GLEON VI Notes

(Archbold Research Station, Lake Placid, FL)

Tuesday Afternoon Breakout Groups (13:30-16:00h):
- IT (Kevin's office)
- Oxygen, DOC, microbes (auditorium)
- Climate/physical modeling (classroom)
- Domains of control (conference room)
- Benthic-Pelagic coupling (library)

Charge to Breakout Groups:
1) Define questions you will answer (broad, some also pragmatic/doable with existing resources).

2) Develop a way to move forward – a plan

3) Identify the leaders who will push things forward

4) What will products of this working group be?

DOC breakout group:

1) DOC questions we will answer (broad, some also pragmatic/doable with existing resources).

a. What are the benefits of having high resolution oxygen measurements?

b. Can we decide on a common protocol on how to do measurements of whole-system metabolism:
- at the sensor level
- and the analysis

c. DOC is not just an element, can we effectively characterize source and quality of DOC?
- Why would a high-frequency approach be valuable?
- What do you need to know beyond color?

d. How can we link the DOC component to microbes (Stefan B.)?
- Characterize communities vs. functional role vs. enumeration?
- Enumeration of benthic-pelagic coupling?
- Pathogens?
- Degradation
- Marine folks are considering in situ DDGE sensor.

e. How can we link the DOC dynamics to oxygen dynamics?
- Need to link oxygen to C to DOC to close loop.

f. Tim asks what are scientific questions?

g. What is extent of littoral-pelagic coupling?

h. What is the source of the DOC and what are the consequences (Lauri)?
- Jon Cole suggests "color sensors" are very stable.

BIG Q#1. What drives long-term trends that have been observed in DOC and what are the underlying short-term processes and mechanisms?
- GLEON ideal for addressing this with high temporal resolution?
- Management relevant (chlorination by-products in Colorado reservoirs and Matt Miller's meeting with utilities).
- Finland (Lauri Arvola) – climate change is altering the landscapes dramatically. What is the consequences for lakes and water quality, and ultimately the Baltic Sea?
- What is the relevance of the residence time to lake response?

Two major focal questions for DOC group at this point:

BIG Q#2: What is the nature of metabolic responses to episodic events?
- Are they a linear function of the magnitude of the perturbation?
- Or is there a response threshold?
- What are the constraints on the nature of these responses?

Leaders and Approach for Progress (by September):

a. Peter Staehr will write up best practice methodology for estimating respiration and GPP from oxygen data.
- Interact with IT group.

b. Eleanor Jennings and Stuart Jones will provide a draft that includes the scope of a review on episodic events and analyses of responses (linear vs. threshold vs. other?).
- Types of events?
- Frequency of measurements?
- Types of responses?
    - GPP, R
    - Microbial:
    - Optical
- Which sites can participate?

c. Other thoughts and considerations:
- What is the relationship between lake stratification and response to episodic events?
- What is importance of residence time?
- Include the exploding African lakes (Nyos, Monoun, others).
- Nature of sensors available to assess DOC quantity and quality
- Characterizing and processing of allochthonous vs. autochthonous DOC and effects on lake metabolism?

BIG Q#3 Why is respiration ~10x less variable than primary production (GPP) across a wide range of systems?

Leadership and Approach for Progress Q#3:

a. Jon Cole came up with this and will lead this effort and contact a few others that might be interested in writing up a paper on this.

b. Peter Staehr will write up best practice methodology for estimating respiration and GPP from oxygen data.

Products: Publication of answer to this question.

Other: Question is summarized in Del Giorgio book chapter.

BIG Q#4 (Jon Cole's idea) Is there a diel cycle in water color and what is it due to?

- Role of microbes?
- Role of photobleaching?
- Role of landscape position?
- Role of land-use patterns (agriculture, forest, urban, alpine, etc.)?
- How do these cycles vary with season, degree of allochthony, or cloud-cover?

Rationale: "Color" (CDOM fluorescence) data are extensive – and this color varies on a diel cycle – reformation of color in the dark. Where is this color coming from and what is regulating these cycles? What is the role of microbial vs. photolytic activity? Is there a quenching of fluorescence that goes on? Can we use oxygen isotopes?

Consider similarities/differences in hydrology vs. climate in eg Lake Annie vs. lakes in N. Wisconsin? Will lakes in N. Wisconsin look like Annie in 100 years?

BIG Q#5 Can we use space-for-time substitutions to understand climate change impacts?

What is role of modeling (e.g. DYRESM) in comparing lakes in different locations? They use data like those collected by GLEON.

Jon Cole asks if these pass the Kurt Vonnegut test "Can you explain this to an 8-year old? If not, it is not science."