Geophysical Research Abstracts
Vol. 16, EGU2014-16202, 2014
EGU General Assembly 2014

Dinoflagellate cyst production in Hudson Bay, the world's largest inland sea, based on monthly sediment trap data

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Phytoplankters, microscopic primary producers of oceans are capable of responding rapidly to environmental fluctuations due to their high cell replication rates. Fast phytoplankton growth maybe balanced out by equally fast consumption by herbivorous grazers. In high-latitude marine systems, seasonal fluctuations in plankton biomass are essentially linked to light regime controlled by the waxing and waning sea-ice cover. In addition, nutrient limitation in surface waters, seasonal temperature fluctuations and changes in freshwater inputs may play important roles.

In cold-water seas, many planktonic organisms cope with seasonal harshness by the production of benthic dormant stages. Dinoflagellates are a diverse group of single-celled plankton, constituting major marine primary producers, as well as herbivorous grazers of the microbial loop. Many dinoflagellate species produce highly resistant, organic-walled resting cysts that are archived in sediments and have been increasingly used to reconstruct past environmental conditions, e.g., sea-surface temperature and salinity, productivity, sea-ice cover and eutrophication. Marine sediment core sequences are characterized by slow accumulation rates and high mixing rates: the top centimeter of surface sediment from an arctic shelf may correspond to several years or decades of deposition. Consequently, sedimentary archives do not give direct information on long-term changes in seasonal bloom patterns or cues of annually recurring life-cycle events.

We used two particle-intercepting sediment traps moored in eastern and western Hudson Bay, respectively, to study monthly fluctuations in dinoflagellate cyst production from October 2005 to September 2006. The traps were deployed close to the seafloor and recovered during the ArcticNet annual expeditions onboard the CCGS Amundsen in 2005 and the CCGS Pierre Radisson in 2006. We document the seasonal succession of dinoflagellate cyst taxa, together with cyst species composition, diversity and fluxes and compare dinoflagellate cyst phenology to that of environmental parameters. This study is crucial to ongoing investigations that apply sediment dinoflagellate cysts to study long-term environmental change in Hudson Bay. Despite the challenges related to sediment trap studies in the Arctic and Subarctic, e.g., low particulate fluxes and disturbance by resuspended sediments, they provide a solid means to study the seasonal behaviour of cyst-producing dinoflagellates and help providing a firmer ecological foundation for sediment core studies.