Introduction to GLEON and update since last meeting

Tim Kratz
University of Wisconsin-Madison
Chair, GLEON Steering Committee

Archbold Biological Station
12 February 2008

GLEON 5: Montreal - 11 August 2007

GLEON
global lake ecological observatory network

Welcome to GLEON 6!!!

66 participants
- 25 first time
- 13 students
- 22 female, 44 male

5 continents
- Asia
- Europe
- North America
- Oceania
- South America

Argentina
Australia
Brazil
China
Denmark
England
Finland
Hungary
Ireland
Israel
Korea
New Zealand
Sweden
Switzerland
Taiwan
United States

GLEON
global lake ecological observatory network

Outline

- GLEON tutorial – who, what, when, where, why, how
- Progress since GLEON 5 (August in Montreal)
  - Deployments and IT
  - Governance/Organizaton
  - Proposals/Funding
- Spreading the word
  - Science results
  - Materials “About GLEON”

Acknowledgements

- Multiple domestic agencies including
  - US National Science Foundation (Autoscaling, RCN, LTER awards, supplements for Taiwan, China and Korea, Nordic Countries, South America)
  - Gordon and Betty Moore Foundation
  - National Science Council Taiwan (KING project)
  - Taiwan Forestry Research Institute
  - Foundation for Research, Science and Technology (New Zealand)
  - Israel Water Commission
  - And others….
- Local organizers
  - Archbold Biological Station: Hilary et al.
  - Florida International U: Evelyn et al.

GLEON
global lake ecological observatory network

The Global Lake Ecological Observatory Network (GLEON)

- A grassroots network of
  - ecologists, engineers, information technology experts
  - institutions and programs
  - instruments
  - data
- Linked by a common cyberinfrastructure
- With a goal of understanding lake dynamics at local, regional, continental, and global scales

GLEON
global lake ecological observatory network

gleon.org

Yuan Yang Lake, Taiwan ; photo by Matt Van de Bogert

GLEON's Mission

Facilitate **interaction** and build **collaborations** among an **international**, multidisciplinary community of researchers focused on **understanding, predicting, and communicating** the impact of natural and anthropogenic influences on **lake ecosystems** by developing, deploying, and using networks of emerging **observational system technologies** and associated **cyberinfrastructure**.

GLEON
global lake ecological observatory network

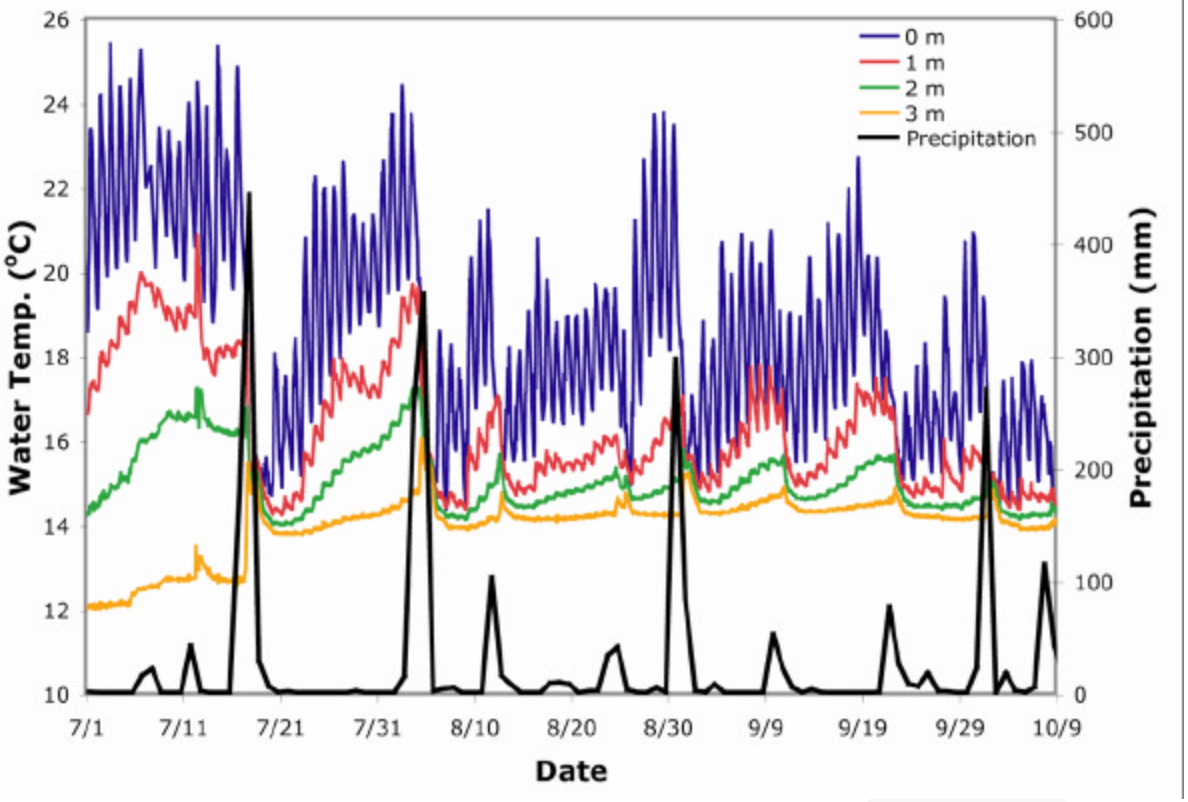
http://gleon.org

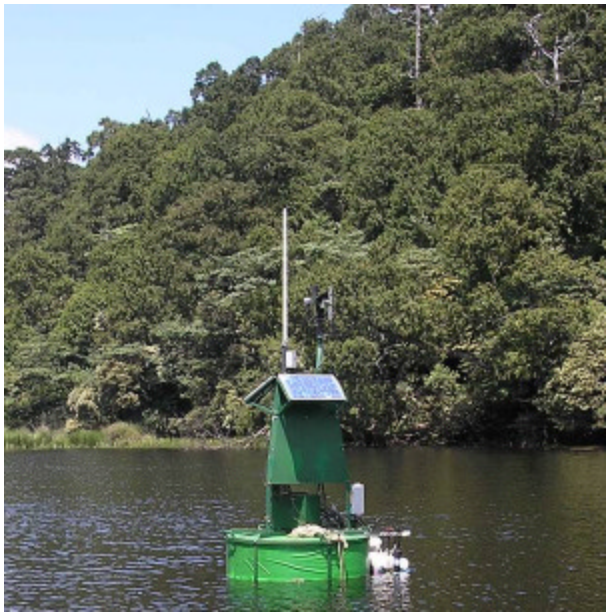
Research enabled by the "observatory" approach

- **Coupling of physical and biological processes**
- **Role of episodic events, thresholds, and non-linear dynamics**
- **Source, movement, and fate of carbon in lakes and watersheds**
- **Lakes as "sensors" of landscape & climate change**
- **Domains of control of limnological processes**

An Example: GLEON and episodic events

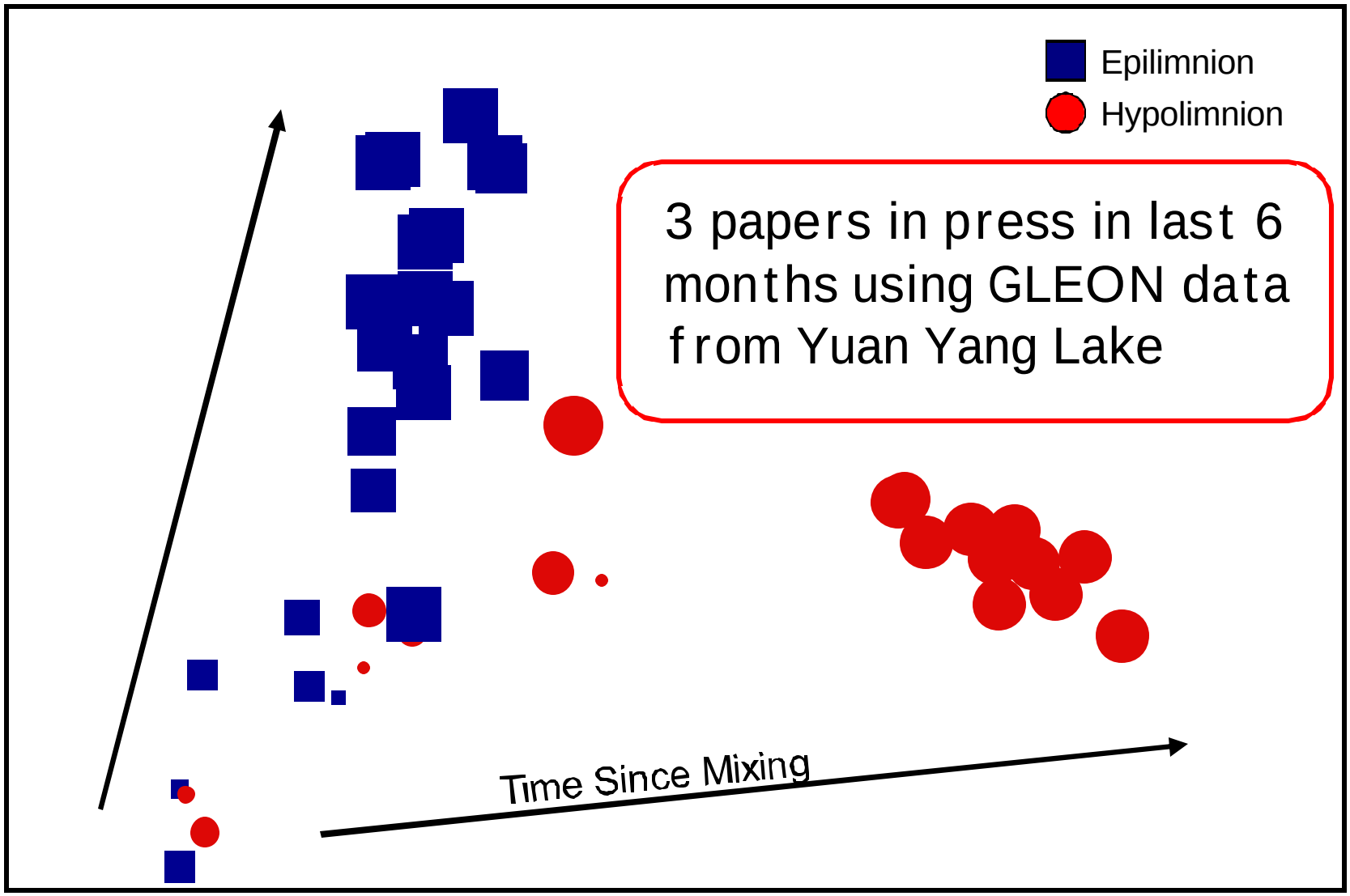
Yuan Yang Lake, Taiwan





From Jones et al. (in press, L&O)

Yuan Yang Lake Bacterial Community Composition



Slide courtesy of Stuart Jones/Trina McMahon

Meetings

GLEON I

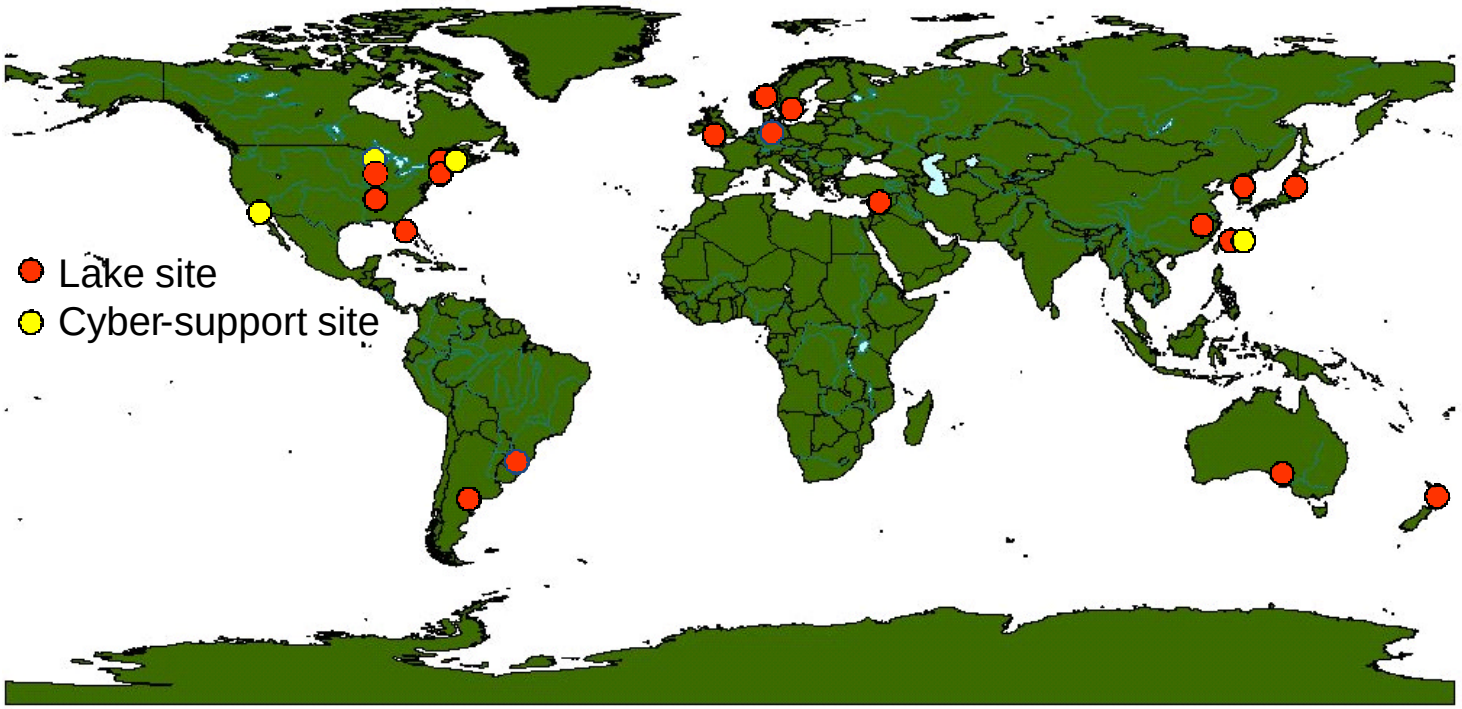
GLEON II

GLEON III

GLEON IV

GLEON V

GLEON Sites



- Broad international participation
- More than 120 scientists
- Most sites are developing

GLEON Steering Committee

Tim Kratz, Chair
Univ. Wisconsin
USA

Peter Arzberger
Univ. California-San Diego
USA

David Hamilton
Univ. Waikato
New Zealand

Fang-Pang Lin
National Center for
High Performance Computing
Taiwan

Paul Hanson
Univ. Wisconsin
USA

Ami Nishri
Limnology and Oceanographic Research Center
Israel

Lauri Arvola
Univ. Helsinki
Finland

Kathie Weathers
Institute for Ecosystem Studies
USA

Justin Brooks
Univ Adelaide
Australia

Thorsten Blenckner
Uppsala Univ.
Sweden

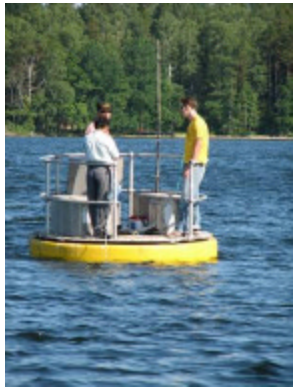
Boqiang Qin
Nanjing Inst.
Hydrology and Limnology
China

Meets Wednesday Lunch

- **next meetings**
- **working groups**
- **membership**

GLEON Activities

- ✓ Share experience, expertise, and data
- ✓ Catalyze joint projects via working groups
- ✓ Develop tools
- ✓ Conduct multi-site training
- ✓ Create opportunities for students
- ✓ Meet and communicate regularly



GLEON: Shared Vision*

- Participation: contribute to GLEON mission
- Openness: share experience and expertise
- Data: share data as openly as possible
- Informal: "flat" organization – "grassroots"
- Transparent: open decision-making
- Training: integration of students
- Diversity: gender, geography, discipline

**Abstracted from: GLEON Operating Principles and Procedures, Aug 2007 posted on gleon.org*

GLEON Working Groups
(some possible examples)

- DOC/carbon dynamics
- Information technology
  - data acquisition and analytical techniques
- Physical modeling and climatic drivers
- Microbial processes
- Domains of Control
- ???

Progress since GLEON 5

Montreal, 11 August 2007

- Governance
- Deployments
- IT -- Vega and DataTurbine
- Funding
- Publications

Membership

GLEONRCN Website - Windows Internet Explorer

http://www.gleonrcn.org/index.php?pr=Membership

GLEON: Lake Directory | GLEONRCN Website

Home Page | About | Lakes | RCN | Events | Products | Sponsors | Membership

Authenticate to Check Applications | Membership Application

Individual Membership Application

Site Membership Application

Check Submitted Applications

List of Current GLEON Individual Members

List of Current GLEON Site Members

Saturday, February 9, 2008

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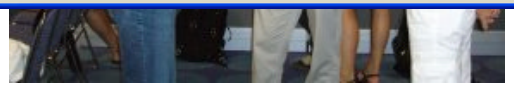
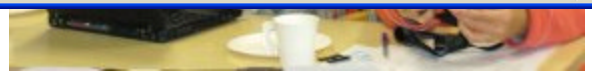
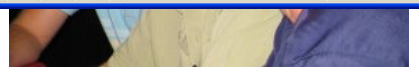
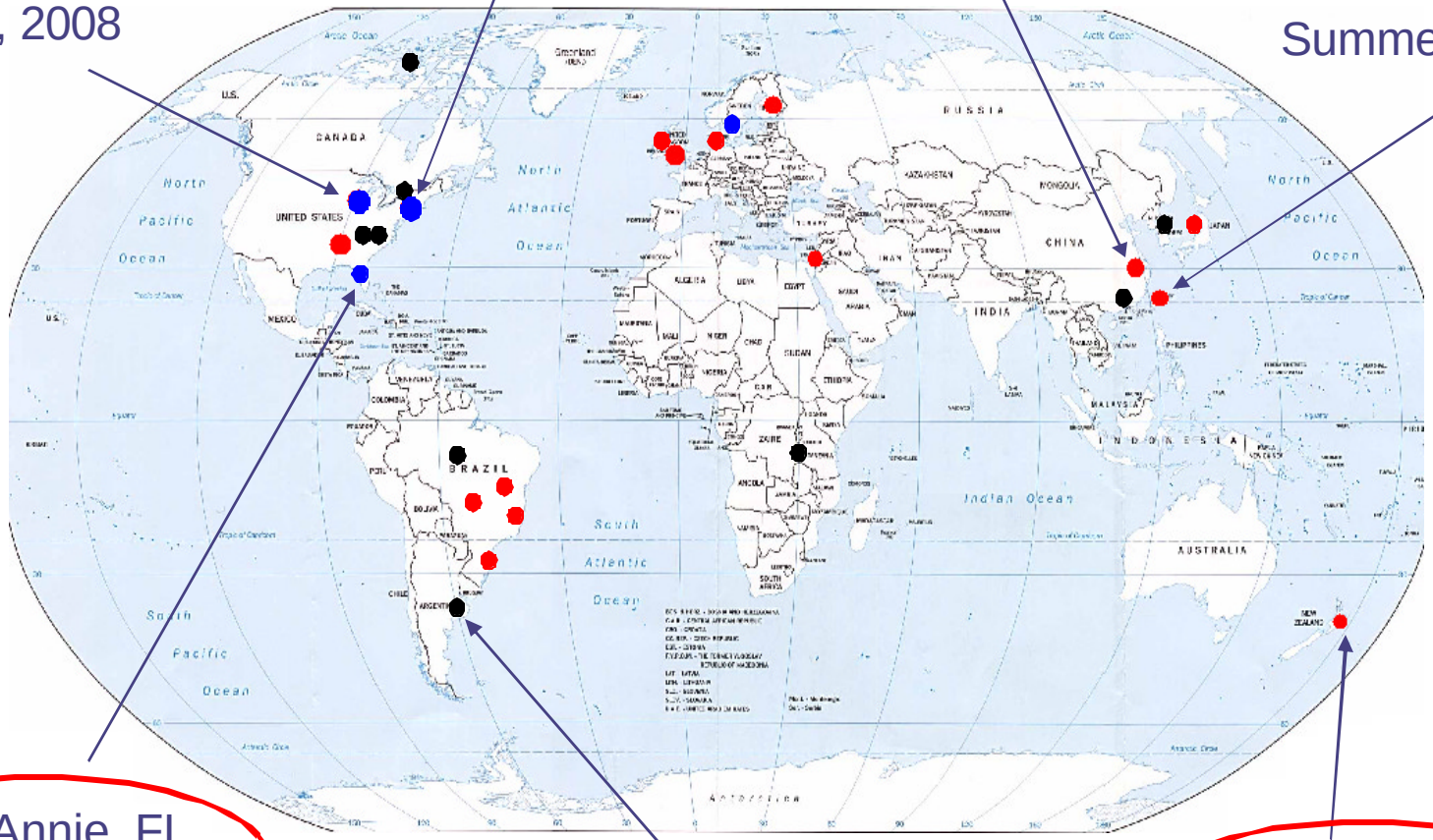
Done | Internet | 100%







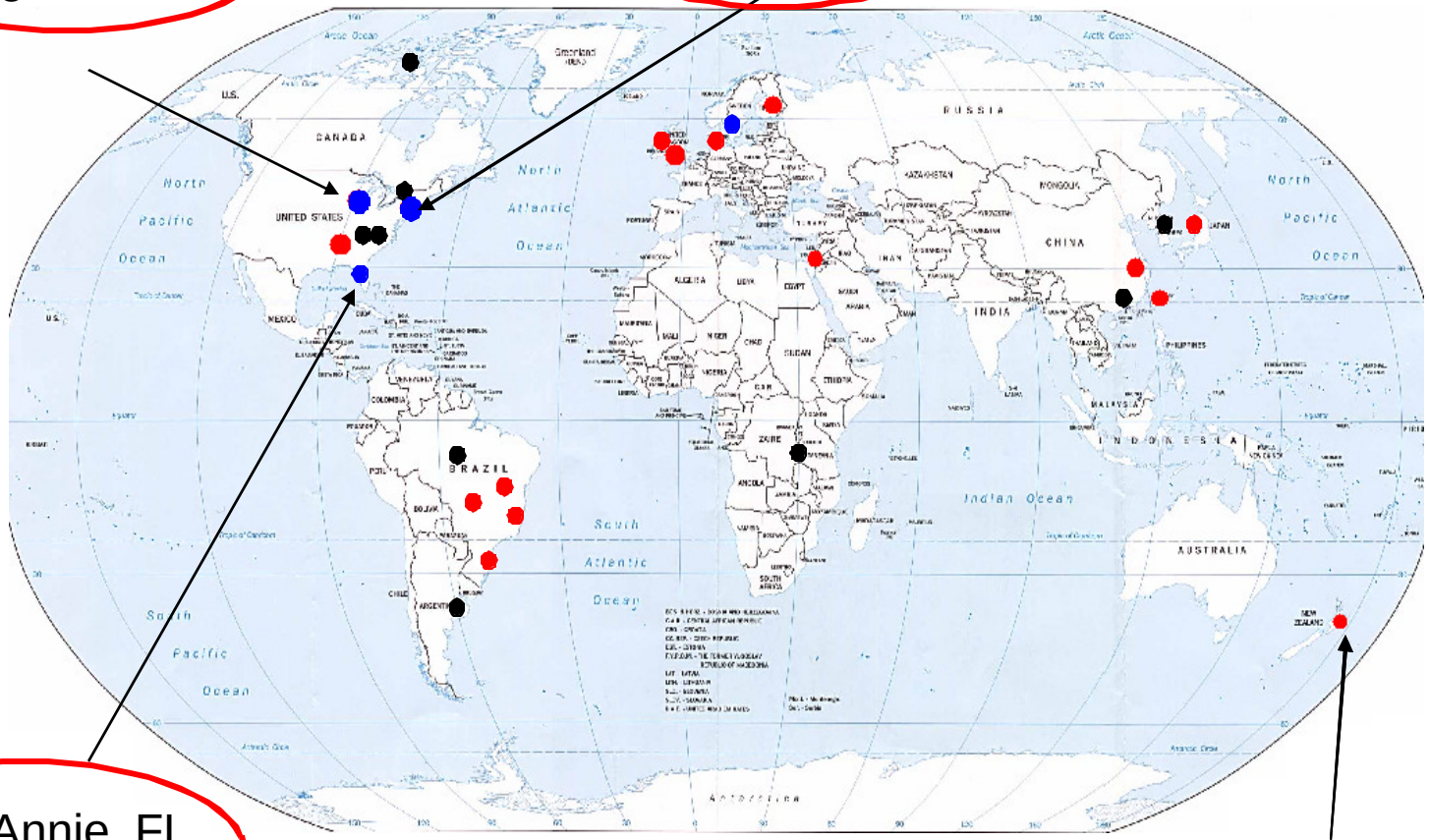
New or Planned Sensor Hardware Deployments



New or Planned Information Technology Deployments

Wisconsin lakes
August 2007

Lake Sunapee, NH
October, 2007



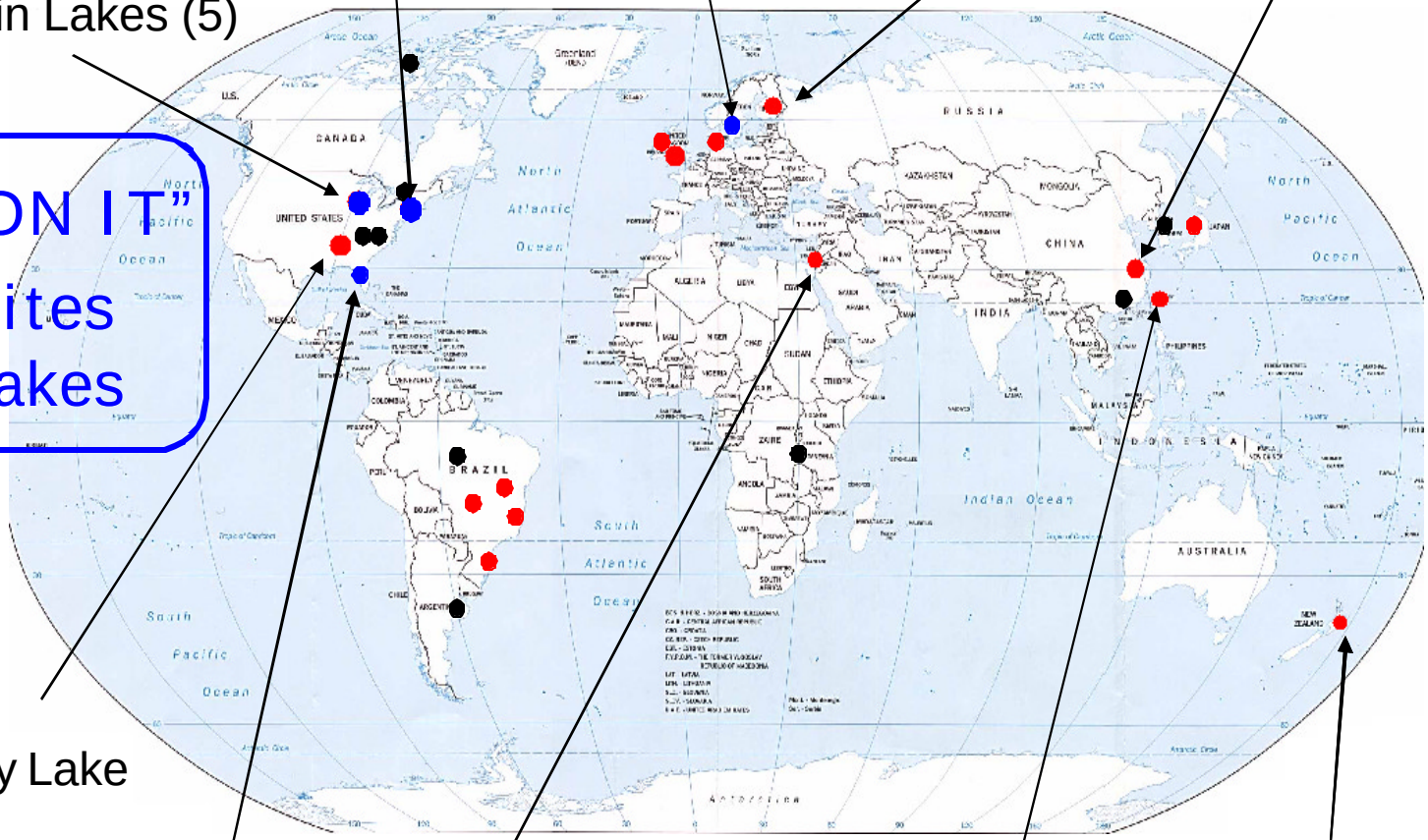
Lake Annie, FL
February, 2008

Rotorua Lakes, NZ
July, 2008

GLEON sites with instrumented lakes

~14 Sites
~18 lakes

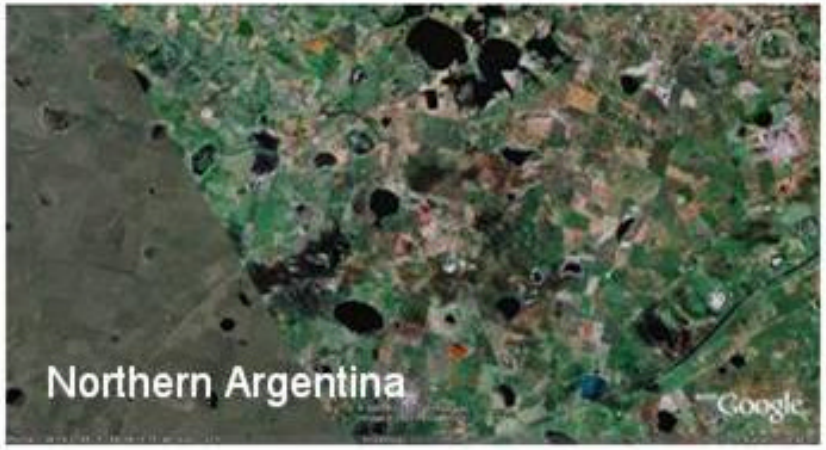
"GLEON IT"
4 Sites
9 Lakes



12 February 2008

GLEON Expands to Argentina

The Pan American Sensors for Environmental Observatories Workshop, June 2007: Tom Harmon, Daniel Lupi, Gerardo Perillo



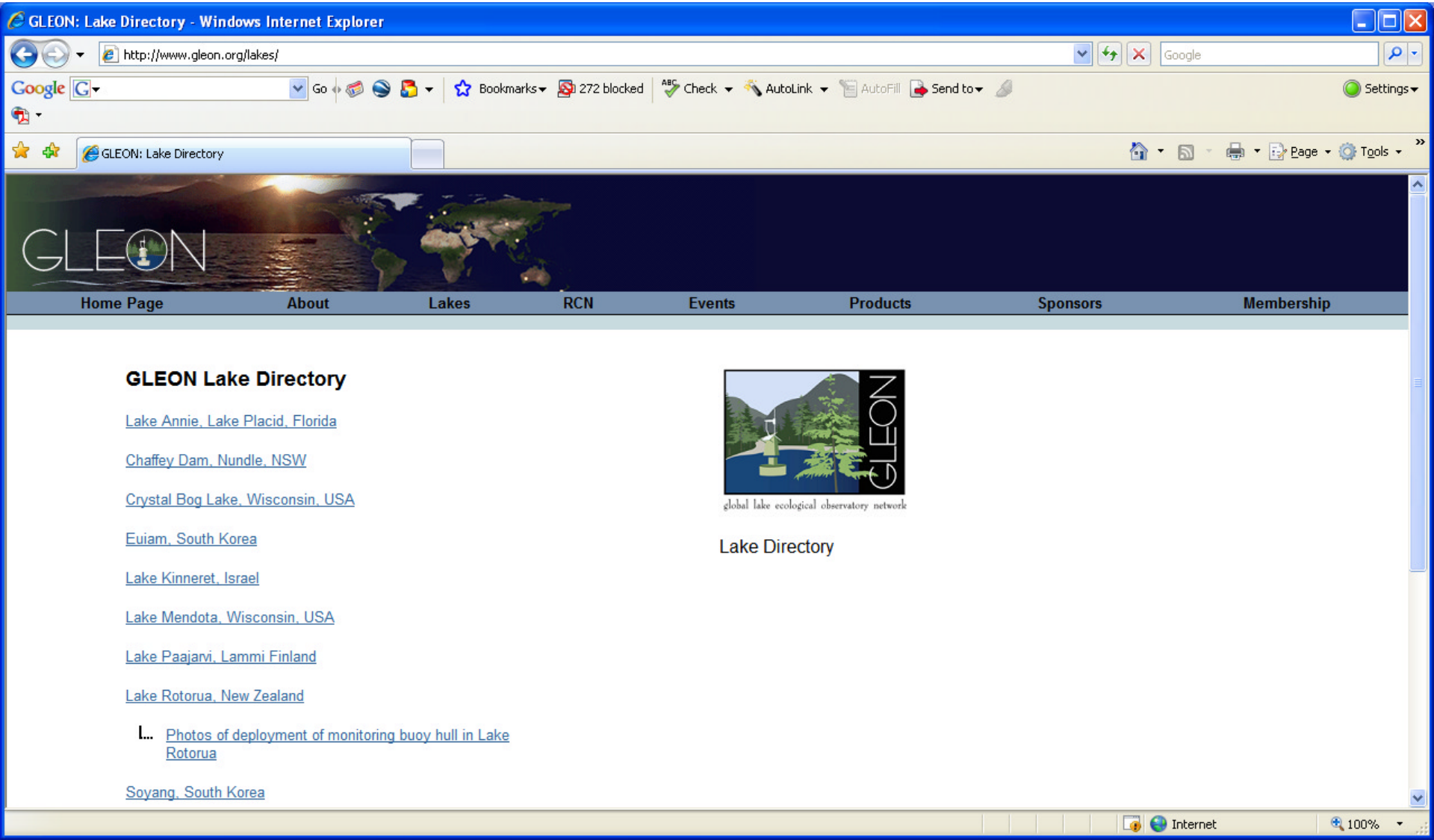
- Argentine delegation (2 faculty, 3 graduate students) at this meeting
- Reconnaissance visit by US scientists to Argentina in April, 2008
- Grad student research trip follow-up

Partially supported by NSF-OISE supplemental award

https://eng.ucmerced.edu/paseo/

New: Lakes Metadata Interface

Barbara will describe later this morning….



Building Support Infrastructure for Grass-Roots, Community-Based Research Networks:

- Provide Community with Functioning Sensor Network
  - At some sites; for some data
  - Develop, improve, package tools for easy installation
  - Deploy tools and systems at specific sites
- Limnological synthesis – postdoc!
- Create Active International Community

Gordon and Betty MOORE FOUNDATION

Proposals/Funding

Recently funded

- RCN - Paul Hanson et al., next presentation
- Gordon and Betty Moore Foundation (Peter Arzberger et al.)
- NSF South American supplement (Kratz et al.)
- EU funding for Sweden, Finland, Estonia
- Finnish funding for Paajarvi
- Others?

In review

- CI Team (US NSF – Weathers, Chiu, Benson et al.)
- 2 others to be submitted this month
- others???

Spreading the word...

GLEON brochure

Available at gleon.org

GLEON Video

Thanks to Jennifer Matthews, UCSD

Publications

Published

- Porter, J., P. Arzberger, H. Braun, P. Bryant, S. Gage, T. Hansen, P. Hanson, F. Lin, C. Lin, T. K. Kratz, W. Michener, S. Shapiro, and T. Williams. 2005. Wireless sensor networks for ecology. Bioscience 55:561-572
- Lauster, G., P. C. Hanson, and T. K. Kratz. 2006. Gross primary production and respiration differences among littoral and pelagic habitats in northern Wisconsin lakes. Canadian Journal of Fisheries and Aquatic Sciences 63:1130-1141.
- Hanson, P. C., S. R. Carpenter, D. E. Armstrong, E. H. Stanley, and T. K. Kratz. 2006. Lake dissolved inorganic carbon and dissolved oxygen: changing drivers from days to decades. Ecological Monographs 76:343-363.
- Kratz, Timothy K., Peter Arzberger, Barbara J. Benson, Chih-Yu Chiu, Kenneth Chiu, Longjiang Ding, Tony Fountain, David Hamilton, Paul C. Hanson, Yu Hen Hu, Fang-Pang Lin, Donald F. McMullen, Sameer Tilak, Chin Wu. 2006. Towards a Global Lake Ecological Observatory Network. Publications of the Karelian Institute 145:51-63.
- Hamilton, D.P., T.K. Kratz, P. Arberger, and F.P. Lin. 2006. Development of a global lake ecological observatory network. Proceedings of the International Workshop for Lake Observing Systems. Institute of Industrial Science, University of Tokyo, Japan & Lake Biwa Environmental Research Institue, Shiga, Japan. p:19-24.
- Tilak, S., K. Chiu, T. Fountain, T. K. Kratz, P. Arzberger, and B. Benson. 2006. Towards Automated Instrument Management For Lake Monitoring Systems. *in* 7th International Conference on HydroScience and Engineering (ICHE).
- Hanson, P.C. 2007. A grass-roots approach to sensor and science networks. Frontiers in Ecology and the Environment 5:343.

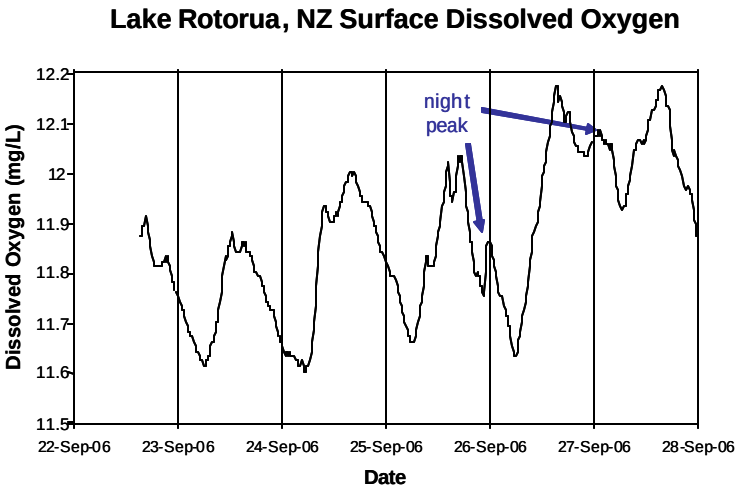
Publications (cont.)

In Press or Accepted Pending Revision

- Williamson, C.E., W.K. Dodds, T. K. Kratz, and M. Palmer. (in press). Forecasting environmental change at regional to continental scales: lakes and streams as sentinels and integrators of terrestrial and atmospheric processes. Frontiers in Ecology and the Environment.
- Tsai, Jeng-Wei, Timothy K. Kratz, Paul C. Hanson, Jiunn-Tzong Wu, William Y.B. Chang, Peter W. Arzberger, Bing-Shih Lin, Fang-Pan Lin, Hsiu-Mei Chou, Chih-Yu Chiu. (in press). Seasonal dynamics and regulation of lake metabolism in a subtropical humic lake. Freshwater Biology.
- Jones, S. E., Chiu, C. Y., S. E. Jones, T. K. Kratz, J. T. Wu, A. Shade, and K. D. McMahon. (in press). Typhoons initiate predictable change in aquatic bacterial communities. Limnology and Oceanography.
- Tilak, S., P. Arzberger, D. Balsiger, B. Benson, R. Bhalerao, K. Chiu, T. Fountain, D. Hamilton, P. Hanson, T. Kratz, F.P. Lin, T. Meinke, and L. Winslow. (in press). Conceptual Challenges and Practical Issues in Building The Global Lake Ecological Observatory Network. Proceedings of the third International Conference on Intelligent Sensors, Sensor Networks and Information Processing (ISSNIP) 2007, Melbourne, Australia.
- Tsai, J. W., T. K. Kratz, P. C. Hanson, J. T. Wu, W. Y. B. Chang, P. W. Arzberger, B. S. Lin, F. P. Lin, H. M. Chou, and C. Y. Chiu. (in press) Seasonal dynamics of lake metabolism in a sub-tropical alpine lake. Verh. Internat. Verein. Limnol.

In Review

- Jones, S. and others. (in review). The influence of typhoons on the carbon balance of Yuan Yang Lake, Taiwan. Global Change Biology.
- Hanson, P.C., S.R. Carpenter, N. Kimura, C. Wu, S.P. Cornelius, and T.K. Kratz. In review. Evaluation of metabolism models for free-water dissolved oxygen methods in lakes. Limnol. Ocean. Methods.

Goals and outcomes of this meeting

- People
- Science
- Interdisciplinary
- Fun