Mathew G. ALLAN[1], David P. Hamilton[1], Brendan J. Hicks[1], and Lars Brabyn[2]

Validation of Landsat retrieved surface water temperature using GLEON buoy data

[1]Centre for Biodiversity and Ecology Research, Department of Biological Sciences, The University of Waikato, Private Bag 3105, Hamilton 3240, New Zealand
[2]Department of Geography Tourism and Environmental Planning, Faculty of Arts and Social Sciences, The University of Waikato, Private Bag 3105, Hamilton 3240, New Zealand

We investigated atmospheric correction of Landsat 7 ETM+ thermal data for retrieval of accurate lake surface temperature in the Rotorua lakes, New Zealand. The retrieved temperatures in 14 images between 2007 and 2009 were validated using GLEON buoy measured surface water temperature. The impact of the atmosphere was modelled using four sources of metrological data as an input to the radiative transfer model MODTRAN 3.7. Using radiosonde data yielded a root mean squared error (RMSE) of 0.37 ºC between ground truth and satellite derived temperatures, using atmospheric data from the MODIS TERRA satellite yielded a RMSE of 0.54 ºC, using Atmospheric Infrared Sounder (AIRS) satellite data yielded RMSE of 0.76 ºC, and using NASA's atmospheric parameter calculator (National Center for Environmental Prediction (NCEP) metrological data) yielded an RMSE of 1.06 ºC. The retrieved Landsat temperature was used to validate 3D physical models of Lake Rotoehu.

Kamal ASIF[1] and Hifzur Rahman[2]

Eco-Structures and Biodiversity of Lakes and Wetlands of Upper Gangetic Plains
-A Quest for Sustainable Ecotourism Development

[1] Research Scholar and [2]Professor, Department of Geography, Aligarh Muslim University, Aligarh, India

Shallow lakes and wetlands of the Upper Gangetic plains are an important ecological and socio-economic resource of north India. The impact of human pressure on lakes and their catchments has precipitated a decline in their ecological status and are going under impulsive alterations due to global warming and climate change. This has resulted in greater flooding and erosion, degraded water quality and declining of many floral and faunal species.

Besides interaction with man, environment also interacts with plants and animals, all of which constitutes the subsystems of the global ecosystem. It could, for example, be a grain of soil, a pond, a forest, a river, the sea, a biome or the entire biosphere. When such ecological destinations are visited for their natural or cultural interest that strives to prevent ecological losses in a particular area we call it ecotourism. Conserving the environment by enhancing culture and protecting ecology through tourism is the essence of sustainable ecotourism development. Such a strategy, in its purest sense, attempts to make low impact on the environment and on local culture, while helping to generate income, employment, and the conservation of local ecosystems.

In order to understand local, regional and global lake ecosystems, the paper argues to protect the ecological structures and, biodiversity of the lakes and wetlands in the area selected for study, and to adopt appropriate research methodology to facilitate a proper management and action plan to preserve lakes by promoting ecotourism strategies.

Vanesa Y. BOHN[1,2], Paula D. Pratolongo [1,3], María C. Piccolo[1,2] and Gerardo M.E. Perillo[1,3]

Evaluation of the trophic state and nutrient dynamics of Pampean shallow lakes (Argentina) using a combination of field and satellite data

[1] CONICET - Instituto Argentino de Oceanografía (IADO)
CC 804 B8000FWB Bahía Blanca. Argentina
Corresponding author: vbohn@criba.edu.ar - Tel: (54-291) 486-1112/1519
Fax: (54-291) 486-1112/1519
[2] Departamento de Geografía y Turismo, Universidad Nacional del Sur (UNS)
12 de octubre y San Juan. 4º Piso. 8000 Bahía Blanca, Argentina.
[3] Departamento de Biología, Bioquímica y Farmacia, UNS
San Juan 670.2º Piso. 8000 Bahía Blanca, Argentina
[4] Departamento de Geología, UNS
San Juan 670 (8000) Bahía Blanca, Argentina

A method based on the analysis of satellite image was developed to study the trophic state of the Pampean shallow lakes (Argentina). The method consists in a regression model for trophic state estimation between two information sets: field data (chlorophyll-a concentration) and satellite spectral reflectance. Field data was obtained by sampling sites corresponding to Unamuno and Calderón shallow lakes, as representative cases of the study area. A 0 – 100 eutrophication scale was developed to indicate four different trophic levels: oligotrophic, mesotrophic, eutrophic and hypertrophic. A representation of the spatial distribution of chlorophyll-a was developed by means of interpolation. Categorizing interpolated values, an illustration of the different chlorophyll-a contents was developed in two thematic maps. The pigment distribution was analyzed in six selected shallow lakes during two different periods: a wet and a normal year. The model application showed similar results for the estimation of the trophic state of the lakes whose mean chlorophyll-a concentration data was available. An analysis of frequency was carried out to determine the trophic conditions of all the water bodies in the study area during both periods.

Cayelan C. CAREY[1]

A cross-GLEON analysis of cyanobacterial blooms: network synergy and serendipity

[1]Department of Ecology & Evolutionary Biology, Cornell University, Ithaca, New York, USA

At GLEON 9, I proposed a cross-site analysis of the ecosystem effects of cyanobacterial blooms, soliciting plankton samples and historical data from GLEON lakes around the world that experience blooms. The response from GLEON members

was overwhelmingly positive, and 14 lakes in 9 countries are participating in my project. The focal lakes are on a trophic gradient from oligotrophic to hypertrophic, and I hypothesize that blooms stimulate phytoplankton and zooplankton in oligotrophic systems, and inhibit plankton food webs in more eutrophic systems. This project was recently funded by an NSF Doctoral Dissertation Improvement Grant, and sampling is already underway. In addition to the scientific contribution of this work, this project also incorporates a number of outreach activities, including the training of a Chinese masters student at Lake Taihu and teaching Lake Sunapee homeowners limnological sampling methods.

Carolina FERNÁNDEZ[1], Elisa R. Parodi[1,2], and Eduardo J. Cáceres[3]

Trophic state and cyanobacterial abundance along a year in an artificial Pampean lake

[1] CONICET- IADO, Bahía Blanca, Argentina.
[2] Laboratorio de Ecología Acuática, Universidad Nacional del Sur, Bahía Blanca, Argentina.
[3] Laboratorio de Ficología y Micología, Universidad Nacional del Sur, Bahía Blanca, Argentina.

The detriment in the trophic status and the development of cyanobacterial blooms are a major threat to the sustainability and safety of water resources around the world. Paso de las Piedras Reservoir is an artificial lake located in the southern part of Buenos Aires Province, Argentina. This lake is the unique water supply source for about 400000 inhabitants. The current trophic status was evaluated applying two different classification criteria on physicochemical and biological data over a period of a year (June 2004 to June 2005). The structure and abundance of the phytoplankton community was also studied. Cyanobacteria, green algae and diatoms were the most important constituents; cyanobacteria dominated from December 2004 until May 2005, during summer and early autumn, the product of a large relative abundance mainly of *A. circinalis* and *M. natans*. These high concentrations of cyanobacteria characterized a bloom with an average density of 133.05×10^3 cells.mL^{-1}, and an average chlorophyll concentration of 28.7 mg.m^{-3}. Four of the cyanobacterial species found are potentially producer of toxins. Considering the two trophic classification systems, and based on total phosphorus data, the reservoir is classified within the hypertrophic category. In contrast, considering only the chlorophyll and turbidity data, the lake would be classified within the eutrophic category.
PGI-24B/145-SGCyT-UNS

Maria Luiza S. FONTES[1] and Paulo C. Abreu[2]

Primary production and the microbial food web in the suboxic waters of a subtropical coastal lagoon

[1]Programa de Pós-graduação em Ecologia, Departamento de Ecologia e Zoologia,Centro de Ciências Biológicas, Universidade Federal de Santa Catarina, Brasil.

[2]Instituto Oceanográfico, Universidade Federal do Rio Grande (FURG), Rio Grande, RS, Brasil.

Primary production (light CO_2 fixation and oxygen production), the contribution of bacteriochlorophyll *a* (Bchl *a*) driven anoxygenic photosynthesis to energy production and microbial biomass were investigated in the stratified Conceição Lagoon (Brazil) in 2007. Conceição Lagoon usually presents a sharp oxycline between 2.5 and 4 m deep in the central portion. Suboxic waters (dissolved oxygen = DO < 0.5 mg L^{-1}) develops in the bottom waters seasonally. Peaks of Chlorophyll-*a* (Chl *a)* and BChl *a* were found in the suboxic bottom waters in fall. Net oxygen production (NOP) was correlated with light CO_2 fixation in summer, while in fall, light CO_2 fixation was decoupled from oxygen production. BChl *a*-containing bacteria contributed with an average of 27 % of total photosynthesis in fall, based on BChl*a*:Chl*a* ratio, with light acting as the main abiotic regulator. The structure of the bacterial assemblage presented in the bottom waters of the stratified area changed with the decrease on DO, passing from a cyanobacteria-dominated community in summer to an anaerobic purple sulfur bacteria-dominated in fall. This change in bacterial community structure corroborated with the CO_2 fixation rates. A positive correlation between the biomass of cyanobacteria and flagellates of 25-50 μm, and between purple sulfur bacteria and ciliates > 50 μm was observed. The microbial biomass in suboxic bottom waters was at least 5-fold higher than those in the oxygenated waters. The results demonstrate the importance of anoxygenic primary production and bacteria to the carbon flow in the lagoon.

Claudia F. FORNERÓN [1], Vanesa Y. BOHN [1,2] and M. Cintia PICCOLO [1,2]

Limnological study of Sauce Grande Shallow Lake (Argentina) during a dry period

[1] Instituto Argentino de Oceanografía (IADO- CONICET). Bahía Blanca, Argentina.
[2] Universidad Nacional del Sur. Departamento de Geografía y Turismo. Bahía Blanca, Argentina.

The shallow lakes of the "Pampean" region of the Buenos Aires Province (Argentina) exhibit a strong areal variation under the presence of flooding or drought periods. The aim of this work is to analyze the effect of the drought occurred during 2008-2009 period on the Sauce Grande shallow lake basin, as well as to describe the physical and chemical parameters distribution during such event.

The precipitation data (2003-2009) was obtained from the Meteorological Service database. The Standard Precipitation Index (SPI) was applied in order to analyze the normal, dry and wet years. A multitemporal study of the shallow lake area was completed by means of MODIS satellite image processing. *In situ* measurements of physical and chemical parameters were gathered and water samples for chlorophyll-a analysis were collected from September 2008 to December 2009.

For the period 2003-2005, the SPI indicated normal years with a mean precipitation value of ~690 mm whereas the 2006 year showed a decrease in the precipitation (annual precipitation of ~440 mm). The mean area of the Sauce Grande shallow lake was of ~20 km^2 during the normal period decreasing in approximately 5%

during 2006. During 2008-2009 SPI index indicated an extremely dry period (mean annual precipitation of ~390 mm). As a result, the lake area at the ending of the dry period was ~17 km^2 (10% decrease). The depth of the lake on normal precipitation periods is 2 m. During the draught the depth decreased almost 40 %. As a consequence, the electrical conductivity increased 5 mS cm^{-1} and the trophic state changed from a mesotrophic to eutrophic state.

P. E. GARCIA[1]; Diéguez, M. C.[1]; Ferraro, M. A.[2]; Zagarese, H. E[2] and Pérez, A. P.[1]

Bioaccumulation and potential origin of photoprotective compounds (Mycosporine-like Amino Acids) in freshwater copepods from Patagonia

[1]Laboratorio de Fotobiología. UNC. IMIBIOMA. Bariloche (Argentina).
[2]Laboratorio de ecología y fotobiología acuática. IIB-INTECH. Chascomus (Argentina).

Mycosporine-like amino acids (MAAs) are common photoprotective compounds occurring in certain groups of freshwater and marine organisms. These compounds act as sunscreen or antioxidants and thus provide protection against harmful ultraviolet radiation (UVR). MAAs can be synthesized by a wide variety of organisms including bacteria, fungi and algae and their synthesis and bioaccumulation is inducible by UVR and visible light. Animals appear to acquire MAAs from their diet and/or from symbiotic organisms. The synthesis of MAAs involves the shikimic acid pathway, which as far as we know, has not been found in metazoans. The bioaccumulation of MAAs in three species of calanoid copepods endemic to Patagonia (*Boeckella antiqua, B. gracilis and B. breviucaudata)* correlates with UVR exposure, supporting their role as photoprotective compounds and revealing a common mechanism in *Boeckella* spp to withstand the high levels of UV experienced in their natural environments. Concomitantly, temperature appears as a factor regulating the process of bioaccumulation of MAAs and the survivorship of cold-adapted species of *Boeckella* as well. Peaks of MAAs bioaccumulation in *Boeckella* spp. were recorded between 12 ºC and 16ºC. Experiments performed with *B. antiqua* fed with algae devoid of MAAs resulted in higher levels of MAAs implying that the process may rely in an alternative source of these compounds such as endosimbiotic bacteria. Batch culture experiments testing the effect of bacteria suppression on MAAs accumulation showed a decrease in the bioaccumulation of these compounds cultures treated with the basteriostatic Chloramphenicol. This result points out that prokaryotic biota likely contributes to the bioaccumulation of MAAs in *Boeckella* spp. Furthermore, experimental analyses testing for the incidence of actual MAAs concentration on the uptake rate of MAAs in B. *antiqua* indicated that individuals bearing high levels of MAAs do not accumulate or even loss these compounds.

Alejandra M. GERADLI[1], M. Cintia Piccolo[1] and Gerardo M. E. Perillo[1]

The effect of climate change on the shallow lakes in “Pampa Argentina”: “Las Encadenadas del Oeste”.

[1]Instituto Argentino de Oceanografía, Universidad Nacional del Sur

The shallow lake “Las Encadenadas del Oeste”, translates into “the western chain lagoons” because of the way they are linked together through channels and streams. Las Encadenadas del Oeste consists of 6 lagoons (Epecuén, Venado, Del Monte, Cochicó, Alsina and Inchauspe) of various depths and sizes, and it is a closed river basin system lined up in an east-west direction. The climate in the study area is warm transitional with two special features. First, there are well defined seasons with high thermal amplitudes. Second, there are periods of alternate floods and droughts. The whole Pampa region is famous for its alternate humid and dry periods, which is seen in the variation of rainfall and temperature in the region. The shallow lakes are polymictic, with no thermal stratification. The temperature variation is very important and it is crucial in the physical, chemical and biological behavior of shallow lakes. The interaction process air-water in the region affects the water temperature strongly. The month of March in these shallow lakes is important because the wind is less intense and thus the mixture of water decreases. The water columns are very stable. The thermal pollution process of water bodies, that had started in the months of January and February is higher. Consequently, there is a significant reduction in the solubility of dissolved oxygen.

Emily KARA[1], P. Hanson[1], K.D. McMahon[1], D. Hamilton[2], M. Hipsey[3], S. Bertilsson[4], C. Wu[1], Y. Hseih[1], C. Carey[5], and K. Rose[6], L. Beversdorf[1], T. Miller[1], E. Gaiser[7], D. D. Motta Marques[8], and T. Kratz [1]

Controls on phytoplankton bloom dynamics in Lake Mendota, WI

[1]University of Wisconsin-Madison, Madison, USA
[2]University of Waikato, Hamilton, New Zealand,
[3]University of Western Australia, Perth, Australia
[4]Uppsala University, Uppsala, Sweden
[5]Cornell University, Ithaca, USA,
[6]Miami University of Ohio, Miami, USA
[7]Florida International University, Miami, FL, USA
[8]Universidade Federal do Rio Grande do Sul, Brazil

We investigate phytoplankton bloom dynamics in eutrophic Lake Mendota WI using a 1D coupled hydrodynamic-biogeochemical model. Antecedent bloom conditions and process controls, including phytoplankton limitation functions, are considered. Model output indicates dominant phytoplankton functional groups (nitrogen and non-nitrogen fixing cyanobacteria) growth are limited mainly by light and occasionally by phosphorus. Primary process controls on phytoplankton biomass are grazing by zooplankton and settling due to gravity. The temporal scales at which the model accurately simulates physical, chemical, and biological variables is assessed by validation of model output against observed variables. Parameterization and calibration of the model for this lake are being documented and automated to increase the ease of model setup of other GLEON sites in the future.

Gregory R. KOCH[1], Evelyn E. Gaiser[1], Peter A. Stæhr[2], and Daniel L. Childers[3]

Seasonally Changing Surface Water Discharge Drives Ecosystem Metabolism Rates in Estuarine Taylor River

[1]Department of Biological Sciences, Florida International University, Miami, FL, USA
[2]University of Copenhagen, Hillerød, Denmark
[3]Global Institute of Sustainability, Arizona State University, Tempe, AZ, USA

Everglades restoration calls for an increase in water delivery to the major watersheds of Everglades National Park. The responses of the estuarine end-members of these watersheds to hydrologic restoration are not entirely understood. In this project, we investigate how ecosystem metabolism in estuarine Taylor River, an important linkage between Taylor Slough and Florida Bay, is related to existing seasonal changes in hydrologic and environmental drivers. While seasons in South Florida are marked by tropical wet/dry patterns of rainfall, salinity concentrations appear to be the best indicator of seasonal change in Taylor River as salinity is a better indicator of freshwater delivery to the estuary. We derived rates of aquatic metabolism from high-frequency (10-minute), free-water, diel changes in water column dissolved oxygen. Ecosystem gross primary production (GPP) and respiration (R) rates were greater in magnitude during the "euhaline" season than the "oligohaline" season. However, net ecosystem production (NEP) did not always show seasonal differences, reinforcing the tight coupling of autochthonous organic matter (OM) production and ecosystem respiration. Furthermore, we investigate the relationships between aquatic metabolism and other driving environmental variables. Seasonal metabolism differences appear to be driven by seasonal changes in total phosphorus (TP) concentrations, which are in turn dictated by seasonally changing water source and water quality patterns in the coastal, southern Everglades.

Maciej K. OBRYK[1], Peter T. Doran[1], and Christopher P. McKay[2]

History of Antarctic lakes: links between summer winds and paleolimnology.

[1]Department of Earth and Environmental Sciences, University of Illinois at Chicago, Chicago, Illinois, USA
[2]Space Science Division, NASA Ames Research Center, Moffett Field, California, USA

The history of perennially ice covered lakes in the McMurdo Dry Valleys (MCM), Antarctica have been extensively studied under the Long Term Ecological Research (LTER) project. The lakes are formed in endorheic basins enclosed by topographic relief or glaciers. Over the past century, the lakes have experienced an overall trend of continuous lake level rise despite decrease in solar radiation. Variability/increase of lake levels is caused by the sole water source; melt from nearby glaciers during austral summer months. During the last glacial maximum lake levels were much higher than today, providing abundant organic matter to present-day soils. The reason for high lake levels at a time when it was much colder than present has been a conundrum. Here, we analyze the impact of anomalous warm summer winds (katabatic winds) on the present-day climate and their potential role in lake history. The preliminary analyses indicate that ancient lakes in Antarctica, such as glacial Lake Washburn, could have formed because of an increase in the frequency of these summer winds in conjunction with more low altitude ice being available at the time.

Jordan S. READ[1], David P. Hamilton[2], Ian D. Jones[3], K. Muraoka[2], R. Kroiss[4], E. Gaiser[5]

"Lake Analyzer": An automated program suite for the rapid analysis of high-resolution instrumented buoy data

[1]Department of Civil and Environmental Engineering, University of Wisconsin – Madison, United States
[2]Centre for Biodiversity and Ecology Research, University of Waikato, New Zealand
[3]Centre for Ecology and Hydrology, Lancaster Environment Centre, Lancaster, United Kingdom
[4]Center for Limnology, University of Wisconsin – Madison, United States
[5]Department of Biological Sciences, Florida International University, Florida, United States

Lake Analyzer is a numerical code coupled with supporting visualization tools which allows an automated procedure for determining indices used to describe the extent of mixing and stratification in lakes and reservoirs. Stability indices, including Lake Number, Wedderburn Number, Schmidt Stability, and thermocline depth are calculated according to established literature definitions and returned to the user in a time-series format. The program was created for the analysis of instrumented buoy data, including water temperature and wind speed, but is flexible enough to allow the analysis of periodic manual samples. Data requirements are structured around required user outputs, eliminating inputs and calculations that are not needed for the desired output. The program also provides error checking and down-sampling for wind and water temperature data, according to user-specified input. Available outputs for the Lake Analyzer program are: water temperature (error-checked and/or down-sampled), wind speed (error-checked and/or down-sampled), metalimnion top, metalimnion bottom, thermocline depth, friction velocity, Lake Number, Wedderburn Number, Schmidt Stability, mode-1 vertical seiche period, Brunt-Väisälä buoyancy frequency, and secondary outputs for several of these options which focus on the parent thermocline depth (deeper seasonal thermocline). Lake Analyzer provides a program suite and supporting standards for the comparison of lakes across gradients of climate, land development, and time.

Kevin ROSE[1], Craig Williamson[1], Jasmine Saros[2], and Carrie Kissman[1]

Indicators of allochthony: new tools and techniques to understand energy flow through lake ecosystems

[1] Department of Zoology, Miami University, Oxford, OH USA 45056
[2] School of Biology and Ecology & Climate Change Institute University of Maine, Orono, ME USA 04469

The degree of allochthony is an important property of aquatic ecosystems that regulates many limnological characteristics including transparency, net ecosystem production, and energy flow through food webs. Even small changes in allochthony, concurrent with environmental changes such as global climate change have the potential to induce large net effects in lakes. New techniques have been developed to assess degree of allochthony within aquatic ecosystems; however no work has yet to

compare these indicators across lakes that vary in degree of terrestrial influence. Degree of allochthony in high mountain lakes can vary widely within small geographic distances as lakes are found above and below the tree-line along gradients of terrestrial inputs. We compared a number of allochthony indicators, including spectral slope, DOC/Chl ratio, particulate organic material deuterium, fluorescence, and transparency ratios across 15 lakes in the Beartooth Mountains (MT/WY, USA) and Glacier National Park (MT, USA). We found that more allochthonous lakes had a steeper (more negative) 350-400 nm spectral slope, higher DOC/Chl ratio, less negative deuterium enrichment, lower fluorescence index ratio, and lower 320 nm UV transparency relative to 380 nm UVR and PAR (400-700 nm) compared with more autochthonous lakes.

L. RYDER [1], E. Jennings[1], E. de Eyto[2] and R. Poole[2], M. Dillane[2].

Estimating carbon pools and processing in an Irish humic lake.

[1]National Centre for Freshwater Research Studies, Dundalk Institute of Technology
[2]Marine Institute, Furnace, Newport, Co. Mayo.

In most clearwater lakes phytoplankton production is the main source of carbon for higher trophic levels. However, in humic lakes allochothonous carbon, exported from the catchment, can represent an equal if not a more important source than the phytoplankton pool. The aim of this project is to elucidate the role of phytoplankton productivity and both dissolved organic carbon (DOC) and particulate organic carbon (POC) sources in fuelling production in Lough Feeagh, a humic lake in the west of Ireland. It will also examine how climate change is likely to impact on in-lake carbon dynamics, in particular on the pools of available carbon and the processing of this carbon by higher trophic levels. The project is using a combination of high resolution fluorescence data to estimate the phytoplankton and DOC pools and nephelometer data to estimate particulates, together with lower frequency sampling of the carbon pools in additional biological components. The collated data will facilitate application and validation of models of in-lake productivity and an assessment of future climate impacts on carbon cycling using downscaled climate change data which are available specifically for the study site. The initial stage of the project involves calibration of in-situ instrumentation to measure DOC and chlorophyll *a* fluorescence, including an assessment of the impact of temperature quenching on fluorescence levels.

Steven SADRO[1]

Linking diel patterns in community respiration to heterotrophic bacteria in an oligotrophic high-elevation Sierra Nevada (California, USA) lake

[1]Department of Ecology, Evolution, and Marine Biology, University of California, Santa Barbara, California, USA

It remains unclear if autotrophic or heterotrophic processes dominate the metabolism of alpine lakes, where nutrient and dissolved organic matter concentrations are simultaneously low. Because conditions are limiting to both phytoplankton and heterotrophic bacterial production, these lakes are ideal environments to explore diel

patterns in community respiration (CR) and the degree of coupling between autotrophic and heterotrophic metabolism. Using a combination of *in situ* free-water and incubation measurements of DO we found a bimodal pattern in CR with ~12x difference between rates. The higher of the two rates started at dusk and lasted 1–6 h into the night (CR_{dusk}) before a rapid transition to the lower of the two rates, which lasted until the following dawn (CR_{dawn}). Heterotrophic bacteria accounted for 73±10% of CR, indicating microbial metabolism was driving patterns. The growth rate constant of bacteria cultured in dusk water was over twice that of bacteria cultured in dawn water, suggesting microbes were responding to differences in the DOM pool. Extracellular release from phytoplankton is the most likely mechanism accounting for the estimated 2.4±1.3 μM daily accumulation of DOC fueling CR_{dusk}. Corroborating estimates of diel DOC accumulation based on DO were independent measurements of overnight DOC draw-down, which were 2–3 μM. These results suggest the largest bacterial respiration component of the system is directly coupled to primary production through changes in DOC at time scales of hours or less while the baseline respiration component of the system is regulated by seasonal scale changes in the bulk DOC pool.

Robyn L. SMYTH[1]

Temporal variability in the surface mixed layer: integrating temperature time series with measures of turbulence

[1]Department of Ecology, Evolution, and Marine Biology, University of California Santa Barbara, USA

Biogeochemical processes and ecological interactions in the plankton can be strongly influenced by the timescales of mixing in stratified lakes. Lacking the expensive instrumentation required to measure mixing directly, many limnologist rely upon measurements of temperature to determine when and where lakes are mixing. Defined by some with a 1ºC per meter change in temperature, the epilimnions of lakes are often considered isothermal, and therefore well-mixed. In the surface mixed layer of the ocean, changes in the level of turbulence have been found to correspond to temperature changes as small as 0.02ºC. I compared measurements of dissipation of turbulent kinetic energy to time series of temperature resolved to 0.001ºC and sampled at a frequency as high as 3 min^{-1} at a 0.5 m depth interval in small, dimictic temperate lakes in Michigan, USA. The 0.02ºC criterion corresponded well with estimates of dissipation and showed that active mixing is restricted to a shallow sub-layer of the epilimnion throughout the summer season. The active mixing layer was as shallow as 0.2 m during solar heating and only deepened to a depth of 1-2 m overnight in a lake with a traditionally defined epilimnion depth of 3-4 m. Furthermore, I found that vertical mixing was driven more by heat loss than by wind forcing. These results have implications for estimates of gas exchange across the air-water interface, free-water estimates of lake metabolism, and UV exposure in these and other small kettle lakes found ubiquitously around the glaciated upper midwestern USA.

Karin SPARBER, Catherine DALTON, Elvira DE EYTO[2], Eleanor JENNINGS[3] and Norman ALLOTT

The influence of DOC on phytoplankton/bacterioplankton biomass in a humic and a clearwater lake in the West of Ireland

[1]Mary Immaculate College, University of Limerick
[2]Marine Institute, Newport, Co. Mayo
[3]Dundalk Institute of Technology,
[4]School of Natural Science, Trinity College Dublin

The largest reservoir of organic carbon in aquatic systems is found in the dissolved fraction. Dissolved organic carbon (DOC) plays a crucial role in aquatic ecosystems as it is a source of energy fuelling microbial metabolism and attenuates ultra-violet and photosynthetically active radiation. Phytoplankton and bacterioplankton biomass was estimated from May to December 2009 in two oligotrophic lakes in the West of Ireland (Lough Feeagh, Co. Mayo and Lough Guitane, Co. Kerry). The former is a humic brown-water lake (water colour 64 - 110 mg l^{-1} PtCo, DOC 4.5 – 11.5 mg l^{-1}, Secchi disk depth 0.8 – 2.1 m) and the latter a clear-water lake (water colour 19 - 26 mg l^{-1} PtCo, DOC 2.7 – 6.4 mg l^{-1}, Secchi disk depth 4.4 – 5.5 m). Detailed analyses using chromophoric dissolved organic matter fluorescence revealed higher concentrations of humic substances in Lough Feeagh, where the abundance of bacteria was three times higher than in Lough Guitane. In contrast, the algal community was inhibited in the humic lake, and reached higher biomass in the clear-water lake.

Luke WINSLOW[1]

Lake Water Optical Properties: What Drives Long-Term Dynamics?

[1]Limnology and Marine Sciences, University of Wisconsin-Madison, Wisconsin, USA

I studied a long-term record of lake water absorbance spectra for eight lakes in northern Wisconsin, USA that are part of the Northern Temperate Lakes LTER site (lter.limnology.wisc.edu) to examine which in-lake parameters control absorbance at inter-annual to decadal timescales. Preliminary results show in-lake temporal variability, unlike cross-lake variability, may not be well explained by DOC concentration. This suggests DOC nature and other variables drive temporal dynamics in these systems. This poster examines this, and other potential implications of this work.