

The Global Lake Ecological Observatory Network (GLEON)

- A grassroots network of
 - lake scientists, 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.org

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

GLEON 7

Campus Roslagen, Norrtälje, Sweden
September, 2008

86 participants

42 first time

20 students

28 female, 58 male

5 continents

Asia

Europe

North America

Oceania

South America

Argentina

Australia

Brazil

China

Czech Republic

Denmark

Estonia

Finland

Germany

Hungary

Ireland

Israel

New Zealand

Poland

Puerto Rico

Spain

Sweden

Switzerland

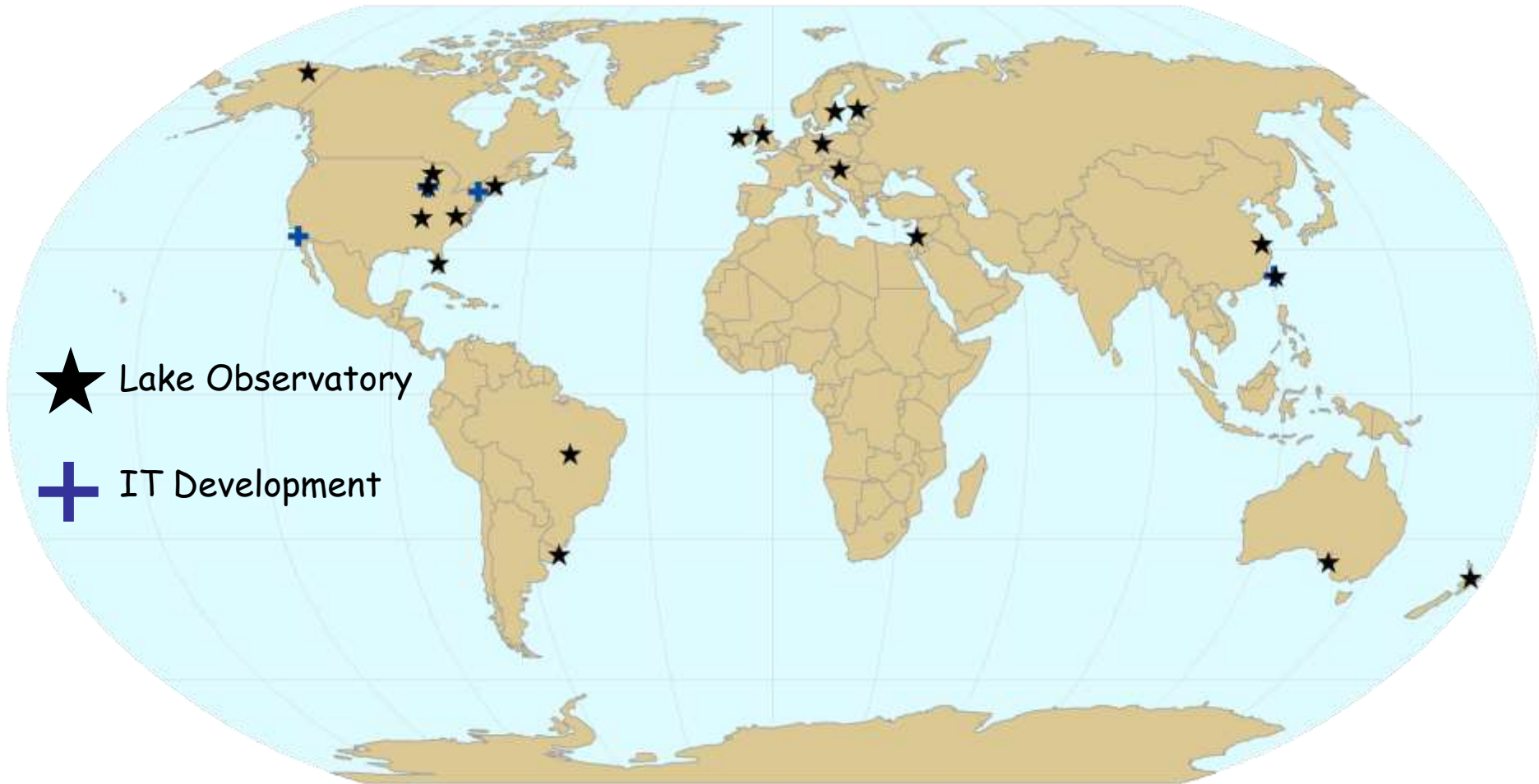
Taiwan

United Kingdom

United States

GLEON
global lake ecological observatory network

GLEON Sites September 2008



Lake Sunapee, USA



Typical Instrumentation

- Weather
- Thermistor chain
- Dissolved Oxygen sensor
- Chlorophyll fluorometer
- CDOM fluorometer
- Turbidity
- pH
- CO₂
- PAR penetration
- ADCP
- etc

Green Lake, Australia



Lake Mangueira, Brazil



Lake Annie, USA



Lake Erken, Sweden



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**.



<http://gleon.org>

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*

Why Grassroots?

- Members decide the science agenda
- Members initiate activities
 - Leads to innovative science
 - Enhances collaborative science
 - Shortens lag time between ideas and action
- Members share expertise and experience
- Open to all who share GLEON vision
- Allows flexibility

GLEON Activities

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



GLEON Steering Committee



Tim Kratz (Chair)
Univ. Wisconsin
USA



Lauri Arvola
Univ. Helsinki
Finland



Peter Arzberger
Univ. California-San Diego
USA



Kathie Weathers
Institute for Ecosystem Studies
USA



David Hamilton
Univ. Waikato
New Zealand



Justin Brooks
Univ Adelaide
Australia



Fang-Pang Lin
National Center for
High Performance Computing
Taiwan



Thorsten Blenckner
Uppsala Univ.
Sweden



Paul Hanson
Univ. Wisconsin
USA



Boqiang Qin
Nanjing Inst.
Hydrology and Limnology
China



Ami Nishri
Limnology and Oceanographic Research Center
Israel

GLEON Working Groups

- **Lake Metabolism/DOC:** Paul Hanson, Kathy Weathers
- **Domains of Control:** Thorsten Blenckner, Eleanor Jennings
- **Information technology:** Fang-Pang Lin, Hsui-Mei Chou
- **Microbes – big expt.:** Trina McMahon, Ashley Shade
- **Microbes – processes:** Stephan Bertilsson, Cayelan Carey
- **Climate/Lake Physics:** Evelyn Gaiser, David Hamilton



How do I become a member of GLEON?

- Individual vs Site Membership
- Agree to shared vision
- Be nominated by two existing members
- Fill out membership form on "gleon.org" website

Please join us!!!

Progress since GLEON 6

Florida, February 2008

- Science
- Tools
- Data
- People/Networking



Progress: Science

- **“Cool Things” with GLEON data workshop (yesterday)**
- **2008 publications**
 - Williamson, C.E., W.K. Dodds, T. K. Kratz, and M. Palmer. 2008. Lakes and streams as sentinels of environmental change in terrestrial and atmospheric processes. *Frontiers in Ecology and the Environment* 6:247-254.
 - Jones, S. E., C. Y. Chiu, T. K. Kratz, J. T. Wu, A. Shade, and K. D. McMahon. 2008. Typhoons initiate predictable change in aquatic bacterial communities. *Limnology and Oceanography* 53:1319-1326.
 - 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. 2008. Seasonal dynamics and regulation of lake metabolism in a subtropical humic lake. *Freshwater Biology* 53: 1929-1941.
 - 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. 2008. Seasonal dynamics of lake metabolism in a sub-tropical alpine lake. *Verh. Internat. Verein. Limnol.* 30:381-385.
 - Coloso, J.J., J.J. Cole, P.C. Hanson, and M.L. Pace. 2008. Depth-integrated, continuous, estimates of metabolism in a clear-water lake. *Can. J. Fish. Aquat. Sci.* 65:712-722.
- **In press**
 - Jones, S., T. K. Kratz, C. Y. Chiu, and K. D. McMahon. (in press). The influence of typhoons on annual CO₂ flux from a sub-tropical, humic lake. *Global Change Biology*.

Progress: Science (cont.)

- **In review**

- Hamilton et al. A Global Lake Ecological Observatory Network (GLEON). (in review) EOS
- Kamarainen, A.M., et al. Phosphorus sources and demand during summer in a eutrophic lake. (in review) Aquatic Biology
- Porter, J. C., E. Nagy, P. C. Hanson, T. K. Kratz, S. Collins and P. Arzberger. (accepted pending revision). New eyes on the world: advanced sensors for ecology. BioScience
- 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. Limnology and Oceanography Methods.

- **Draft Manuscripts**

- Staehr et al. Best practices for estimating Lake Metabolism. Draft manuscript
- Jennings et al. A review of the occurrence and impacts of in-lake episodic pulse events. Draft manuscript
- Hanson et al. The fate of organic carbon pulses from watersheds to lakes in northern Wisconsin. Draft manuscript

Progress (cont.)

- Tools:
 - Completed draft of Controlled Vocabulary
 - See (<http://gleon.org/index.php?pr=Products>)
- Data:
 - New installations
 - Finland: Lake Paajarvi
 - New Zealand: Lake Tutira, Lake Rotoiti

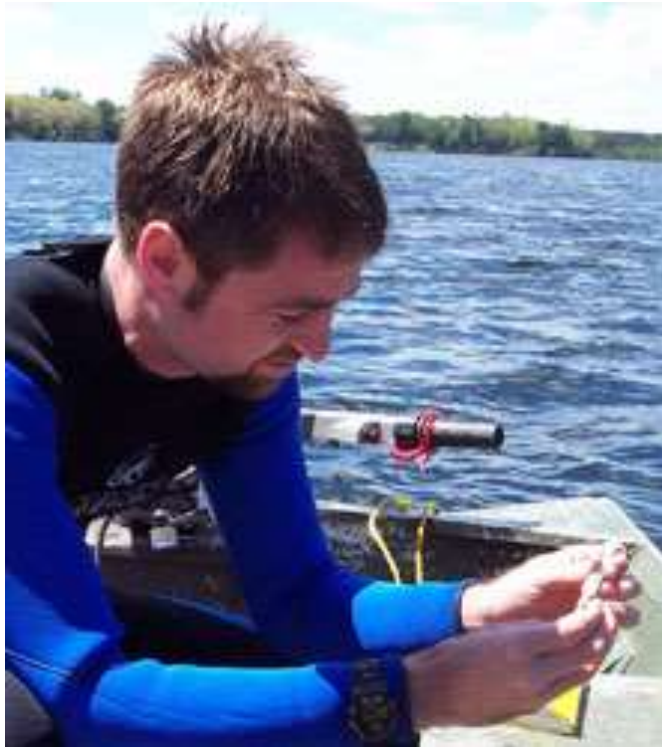
Progress: People/Networking

- Joint field work in Argentina (April 2008)
 - IADO, UCSD, UW, Cornell
 - 8 students involved
- Student Activities
 - 2 US GLEON undergrads spent July, August in New Zealand (controlled vocabulary, physical limnology tools)
 - Brazil grad student to Wisconsin (July)
 - Argentina and US grad student to Climate/Lakes workshop at Lake Tahoe (Sept)
 - 8 GLEON students at this meeting
 - First meeting of GLEON RCN Student Taskforce (September)
 - First GLEON Student workshop (yesterday)
 - First Grad Student “exchange” to happen this fall (Emily Kara to Sweden)
- GLEON Video: UCTV – Doug Ramsey, Producer

Progress: People/Networking (cont.)

- US NSF “CI Team” proposal funded:
 - Kathie Weathers PI
 - GLEON and citizen science
- GLEON video
 - DVDs are available at this meeting
 - Streaming video on gleon.org
- 99 Individual and 17 Site Members
- New GLEON Post Doc!

Chris Solomon - New GLEON Post Doc



- Started September 1, 2008
- Background in Lake Food Web Structure, Stable Isotopes, Benthic Ecology
- Use GLEON data to answer science questions
- Funded by grant from Gordon and Betty Moore Foundation

Goals for this meeting

- Science: Working group products/plans
- Tools: controlled vocabulary, identify additional needed tools
- Data: move towards data sharing
- People: social networking

Steering Committee Meeting

(Wednesday at lunch)

Selected Agenda items

- Science:
 - Working groups
 - Right ones?
 - Process to choose persistent working group leaders?
- Tools
 - Controlled vocabulary: Process for adoption/edits/extension
- Data
 - Links to Site data on gleon.org web site
- People/Networking
 - Creating an inclusive meeting climate
 - Future Meeting plans

Agenda for GLEON 7

Tuesday 30 September 2008

- 07.00 – 08.00 Breakfast
- 08.30 – 08.40 Welcome and introduction to Campus Roslagen: **Kurt Pettersson**
- 08.40 – 09.00 GLEON for beginners and goals for this meeting: **Tim Kratz/Peter Arzberger**
- 09.00 – 09.20 A brief history of GLEON and RCN (with focus on graduate student activities): **Paul Hanson/Cayelan Carey**
- 09.20 – 9.50 Center for Dynamic Process (CDP) and the Microbial Community Dynamics workshop: **Stefan Bertilsson/Trina McMahon**
- 09.50 – 1030 Break
- 10.30 – 11.30 Introduction of New Members
- 11.30 – 12.00 Invited Presentation: **Trina McMahon**, GLEON science products with Taiwan: How GLEON buoys and student exchanges helped play a role.

Agenda (Tuesday cont.)

- 12.00 – 12.30 Reports/plans from working groups (5 min each):
Lake Metabolism: **Paul Hanson, Kathie Weathers**
Domains of Control: **Eleanor Jennings, Thorsten Blenckner**
Microbes (x-site experiment): **Trina McMahon, Ashley Shade**
Microbes (function): **Stefan Bertilsson, Cayelan Carey**
Information Technology: **Fang-Pang Lin, Hsiu-Mei Chou**
Climate and Lake Physics: **Evelyn Gaiser, David Hamilton**
- 12.30 – 14.00 Lunch at Culinar
- 14.00 – 16.00 Working group discussions
- 16.00 – 1630 Report back from the working groups
- 16.30 – 17.00 Break
- 17.00 – 19.00 Poster session/social mixer
- 19.00 – 20.30 Dinner at Culinar
- 20.30 – 20.50 Invited Presentation: **Justin Brookes**
- 20.50 – 21.10 Invited Presentation: **David Hamilton**

Agenda -- Wednesday

- 07.30 – 08.30 Breakfast
- 08.30 – 09.00 Wisenet: Wireless sensor networks and Marine Sensor Networks: **Dr. Roland Grönroos**
- 09.00 – 9.20 Sweden's national lake inventory programme – design, data availability and results: **Gesa Weyhenmeyer, Environmental Assessment, Swedish University of Agricultural Sciences**
- 9.20 – 9.40 Lakes and impoundments as regulators of carbon cycling and climate: **Lars Tranvik, Head of Limnology, Uppsala University**
- 9.40 – 10.15 GLEON IT Vision, Plans, and Tools: **Paul Hanson**
- 10.15 – 10.45 Coffee break
- 10.45 – 12.30 Working group discussions

Agenda – Wednesday cont.

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| 12.30 – 14.00 | Lunch at Culinar; Steering Committee meeting |
| 14.00 – 15.00 | Working group discussions |
| 15.00 – 15.30 | Report back |
| 15.30 – 16.00 | Coffee break |
| 16.00 – 17.00 | Miscellaneous governance, next meeting, wrap up |
| 17.00 – 19.00 | Break |
| 19.00 – | Crayfish Picnic at the shoreline of Lake Erken and crayfishing/sauna |