

AGU Town Hall Meeting
on
Arctic Data and Modeling Needs
for Improved Arctic System Synthesis

ARCSS Committee Data & Modeling Working Group

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Open Meeting of the Arctic Science Community
14 December 2006



ARCSS Move Toward Synthesis

- Aim is improved understanding of the Arctic as a system and of its particular role in the larger Earth system and its response to change
- Aim also is to engage decision-makers and the public on the importance of these issues

Motivation to Think about Data: Situation Today

- Discipline-specific, project-specific models/data sets employ highly specialized structures, resolutions, time/space domains
- Data restrictions/data policy impedes full access (e.g. human/social science data sets)
- Arguably, the typical PI focuses on his/her science; community framework for wide data & model dissemination lacking
- Opportunities on the horizon....IT, new analysis tools: models, instrumentation, remote sensing...IPY, AON challenges looming

TWO QUESTIONS

How can we use data and other information sources in conjunction with appropriate IT, models, analysis tools to improve Arctic system synthesis?

What specific community-based exercises/events can we promote?

At the same time.....

new pathways to synthesis that are
data rich are beginning to take hold

.....some examples and some needs

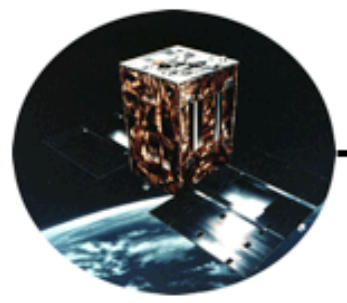
Structure of the MOE GERF project (2002-2007): Carbon management in 21st century



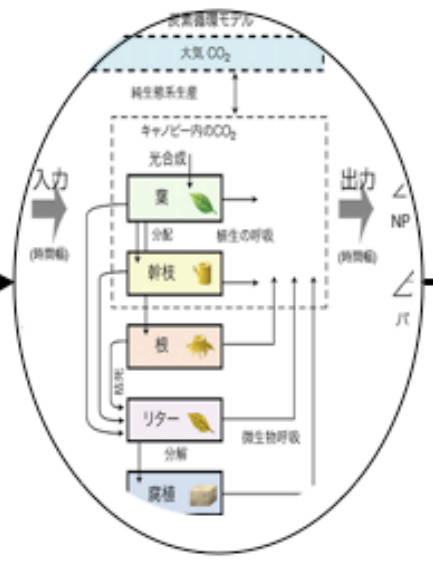
Flux tower observations



Soil-ecosystem process studies

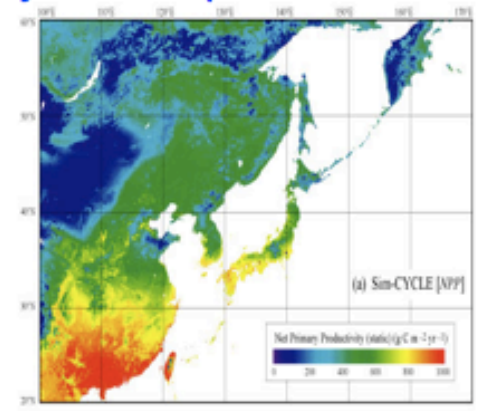


Remote sensing of phenology

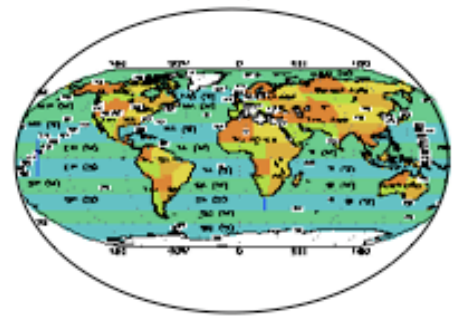


Process model

Mapping Asian carbon dynamics (2000-2005)

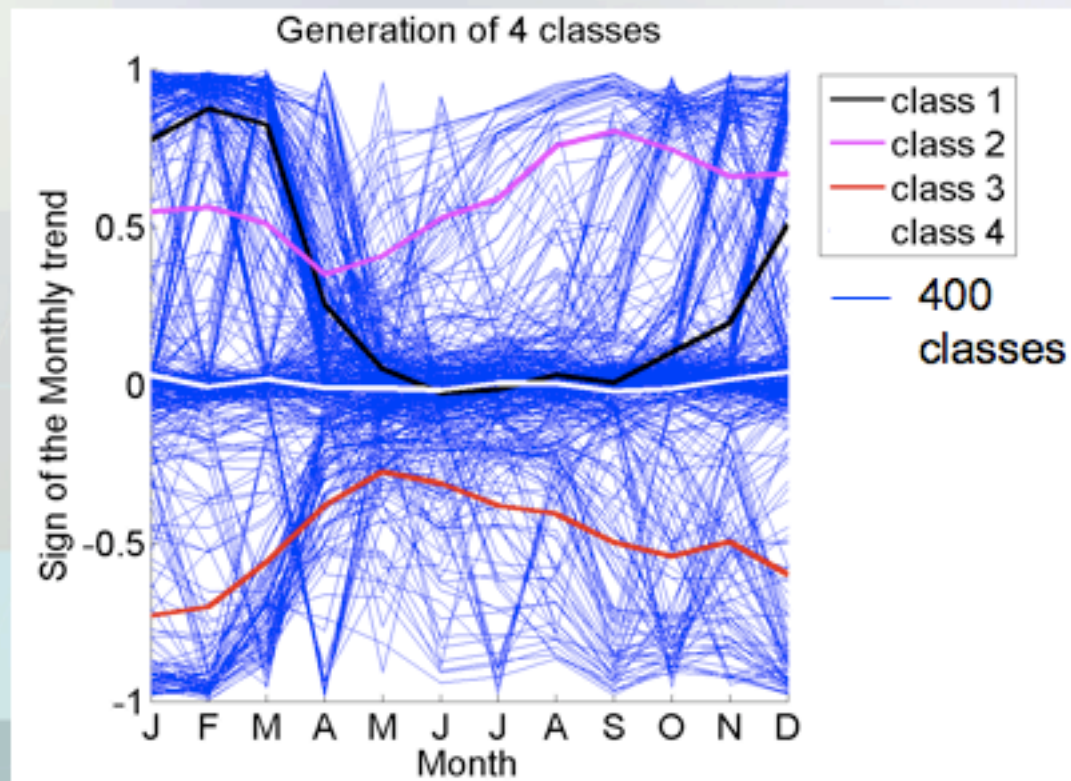


検証



Carbon fluxes evaluated from atmospheric observations

4. Find four characteristic trend patterns with the neural gas method

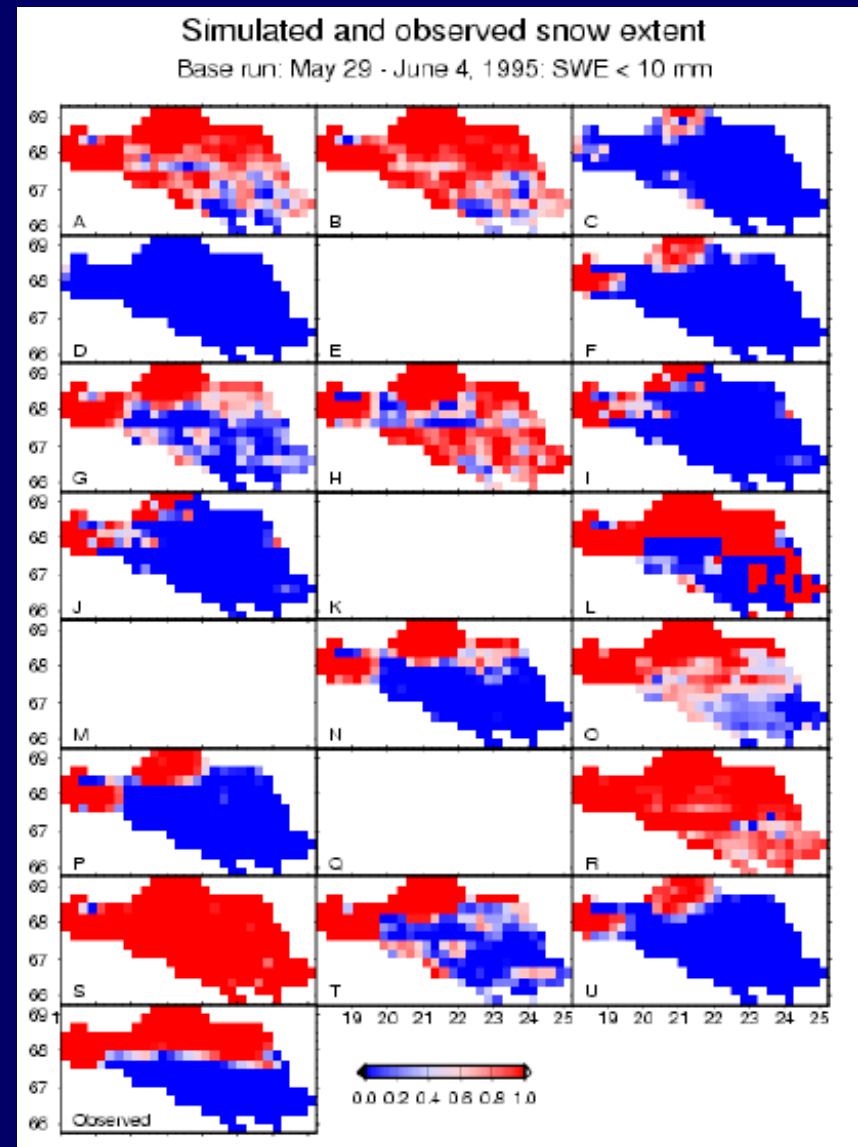


- **Class 1: winter increase**
- **Class 2: general increase**
- **Class 3: strong winter decrease, summer decrease**
- **Class 4: no change**

Synthesis through Intercomparison Experiments

- Broad disparities among models (*e.g. land surface hydrology*) of some of the basic building blocks of the pan-Arctic system
- Ongoing experiments for ocean (*AO-MIP*), regional climate models (*ARC-MIP*)

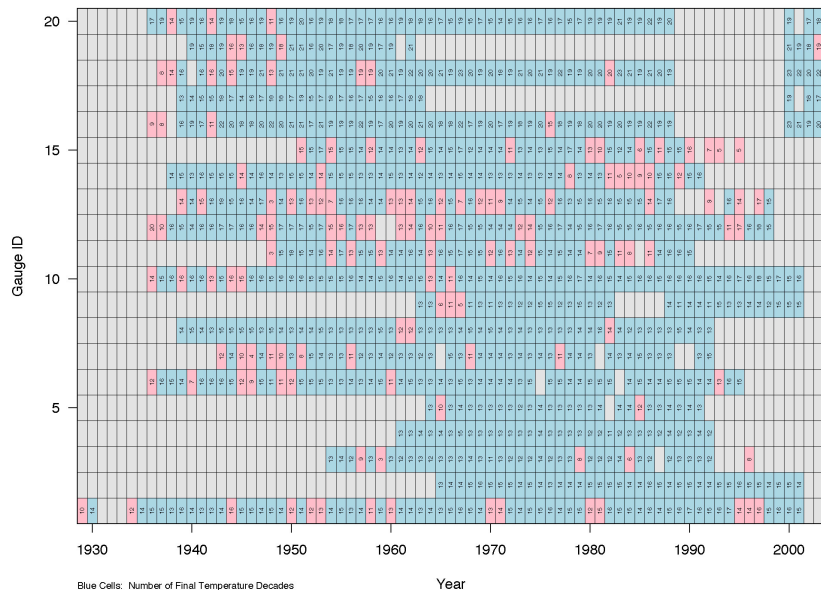
PILPS-2e (Lettenmaier et al.)



Strategies needed to deal with spatially/temporally broken data sets

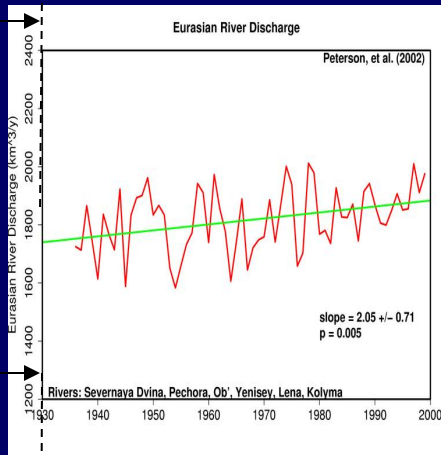
...and for network design, as for IPY and the Arctic Observing Network

Number of Data Points Per Gauge-Year – River Temperature Data



Comprehensive picture also emerging from Earth System Models

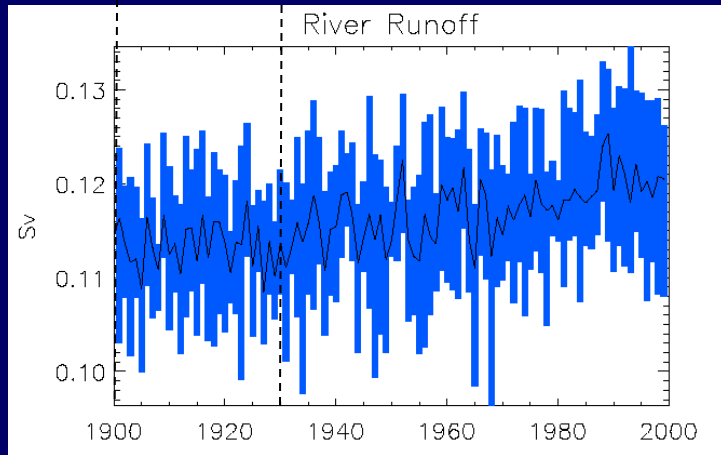
Data Gap



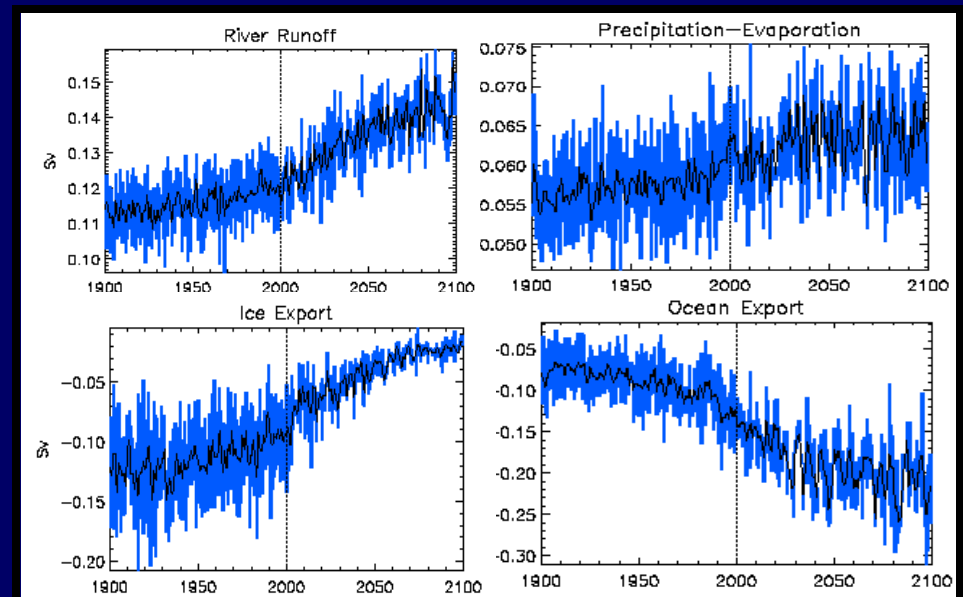
CCSM3 Modeled Eurasian River trend over 20th century = 6.7×10^{-3} Sv/century (2.11 km³/yr)

Results in 7% increase in Eurasian river flow over the century

Agrees well with observed trends discussed by Peterson et al. (2002) (12%↑, 2.05 km³/yr)



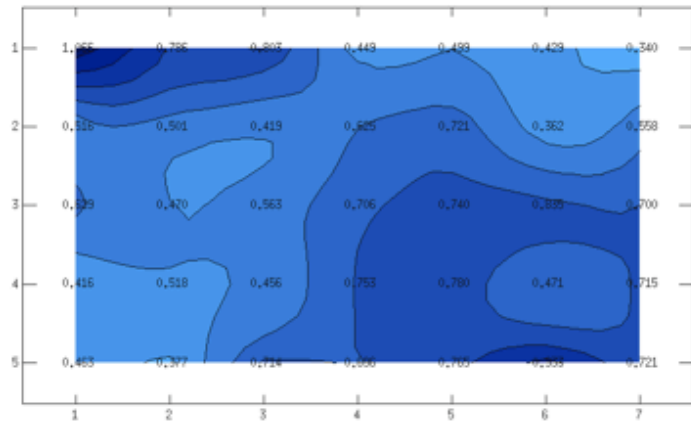
Model Forecasts to 2100 *Coherent Tracking of Fresh Water*



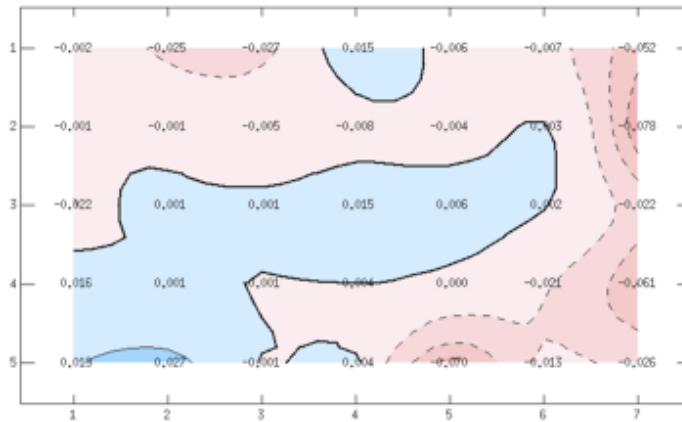
Self-Organizing Maps (SOMs) to Analyze Patterns of Synoptic Climate Climatology & Model Intercomparisons

MM5-ERA40 Net Precipitation Differences

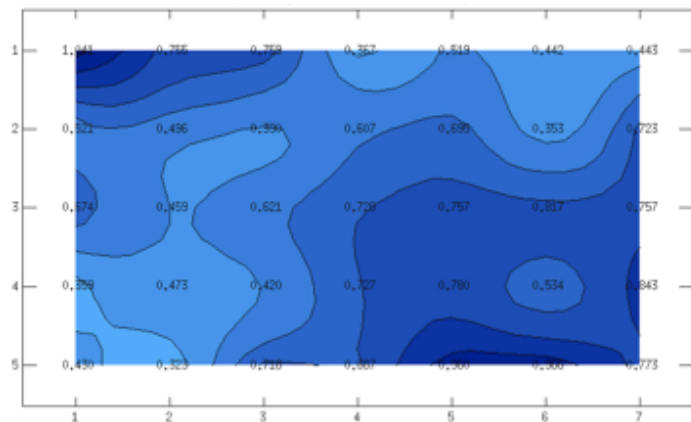
Total difference



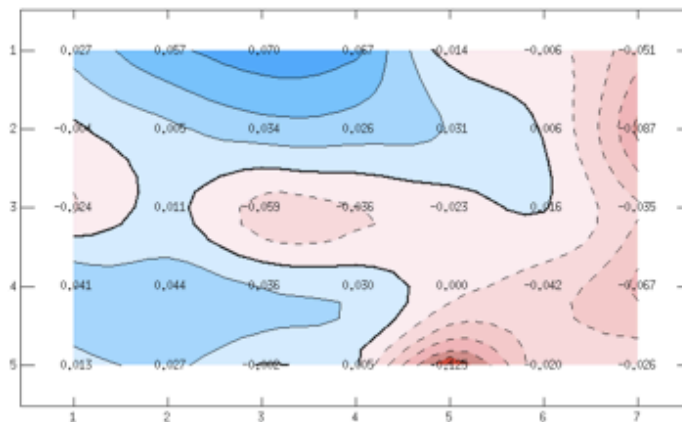
Dynamic difference



Thermodynamic difference



Combined difference



ARCSS Data and Modeling Workshop

2-4 April 2007, Bell Harbor Center, Seattle WA

GOAL: *Bring together data provider & data user communities to identify innovative approaches on data management and assimilation, recent developments in technology, and modeling that will advance Arctic system synthesis*

PARTICIPANTS: *Data Providers, Technology and Information Technology Experts, Data Consumers, Knowledge Brokers
.....more than IT, archiving, meta data std's, data management*

MODE OF EXECUTION: *Breakout teams focusing on “worked” examples --science question driven; e-links*

MAJOR OUTPUT: *report on key issues, opportunities, challenges w/ recommendations to NSF on investments*

ORGANIZING COMMITTEE: C. Vörösmarty & A. D. McGuire (co-Chairs), L. Hinzman, M. Holland, J. Intrieri, M. Murray, J. Schimel, J. Weatherly

We look to you for advice on.....

- The general framework for the exercise
- I.D. the big ticket data-rich synthesis challenges
- Any key issues not mentioned here
- Additional participant communities to invite
- How to best organize the workshop
- Disseminating the findings
- Any other relevant issues you want to discuss?

See

www.arcus.org/ARCSS/message.html

for additional information and background