Geophysical Research Abstracts
Vol. 15, EGU2013-4885, 2013
EGU General Assembly 2013

Testing the effect of increased temperature and river water input on benthic and pelagic metabolism using a large scale experimental pond ecosystem

Patricia Rodriguez (1), Erik Geibrink (2), Francisco Vasconcelos (2), Per Hedström (2), Pär Byström (2), and Jan Karlsson (2)

(1) Department of Ecology, Genetics and Evolution, Faculty of Exact and Natural Sciences, University of Buenos Aires - IEGEBA (CONICET-UBA), (2) Department of Ecology and Environmental Science, Umeå University, 90187 Umeå, Sweden

We performed a large scale experimental study to test the effect of increased temperatures and concentration of allochthonous dissolved organic carbon (DOC) on benthic and pelagic primary production and respiration. The experiment was carried out during one ice-free season (May-October 2012) in a clear-water pond ecosystem divided into 16 enclosures (each 120 m^3 and 1.6 m deep) including natural benthic and pelagic habitats and fish as top consumers (40 adult three-spine sticklebacks were introduced at the beginning of the experiment). Treatments included input of brown river water (23 mg/L in DOC) and heating (3˚C above ambient temperature) in a factorial design: 4 enclosures were kept as controls (clear-cold), 4 enclosures were heated (clear-hot), 4 received river water (dark-cold) and 4 were both heated and received river water (dark-hot). Physical and chemical variables were monitored weekly meanwhile benthic, pelagic and ecosystems metabolism were estimated from free-water oxygen data and incubation studies. The 3˚C difference in temperature between hot and cold enclosures was consistent during the study and DOC concentrations averaged 4 and 8 mg/L in clear water and dark enclosures, respectively; without any interaction effect between temperature and DOC concentration. Vertical light attenuation coefficient (Kd) showed significant differences between treatments with (0.62 ± 0.40 m^{-1}) and without river water (0.24 ± 0.13 m^{-1}). Total nitrogen concentrations ranged between 187 and 300 μg/L, with higher values in the dark-cold enclosures. The same pattern of higher values in dark-cold enclosures was found in phytoplankton chlorophyll a and primary production. Preliminary results show that gross benthic primary production (higher in clear-cold enclosures) largely exceeded phytoplankton production at the beginning of the experiment. Due to high respiration compared to gross primary production the net ecosystem production was in general negative in the pelagic habitat and did not show any effect of temperature or river water treatment. Our results suggest that input of river water may affect relatively shallow lake ecosystems differently compared to what is generally assumed based on studies of deeper systems.