The GEISHA project
Preliminary steps to link storms and lake phytoplankton

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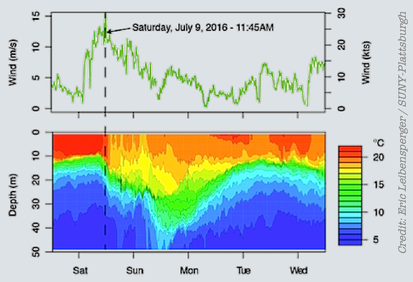
GEISHA

Global **E**valuation of the **I**mpacts of **S**torms on freshwater **H**abitat and structure of phytoplankton **A**ssemblages

AIM

Evaluate the impact of storms on lake phytoplankton community composition

- Identification of association between abrupt shifts in phytoplankton and extreme events
- Characterization of changes in phytoplankton community relative to physical states
- Identification of mechanisms leading to new phytoplankton assemblages or community resilience



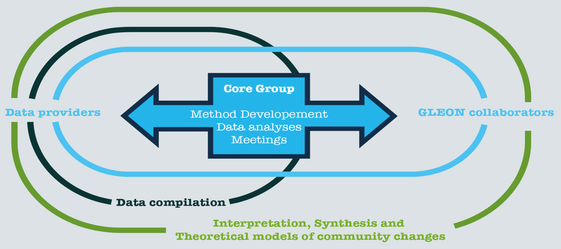
STRUCTURE AND ORGANISATION

- Core international team of 17 researchers with diverse set of skills and experiences
- Complemented with data providers (>30 total)
- And contribution from GLEON Stormblitz* participants

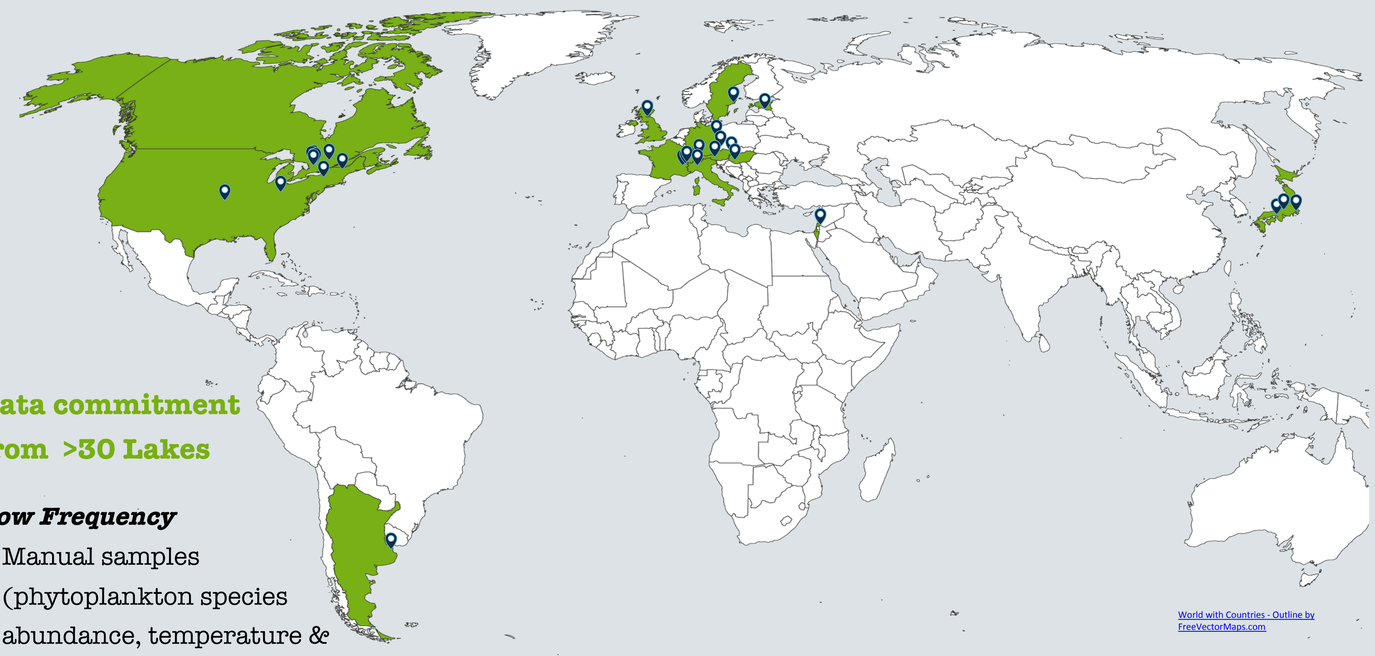
*GEISHA is actually a sub-project within GLEON project Stormblitz

GLEON
Global Lake Ecological Observatory Network

Management of such a large group includes task assignments and inclusivity at different steps of the project.



DATA



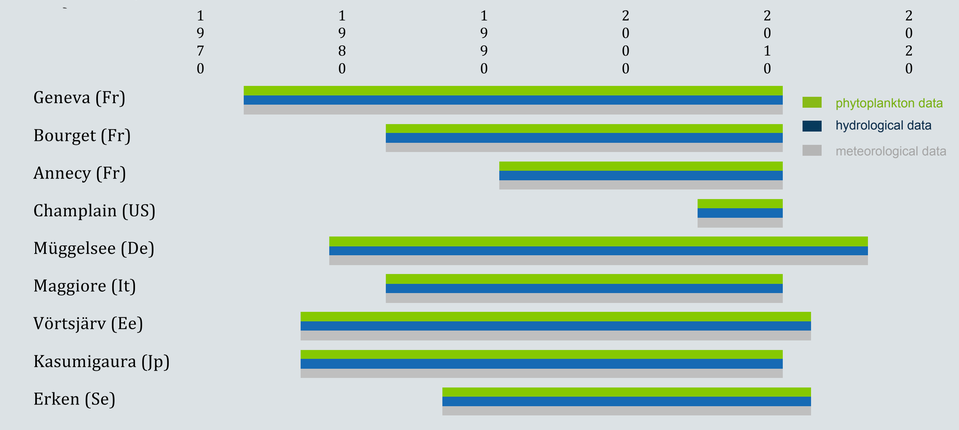
Low Frequency

- Manual samples (phytoplankton species abundance, temperature & nutrients vertical profiles)
- every 2 weeks minimum
- weather
- > 5 years duration

High frequency

- buoy data on Chla
- phycocyanin
- other limnological variables
- weather

BIG THANKS TO ALL OF OUR DATA PROVIDERS[✿] !!



Current collected data and their duration span

TASKS

GEISHA creates time, space and resources to work as a cohesive unit and undertake the following tasks:

Task 1: Data Compilation

Gather data, quality assurance/quality control (QA/QC), and combine datasets.

Task 2: Method Development

Develop metrics relative to phytoplankton communities and statistical tools to run inter-site comparisons.

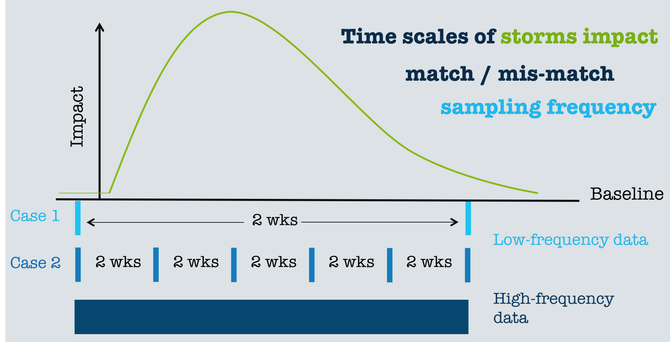
Task 3: Data analyses

Metrics, effect-sizes and meta-analyses.

Task 4: Interpretation, Synthesis and Theoretical Models

Propose hypotheses on mechanisms driving observations; develop frameworks on rules of community assembly and sensitivity of ecosystem to storms.

DATA CHALLENGE



Depending on magnitude and duration of the impact, low-frequency data may miss the effect.

Case 1: intense but short impact - > 2 wks no good

Case 2: impact longer in duration -> 2 wks sufficient

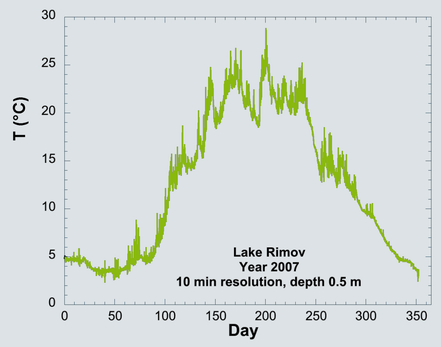
Solution: Couple **low**- and **high**-frequency data sets to maximize knowledge.

HIGH-FREQUENCY ANALYSIS (EX)

Lake Rimov
Reservoir in the Czech Republic
Surface: 210 ha Depth: 47 m

1 6 4
2 4 8
3 9 5

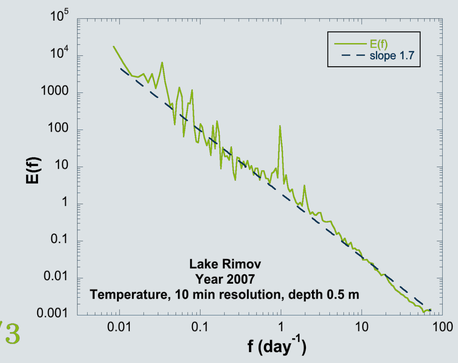
High-frequency surface water temperature in 2007



Fourier Power Spectrum Analysis: indication of possible turbulent forcing of temperature variability, as a turbulent passive scalar.
In case of homogenous turbulence one expects:

$$E(f) = c \times f^{-5/3}$$

with $E(f)$ the energy and f the frequency



Results show a possible influence of turbulence on surface temperature fluctuations, with one peak indicating the daily deterministic forcing.
All the background spectrum is compatible with a turbulence origin, with slope close to 5/3.

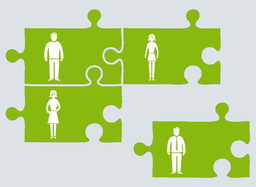
Analysis performed by F.G. Schmitt (CNRS, LOG, France)

WORKSHOPS (WS) & PROGRESS

During the project, the core group will meet regularly during workshops (6 WS over 3 yr.).

The first workshop took place in December 2016 and focused on

I. Team Science



Engage the group and lay groundwork for long-term collaboration

II. Ideas

Generation, refinement and expansion of questions/ approaches

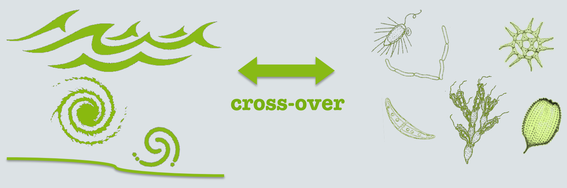
III. Work plans

Specify goals and assign responsibilities to assure progress in-between workshops

Pictures taken during the first workshop in Aix-en-Provence December 2016

The core group was split into two groups to identify key questions in finer details

Physics Sub-Group ⟷ **Biology Sub-Group**



Progress / Time frame

- Subgroup/ Group monthly Skype meeting
- On-going data compilation and QA/QC (cf box "DATA")
- Review paper draft due at 2nd WS (June 2017 @ USGC, Fort Collins)
- 3rd WS (November 2017 @ CESAB, Aix-en-Provence)
- GLEON 19 All-Hands' meeting (late Nov @ NY)

MESSAGES

Interest Piqued ?

We are still looking for more data contributions, particularly from major regions of the globe where data appear scarce. The more the merrier !

Your data are safe!

We defined a data sharing policy signed by all members to protect your data.

Contact us !!

PIs[2,3,4] and presenter[1] contact info below.
And feel free to ask G. Dur during the conference for further details!

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[✿] http://www6.inra.fr/geisha-stormblitz

Storm-Blitz http://gleon.org/research/projects/"storm-blitz"-impact-storms-phytoplankton-composition
GEISHA http://www6.inra.fr/geisha-stormblitz

CESAB http://www.cesab.org/
Powell Center https://powellcenter.usgs.gov