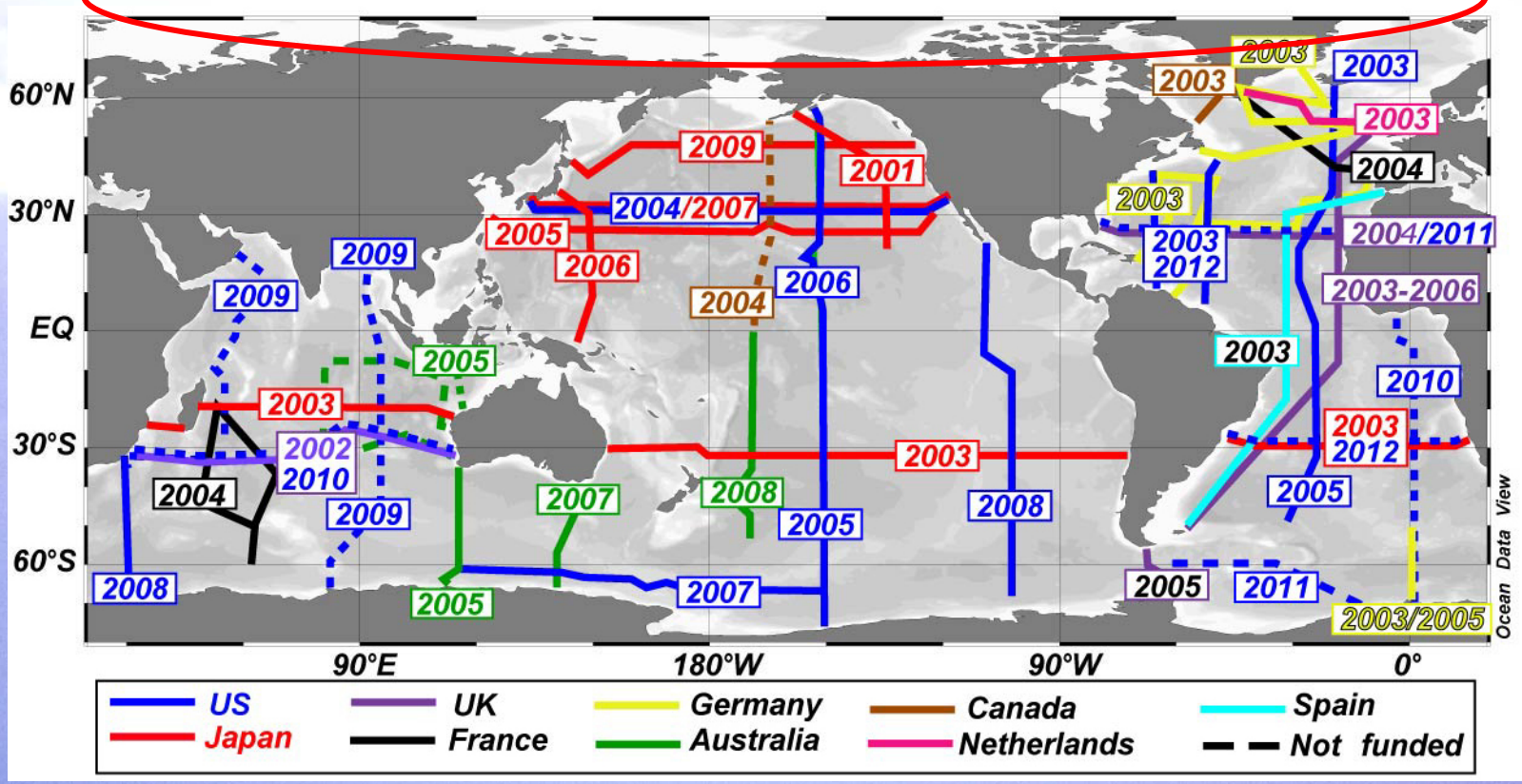



**Courtesy of the World Data Centre for Greenhouse Gases Japan Meteorological Agency. Note that this map changes constantly as data is submitted to the data centre. Suggestions to correct any omissions are welcome by GAW.**

# Ocean Chemistry - Carbon

# Status of Current and Planned Observations

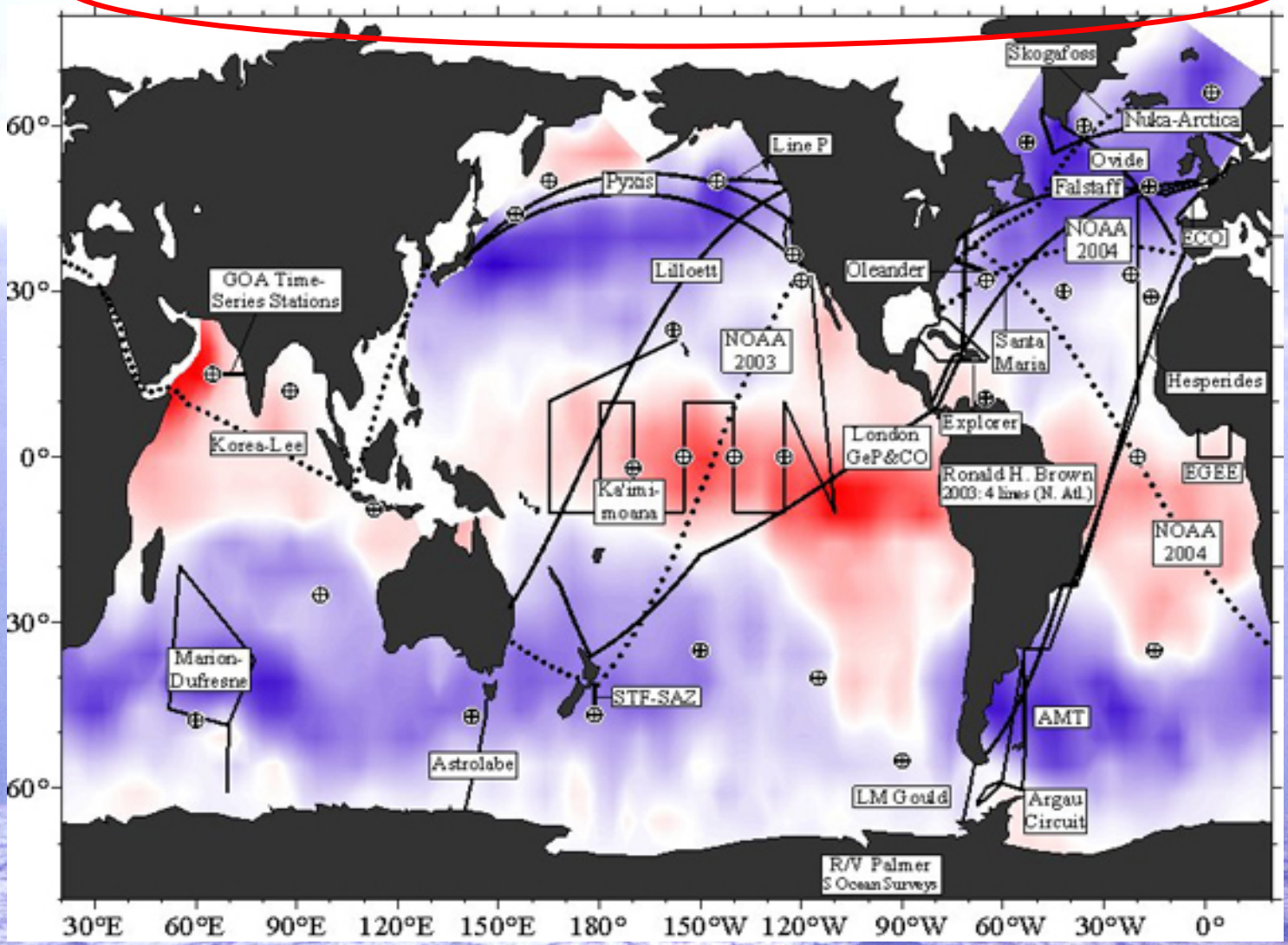
## *Repeat Hydrographic Sections*




**The Existing System** – 31 lines funded, 7 funding-pending. No international agreement on "the survey" strategy.

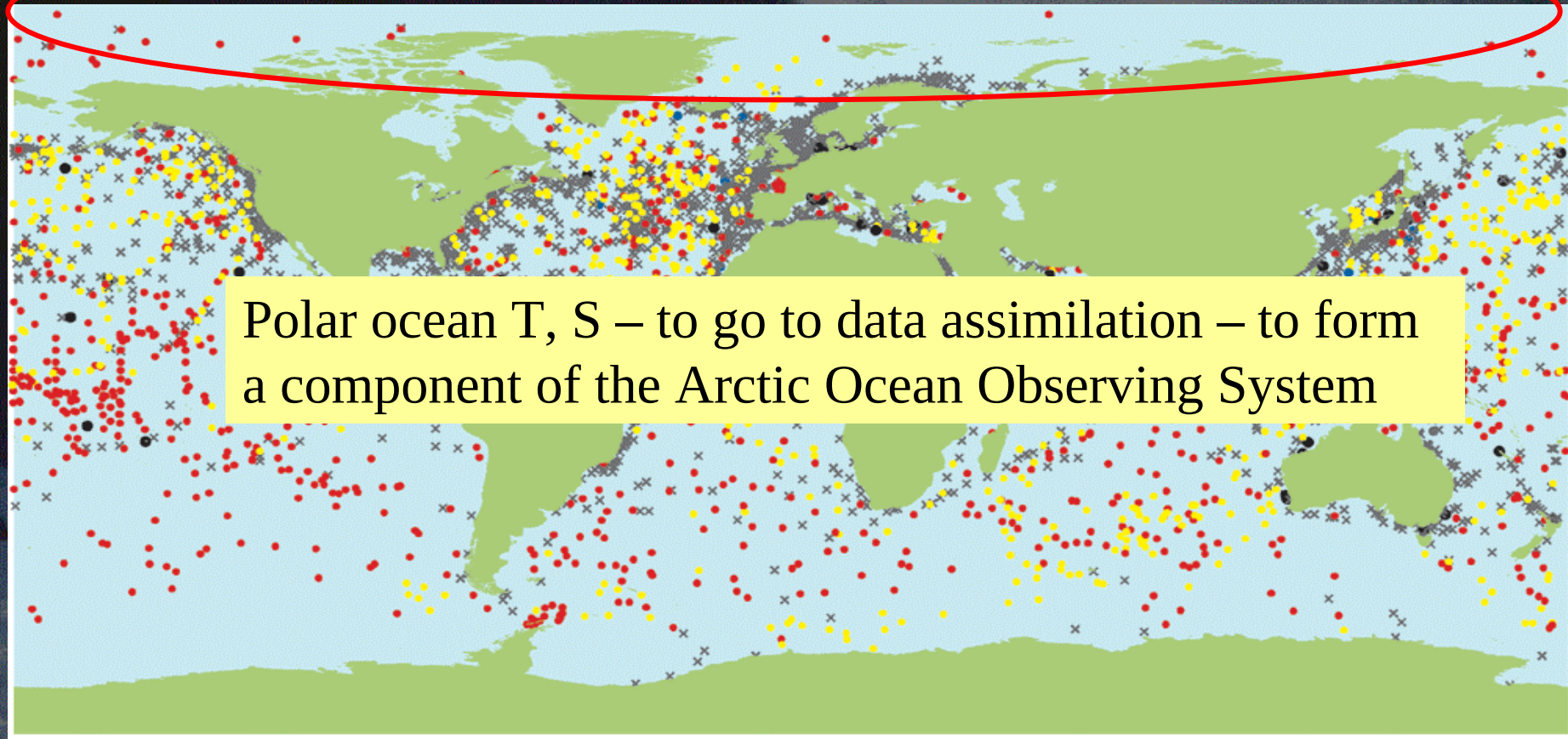
# Status of Current and Planned Observations

## *VOS Carbon Network*



# Ocean in-situ

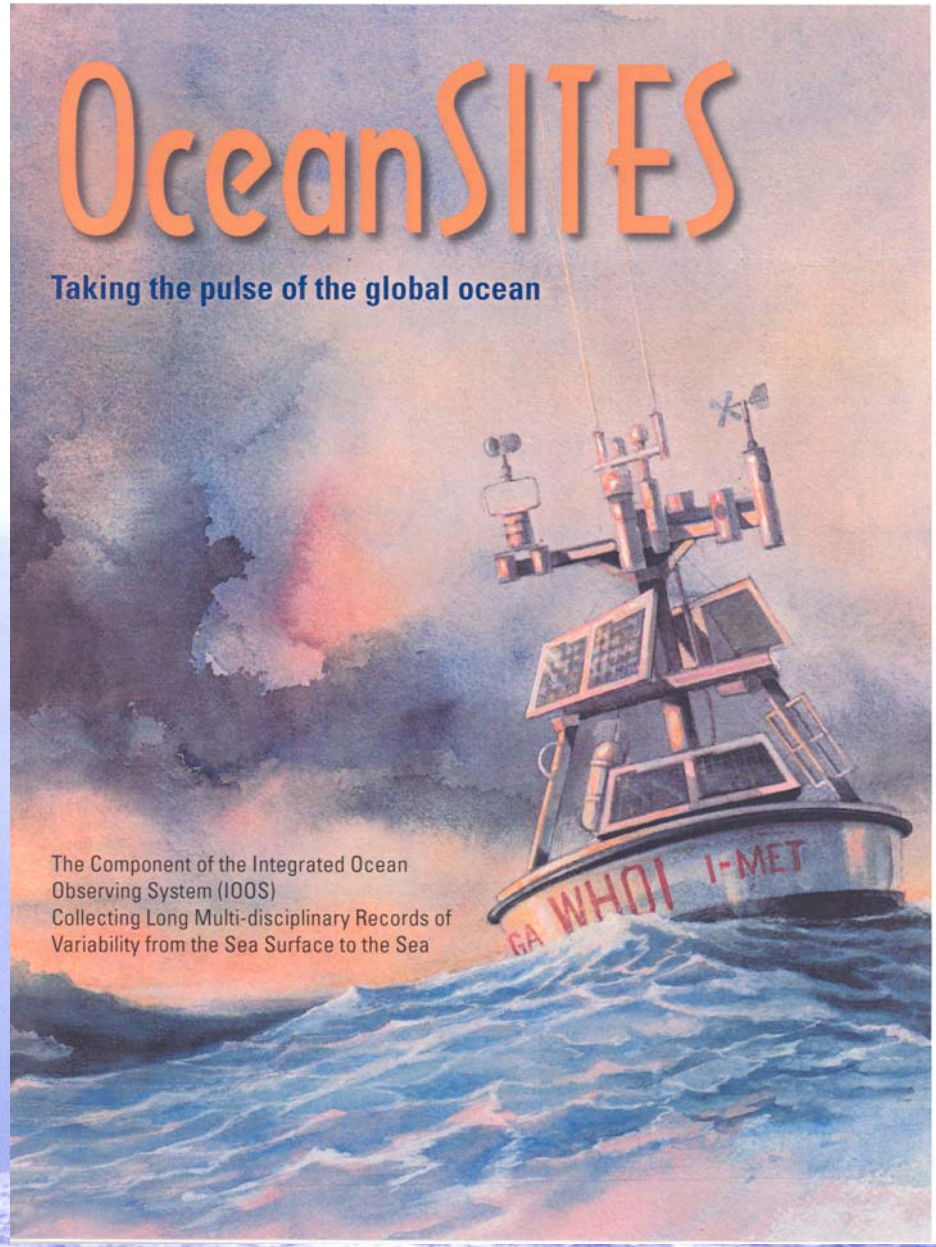
# IN SITU OBSERVING SYSTEM STATUS FEB 2003



Polar ocean T, S – to go to data assimilation – to form a component of the Arctic Ocean Observing System

In situ marine observing platforms, February 2003
(platforms reporting on GTS, last position during the month)

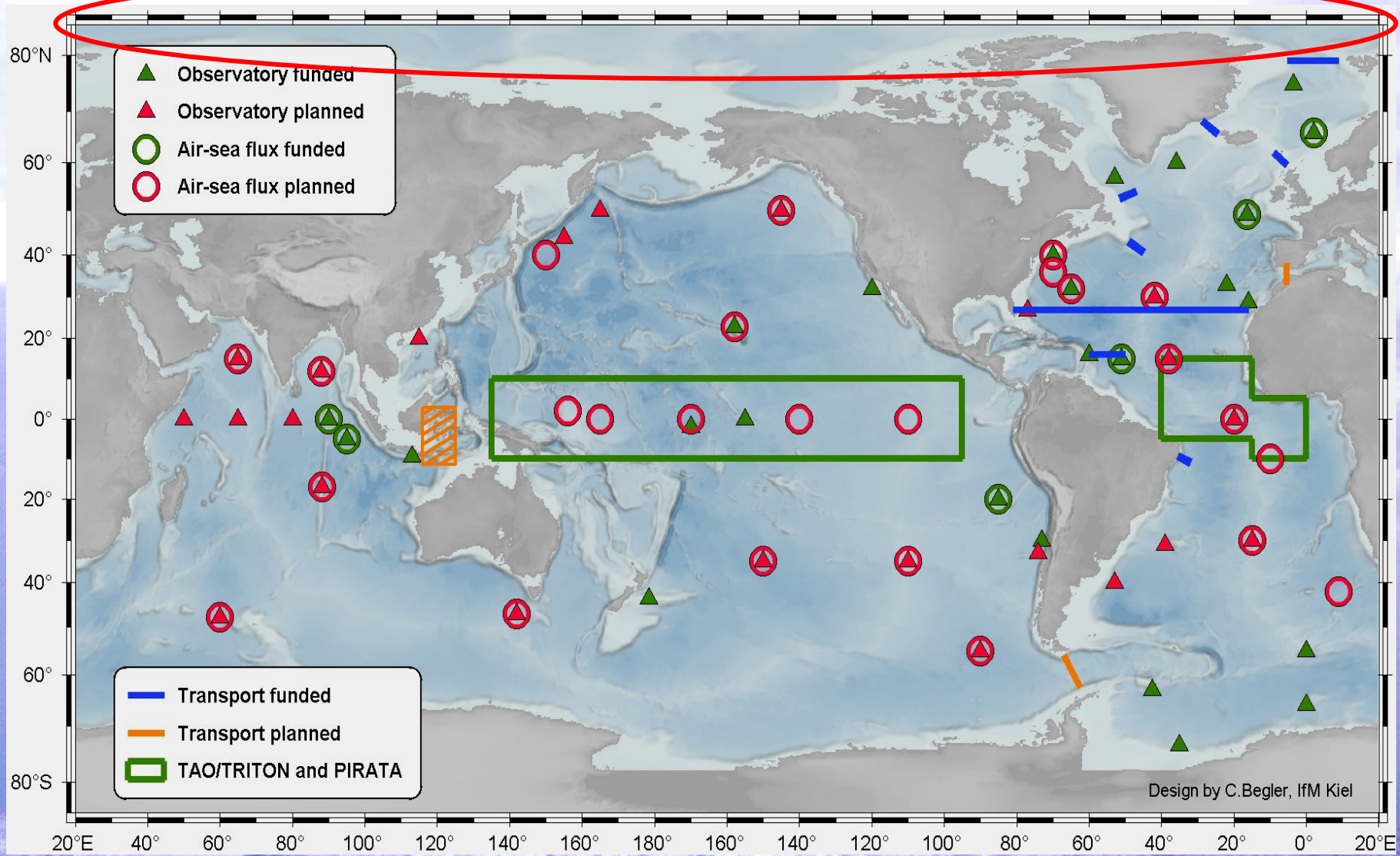
- BATHY (mainly XBTs)
- BUOY (drifting & moored buoys)
- SHIP (mainly VOS ships, some moorings)
- TEMP-SHIP (ASAP)
- TESAC (mainly Argo floats)
- TRACKOB (mainly TSG)




*Courtesy Robert Weller*

**Ice-tethered Platforms, WHOI, 28-30 June 2004**

# Sites identified by Int'l Time Series Science Team

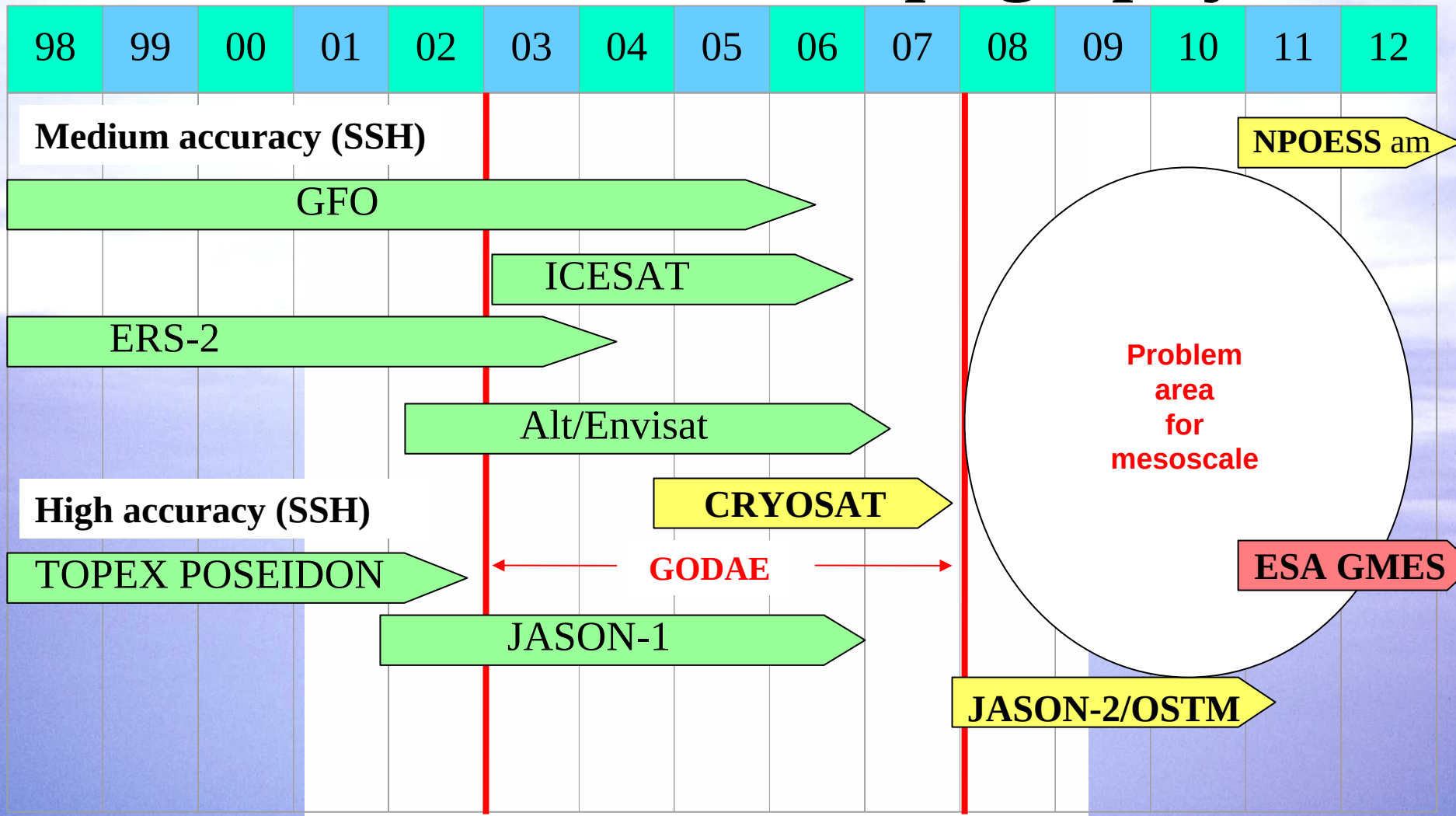



*Courtesy Robert Weller*

**Ice-tethered Platforms, WHOI, 28-30 June 2004**

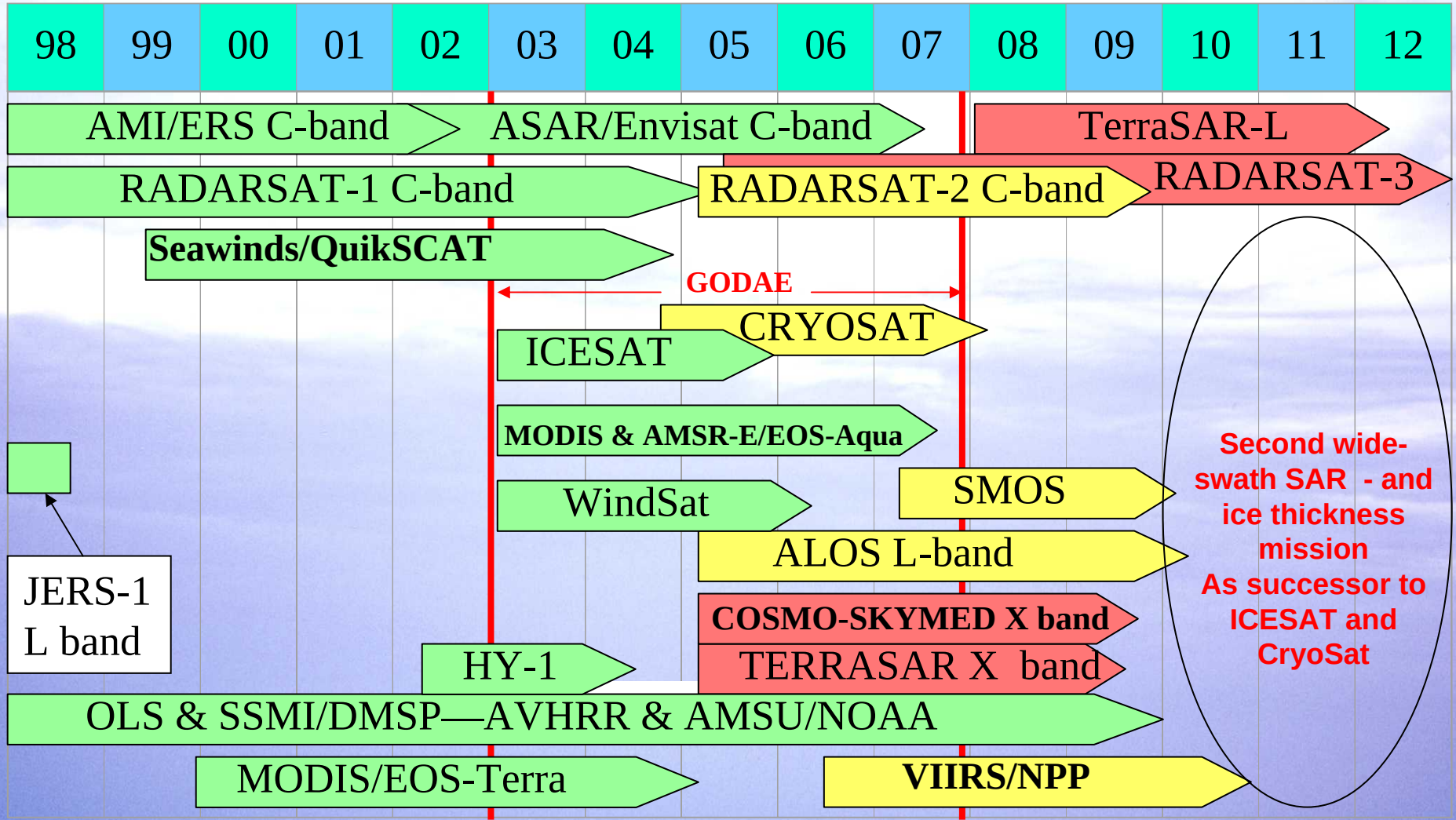
# Remote sensing of the ocean

# Ocean Surface Topography




*Courtesy ESA*

# Sea Ice (Concentration, Drift, Thickness)

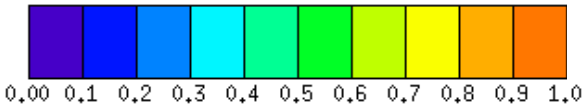



*Courtesy ESA*

**Remote sensing of the ocean:**
**there is a need to be practical - there may be not too much to assimilate from satellites**
**and/or to calibrate/validate**

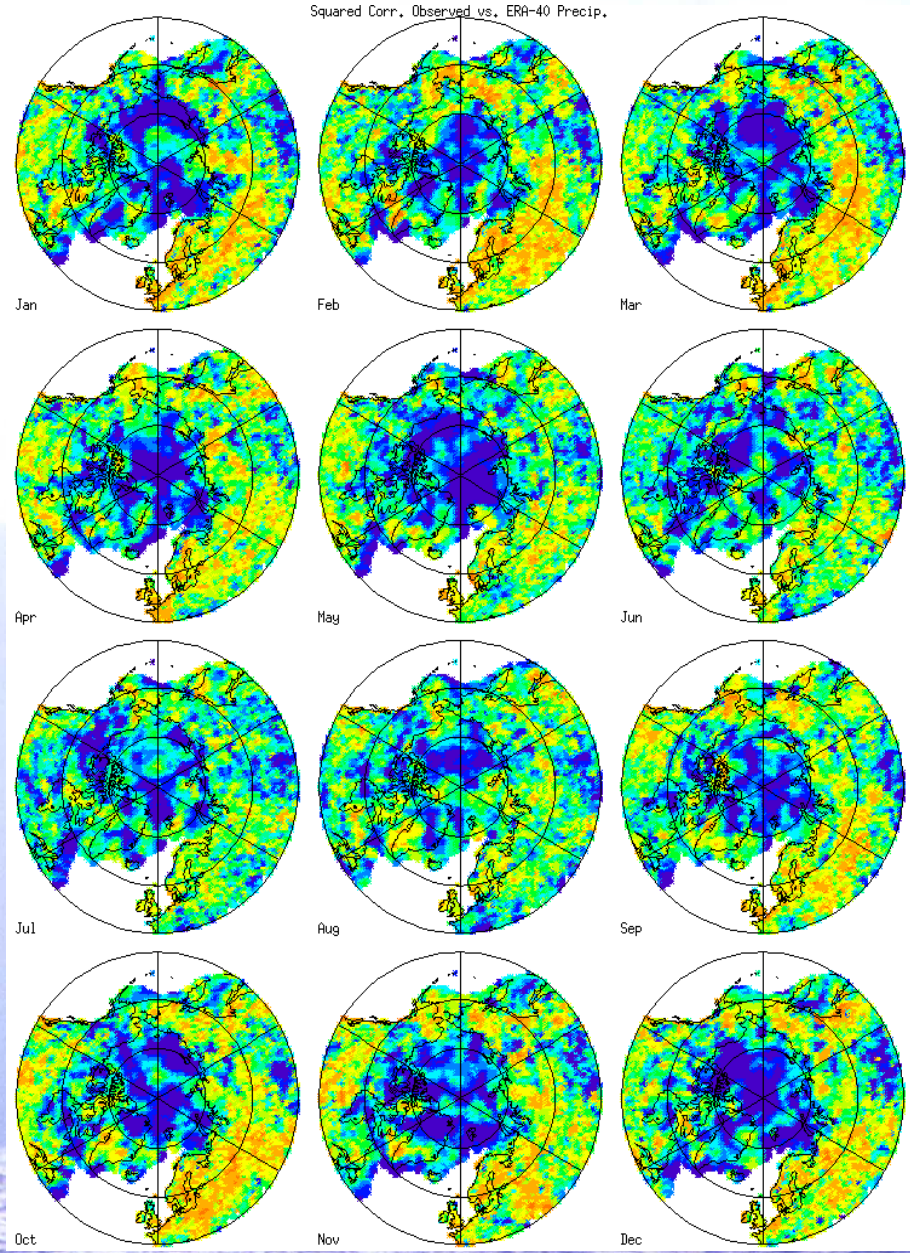
**(including the IPY period!)**

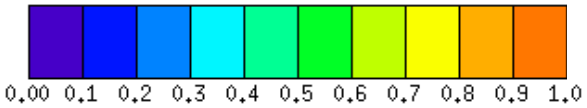
# Global Precipitation




## *Squared Correlations, Observed vs. ERA-40 Precipitation*

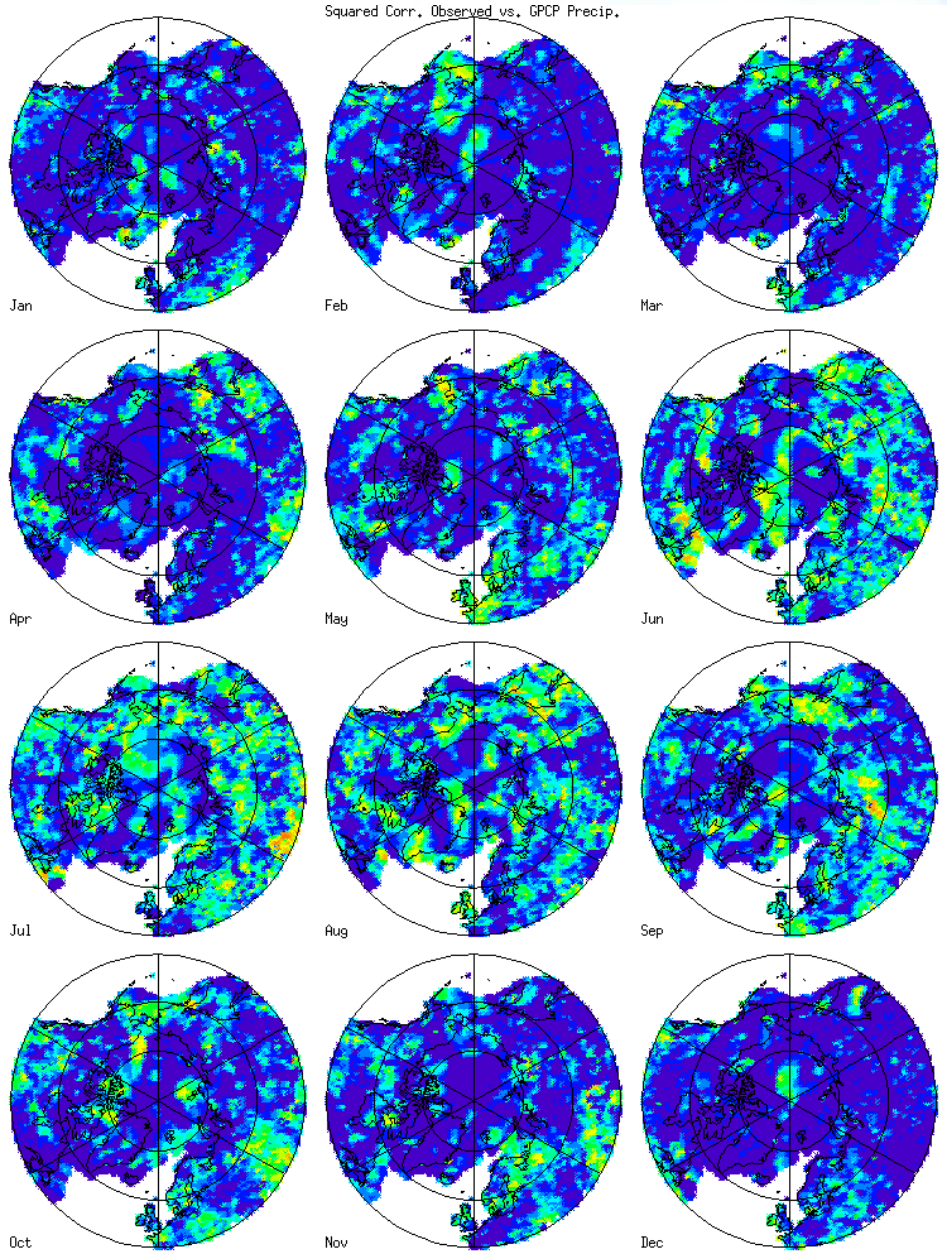
There are large areas, especially over Eurasia, where ERA-40 performs quite well (squared correlations exceed 0.50). But for many areas, performance appears to be poor. But in data-sparse areas, the "observed" gridded time series are of poor quality. ERA-40 may be performing better than is indicated. Performance is better than NCEP-1, but no better than ERA-15. Basic conclusion: ERA-40 fields are good enough to be blended with gauge observations.






## *Squared Correlations: Observed vs GPCP*

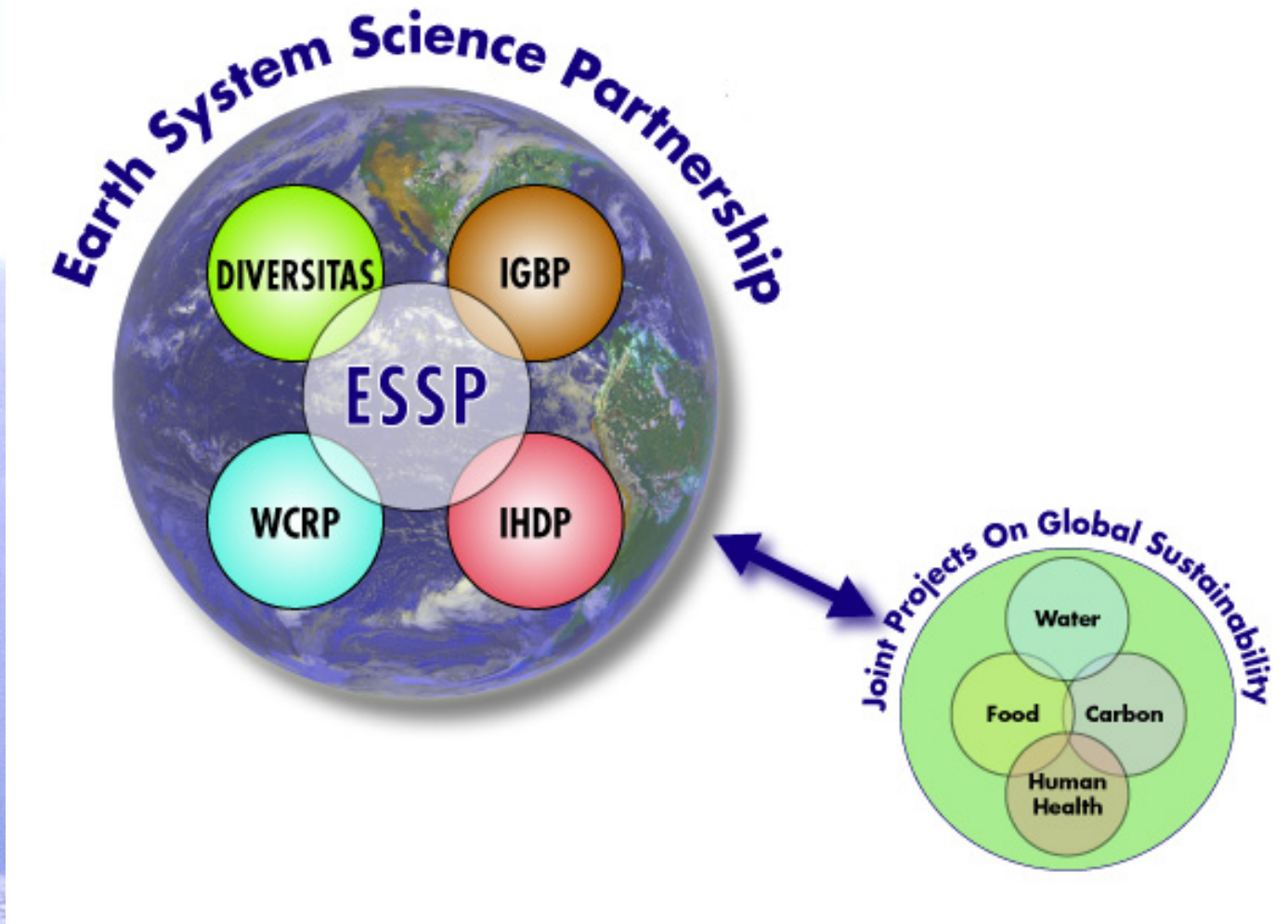
The better performance of ERA-40 (and ERA-15) relative to the GPCP satellite product is abundantly clear. Satellite retrievals have a hard time dealing with the heterogeneous emissivity of land surfaces, and work best over open ocean regions. Over land, reanalysis is “the way to go”. The satellite retrievals are considered to be improved after 1987 (the SSM/I era).



# Notable needs

- Future Precipitation mission – to complement SMOS and Aquarius for E-P (GPM on hold for two years and EGPM not approved)
- High latitude solid precipitation.
- In situ precipitation measurements in the Arctic Ocean!

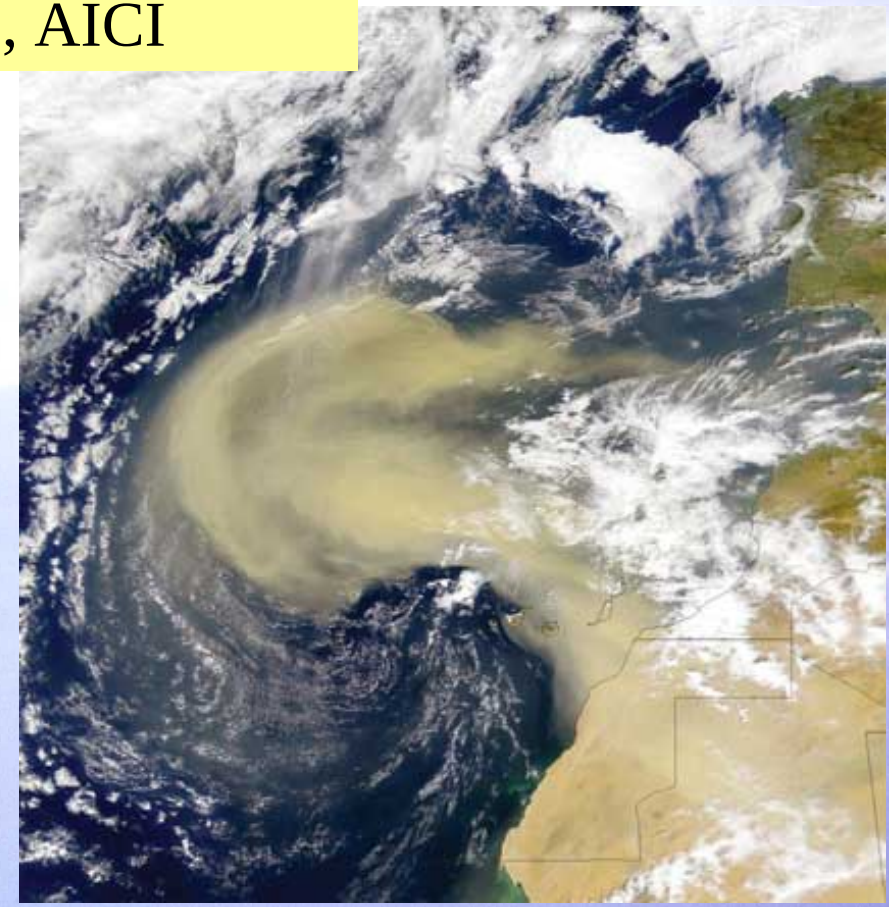
# Global Change Programmes



# Ocean-Atmosphere: SOLAS

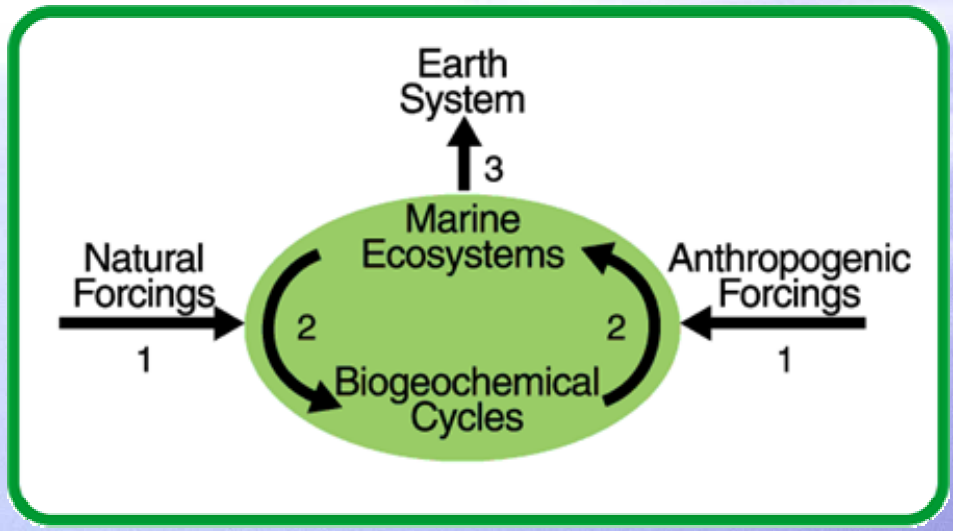
OASIS, AICI

- Biogeochemical interactions and feedbacks between ocean and atmosphere
- Exchange processes at the air-sea interface and the role of transport and transformation in the atmospheric and ocean boundary layers
- Air-sea flux of $CO_2$ and other long-lived radiatively active gases



# Ocean: IMBER

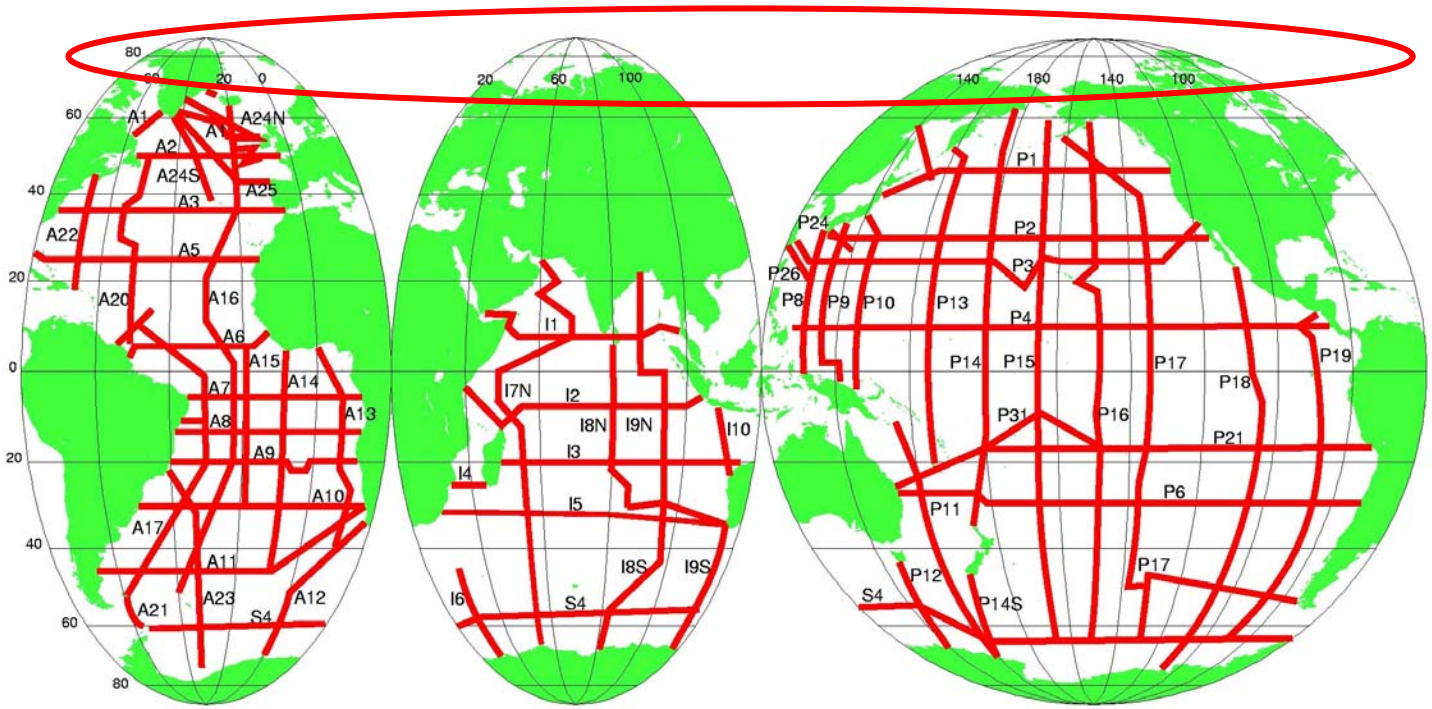
1. How does global change, represented by natural and anthropogenic forcings, impact marine biogeochemical cycles and ecosystem dynamics?
2. How do these impacts alter the mechanistic relationship between elemental cycling and ecosystem dynamics?
3. What are the feedback mechanisms to the Earth System from these changes?




International Council for Science
Scientific Committee on Oceanic Research

GLOBAL CHANGE IGBP

# Studies by WCRP
# WOCE, CLIVAR




**WOCE Hydrographic Programme One-Time Survey**
**(Penny Holliday, WOCE IPO)**

*Courtesy CLIVAR IPO*

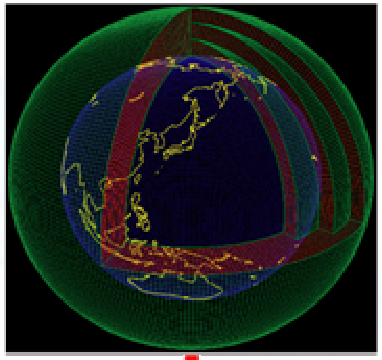
# Studies by WCRP
# GEWEX

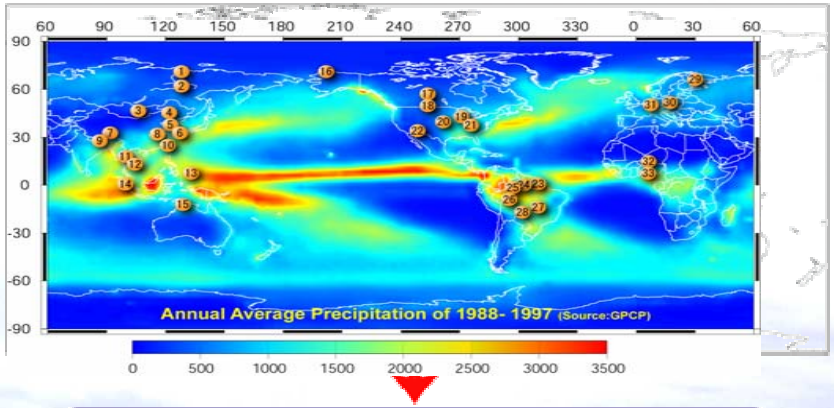
# The First Global Integrated Data Sets of the Water Cycle

Model Outputs by Numerical Weather Prediction Centers

Surface Observational (*in-situ*) Data from the 33 CEOP Reference Sites

Satellite Remote Sensing Data

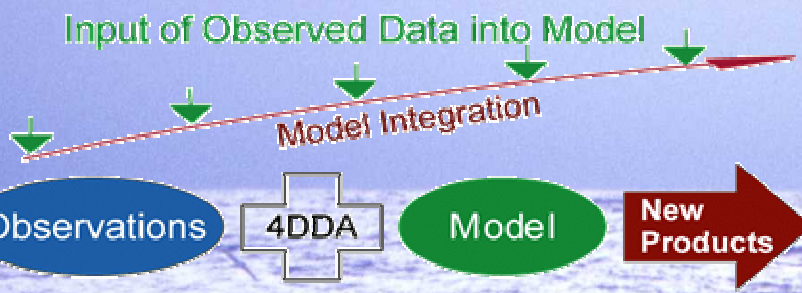





*In-Situ* Data Archiving Center at UCAR (Center at University Corporation for Atmospheric Research) of USA
http://www.ucar.edu/

MODEL Output Data Archiving Center at Max-Planck Institute of Germany
http://www.mpg.de/

Data Integrating/Archiving Center at University of Tokyo and NASDA of Japan
http://monsoon.t.u-tokyo.ac.jp/ceop/

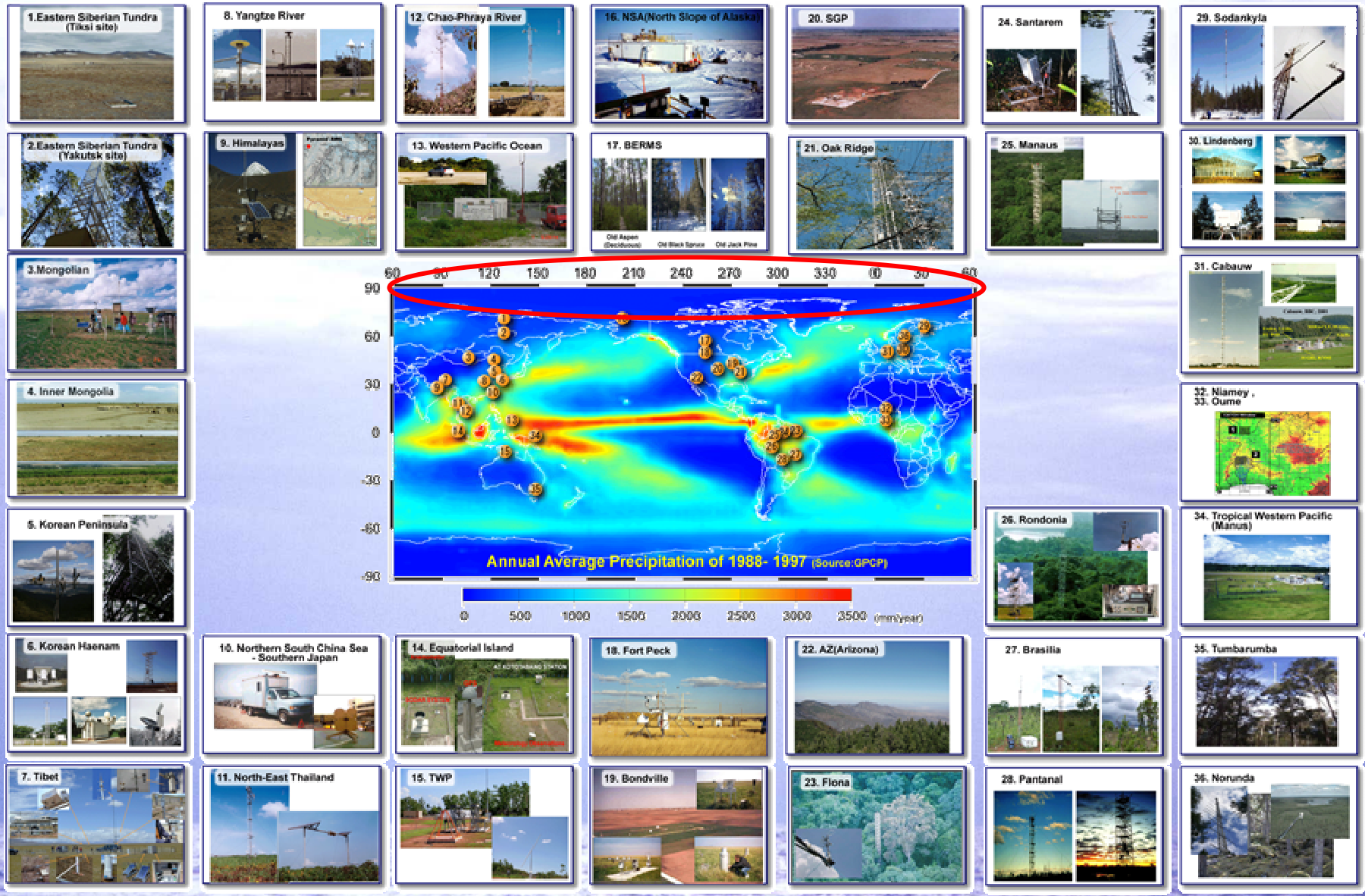



Global Land Data Assimilation System at NASA Goddard Space Flight Center of USA
http://ldas.gsfc.nasa.gov/

Data Archive Center

*Courtesy GEWEX IPO*

# International Cooperation for the Global Coverage



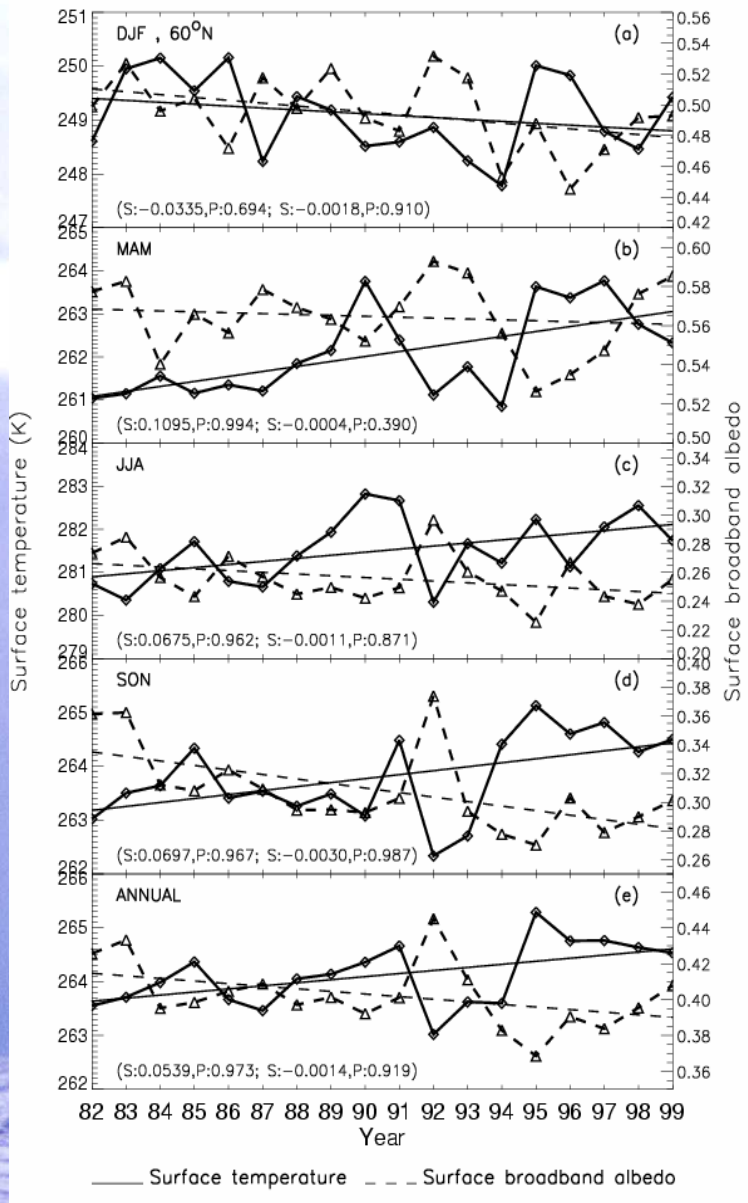

*Courtesy GEWEX IPO*

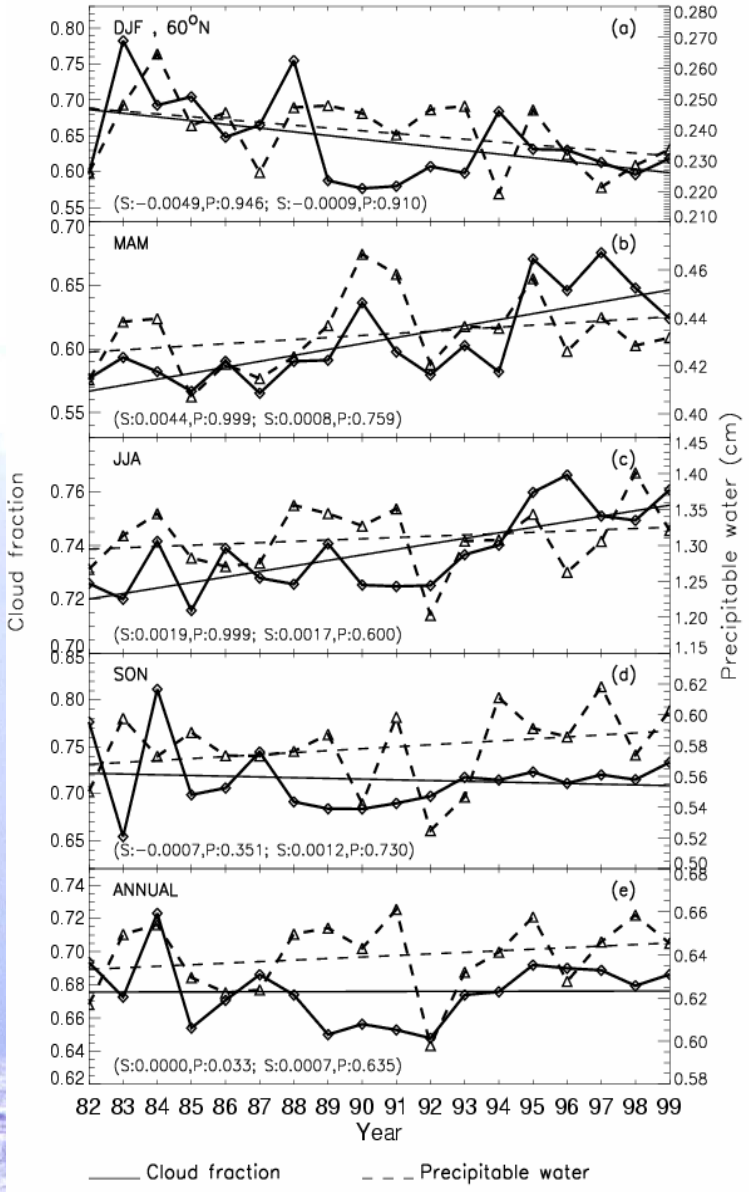
**Ice-tethered Platforms, WHOI, 28-30 June 2004**

# GEWEX/CliC: trends

# Recent Trends by Year

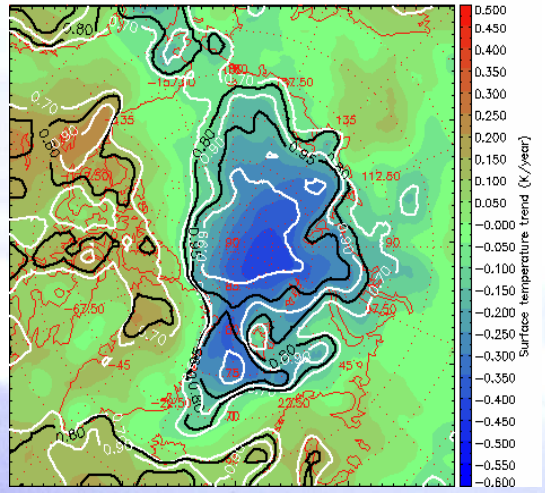
*Courtesy Jeffrey Key*



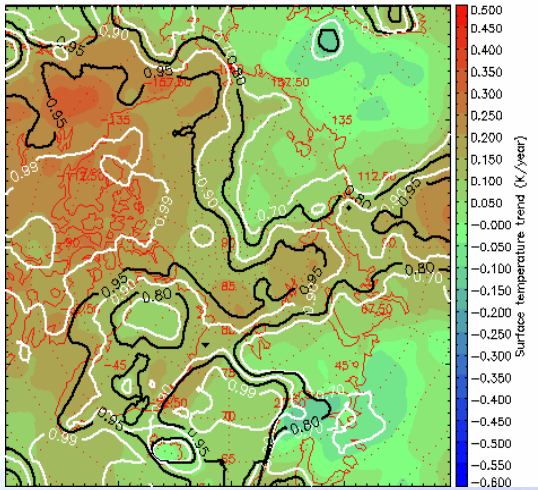



# Recent Trends: Surface Temperature

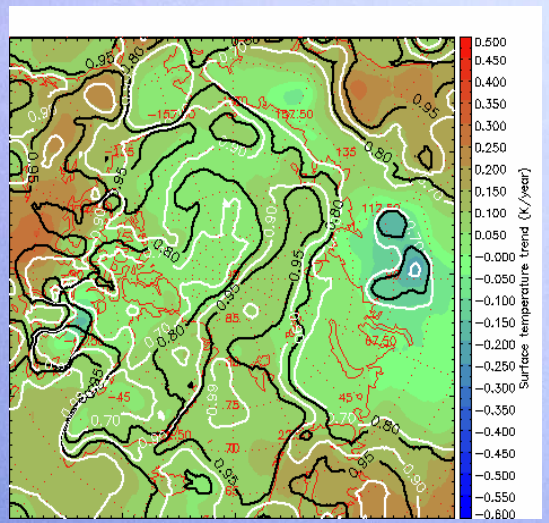
*Courtesy Jeffrey Key*



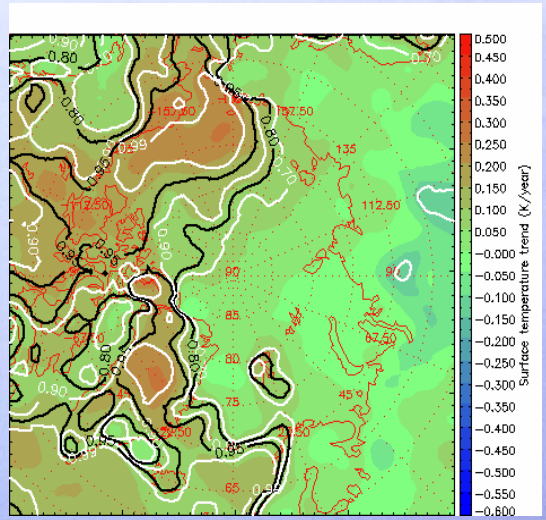

Winter




Spring




Summer

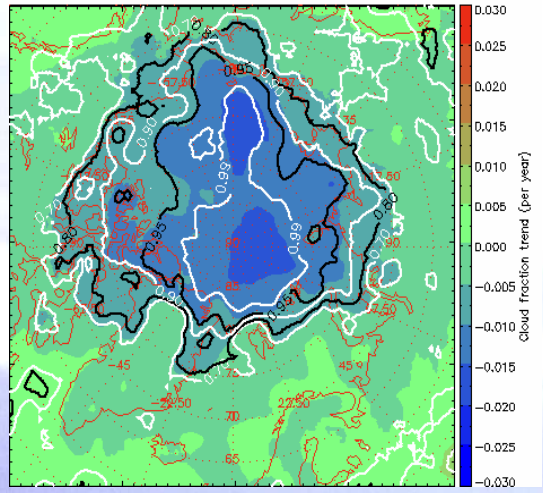



Autumn

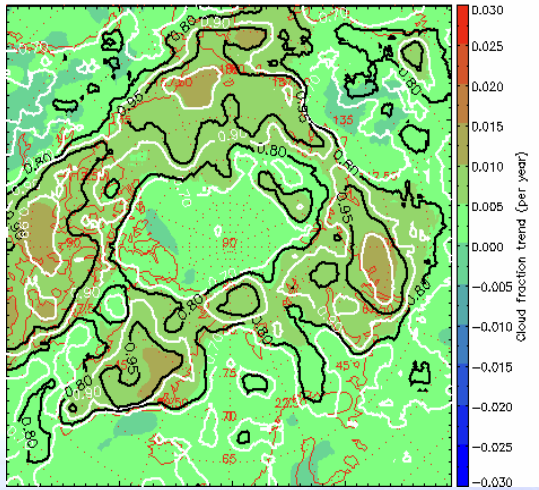
**The spatial distributions of surface skin temperature trend in Winter, Spring, Summer and Autumn during the period of 1982 – 1999 at local solar time of 1400**

# Recent Trends: Cloud Fraction

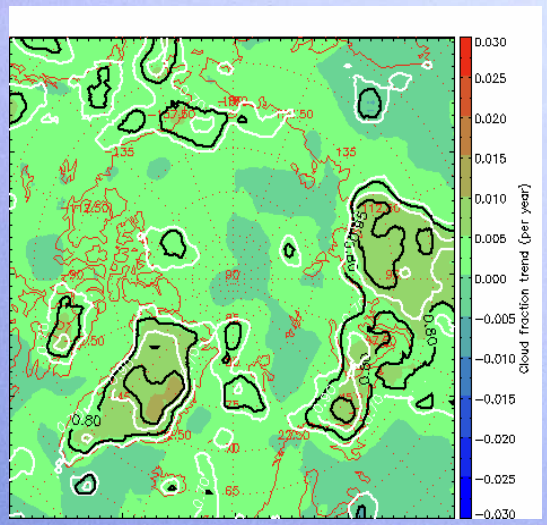
*Courtesy Jeffrey Key*



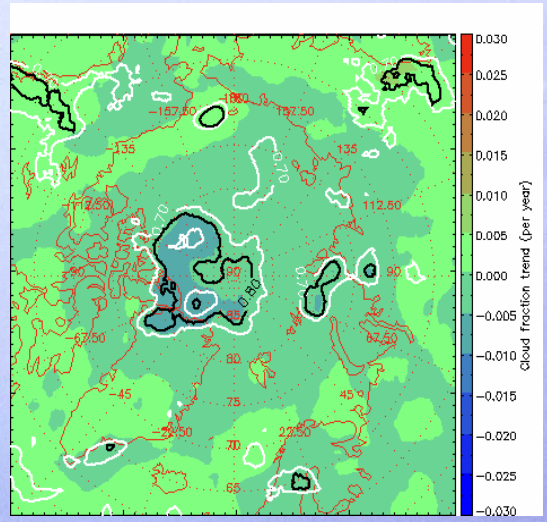

Winter




Spring




Summer

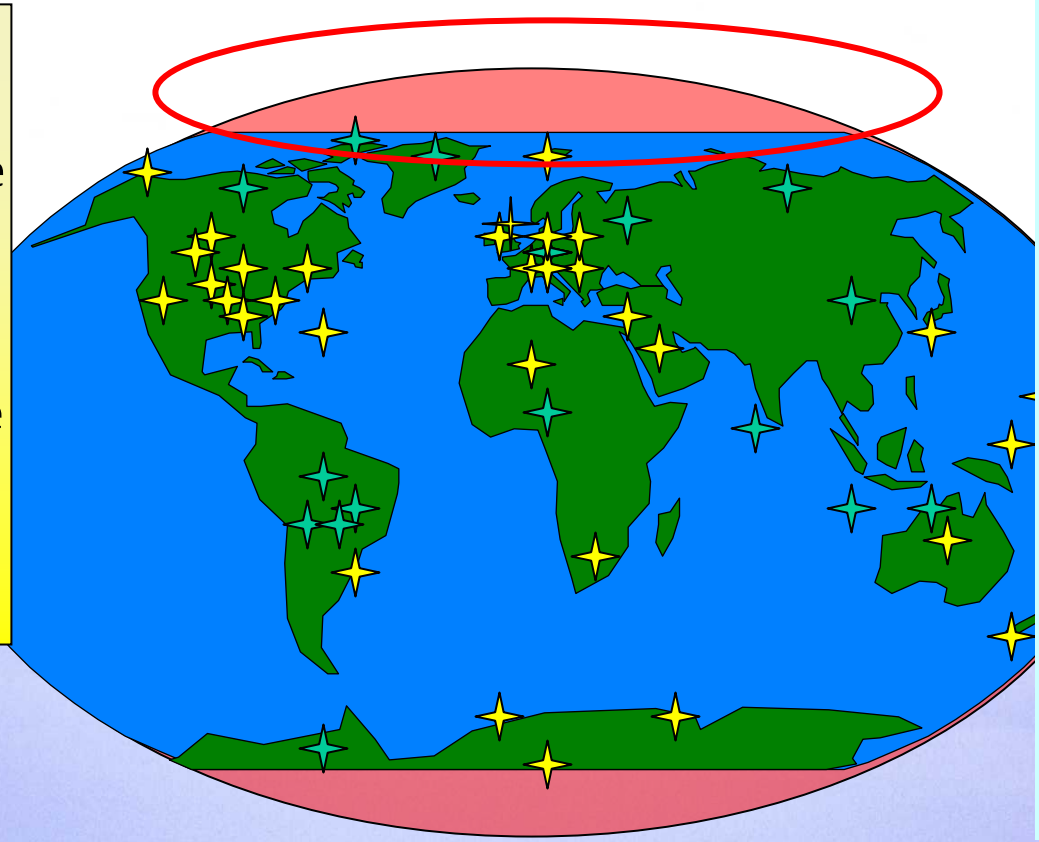



Autumn

**The spatial distributions of cloud fraction trend in Winter, Spring, Summer and Autumn during the period of 1982 – 1999 at local solar time of 1400**

# Baseline Surface Radiation Network

**Goal:**
**To acquire climatically-diverse ground-based surface radiation measurements of the highest possible quality, for climate research.**

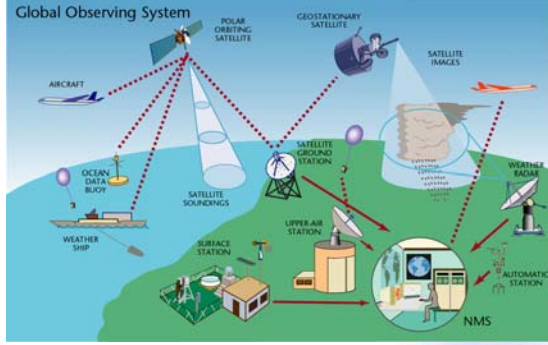


Archiving  Provisional

**Measurements**
- **Direct & diffuse solar***
- **Downward infrared ***
- **Upwelling irrad.**
- **PAR & UV**
- **Aerosol optical depth**
- **Surface meteorology***
- **Upper air met.**

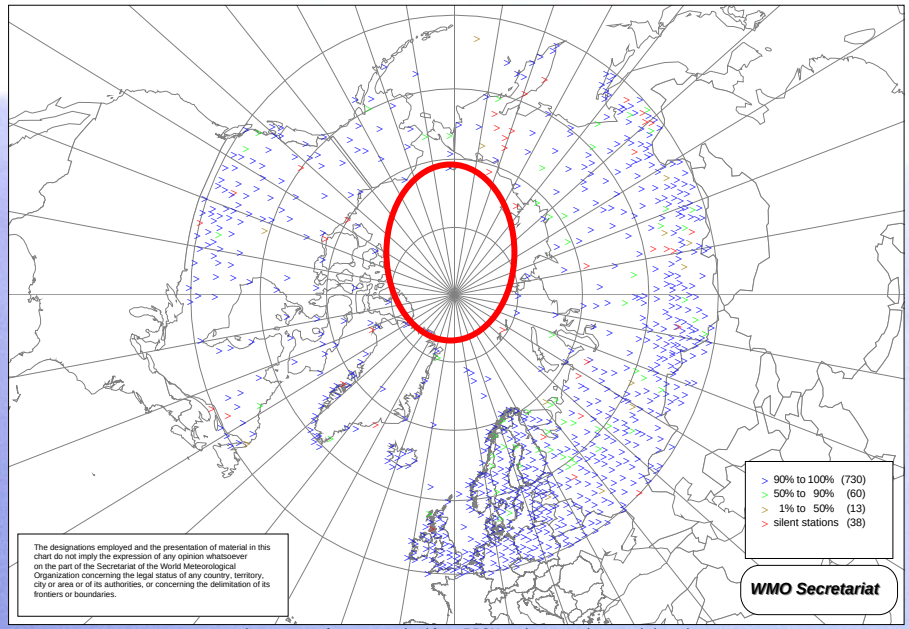
* all sites

**GCOS WISHES TO ADOPT BSRN AS ITS BASELINE RADIATION NETWORK.**




- WMO observing system elements:
  Surface observations - need to be strengthened

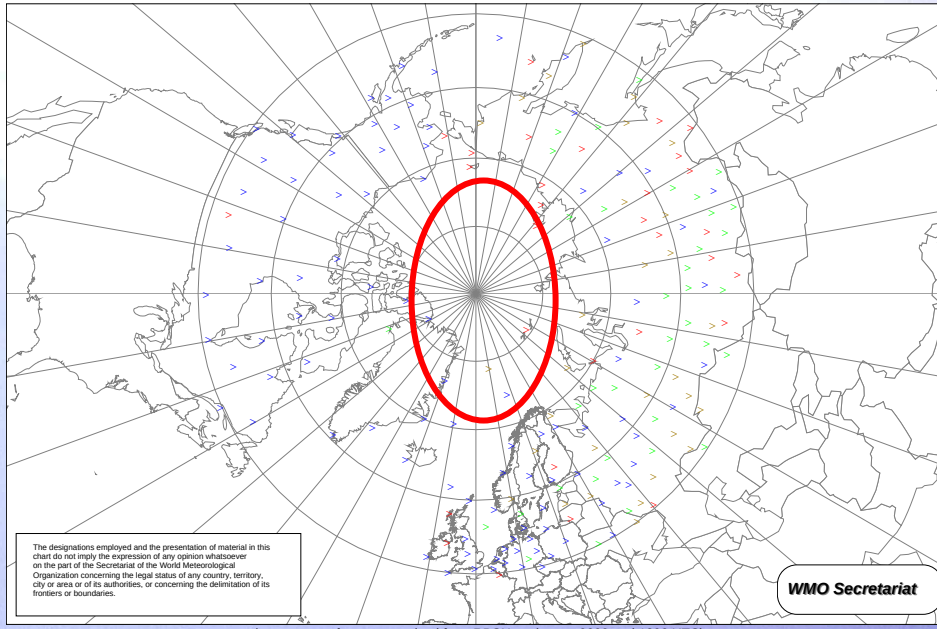
Availability of surface reports received at WWW centres in SYNOP code
Special MTN Monitoring period: 1 to 15 July 2003




(percentage of reports received from RBSN stations at main synoptic hours)

Figure 1

Availability of upper-air reports received at WWW centres in TEMP code
Special MTN Monitoring period: 1 to 15 July 2003




(percentage of reports received from RBSN stations at 0000 and 1200 UTC)

Figure 2

*Courtesy WMO WWW Department*

**Also to strengthen: AMDAR, AIREP, BUOY, ASAP**

# Climate & Cryosphere, Goal and Objectives

Tokyo, March 2000, a new WCRP core project, sunset in 2015

***Principal Goal:***

***To develop and contribute the knowledge of cryosphere into WCRP climate observing, research, modeling, assessment, prediction process and to determine the stability of the global cryosphere in changing climate***

***Supporting Objectives:***

- **Enhance the observation & monitoring of the cryosphere in support of process studies, model evaluation and change detection**
- **Improve understanding of the physical processes and feedbacks through which the cryosphere interacts within the climate system**
- **Improve the representation of cryospheric processes in models to reduce uncertainties in simulation of climate and predictions of climate change**

# Countries Where Cryosphere Occurs

95 countries identified with cryospheric components
Cryosphere truly is global

**ACSYS, regional, ->**

**CliC, global, based on a new approach – frozen water**

**Permafrost, seasonal frozen ground**

**Snow (cover), solid precipitation**

**Fresh water (river-, lake-) ice**

**Marine cryosphere (sea ice, ice shelves,…)**

**Ice sheets, caps, glaciers**

Cryosphere

# CliC Implementation Strategy
# CliC Project Areas

CliC Science and Co-ordination Plan, 2002
CliC Implementation Strategy, 2004 (being finished)

***Implementation - through CliC Project Areas:***

***CPA4. Linkages between the cryosphere and global climate cryosphere***

**CliC will address the cryosphere, observations of the cryosphere, observations in areas with cryosphere.**

**Ice-Tethered Platforms are GOOD for CliC!**
**CliC will endorse them as an important contribution to climate research and observation.**

# IGOS-P Theme on Cryosphere (2004/05)

**(to be led by CliC and SCAR)**

## Three major streams of cryospheric data and applications

- GCOS/GTOS: GSN, GTN-P, CALM, etc.
- ARCTIC-HYCOS, GTN-H, etc.
- AOOS
- SO OS
- GOOS and JCOMM sea-ice compartments

Marine Cryosphere

- GTN-G, WGMS, GLIMS

Alpine Cryosphere

Combined system for observations of soil, meeting requirements of hydrology, geocryology, climate and biogeochemical modelling

# IPY 2007 – 2008
## Brief History

- 1882 – 1883 First International Polar Year - *WMO*
- 1932 – 1933 Second International Polar Year - *WMO*
- 1957 – 1958 International Geophysical Year - *ICSU & WMO*

- ***Resolution 34 of the World Meteorological Congress 2003***

acknowledgement of importance of research into processes governing environmental change in the polar regions, and also elaborating monitoring and forecasting systems, taking account of the sensitivity of high latitude regions on our planet to natural and human impacts.

# IPY 2007 – 2008

## WMO Contribution to IPY (last appendix of the IPY Outline Sci. Plan):

- Observing systems (in-situ + remote sensing) (including AOOS and SOOS, WWW, $O_3$, Arctic-Hydrology)
- Telecommunications
- Standards, formats, protocols, …
- Data centres
- Data holdings
- Research by WMO (own and sponsored, weather forecast research, strong focus on climate research led by CliC/WCRP)
- Logistical support
- Intergovernmental status of decision making

# CliC First Science Conference

## Cryosphere - The "Frozen" Frontier of Climate Science: Theory, Observations, and Practical Applications

## 11-15 April 2005 (just the week before ASSW 2005)

## China Meteorological Administration, Beijing, China

**Current Sponsors**

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Ice-tethered Platforms, WHOI, 28-30 June 2004