Geophysical Research Abstracts
Vol. 14, EGU2012-13353, 2012
EGU General Assembly 2012

Laser Induced Fluorescence Emission (L.I.F.E.): In Situ Non-Destructive Detection of Microbial Life on Supraglacial Environments

B. Sattler (1), M. Tilg (1), M. Storrie-Lombardi (2), D. Remias (3), and R. Psenner (1)

(1) University of Innsbruck, Ecology, Innsbruck, Austria (birgit.sattler@uibk.ac.at), (2) Kinohi Institute, 1700 Alta Wood Drive, Altadena, CA 91001 USA (mike@kinohi.org), (3) University of Innsbruck, Institute of Pharmacy, Innrain 80-82, 6020 Innsbruck, Austria (daniel.remias@uibk.ac.at)

Laser-induced fluorescence emission (L.I.F.E.) is an in situ laser scanning technique to detect photoautotrophic pigments such as phycoerythrin of an ice ecosystem such as supraglacial environments without contamination. The sensitivity of many psychrophiles to even moderate changes in temperature, and the logistical difficulties associated with either in situ analysis or sampling makes it difficult to study microbial metabolism in ice ecosystems in a high resolution. Surface communities of cold ecosystems are highly autotrophic and therefor ideal systems for L.I.F.E examinations. 532nm green lasers excite photopigments in cyanobacteria and produce multiple fluorescence signatures between 550nm and 750nm including carotenoids, phycobiliproteins which would enable a non-invasive in-situ measurement.

The sensitivity of many psychrophiles to even moderate changes in temperature, and the logistical difficulties associated with either in situ analysis or sampling makes it difficult to study these cryosphere ecosystems. In general, the ice habitat has to be disrupted using techniques that usually include coring, sawing, and melting. Samples are also often chosen blindly, with little indication of probable biomass. The need for an in situ non-invasive, non-destructive technique to detect, localize, and sample cryosphere biomass in the field is therefore of considerable importance.

L.I.F.E has already been tested in remote ecosystems like Antarctica (Lake Untersee, Lake Fryxell), supraglacial environments in the Kongsfjord region in the High Arctic and High Alpine glaciers but until now no calibration was set to convert the L.I.F.E. signal into pigment concentration. Here we describe the standardization for detection of Phycobiliproteins (Phycoerythrine) which are found in red algae, cyanobacteria, and cryptomonads. Similar methods are already used for detection of phytoplankton in liquid systems like oceans and lakes by NASA′s Airborne Oceanographic LIDAR since 1979. The possibility to use L.I.F.E. in ice though is a novelty and provides a promising tool to monitor vanishing ice systems like retreating glaciers.