WATER CHEMISTRY

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OBJECTIVES:

- Quantitatively map surface chlorophyll and turbidity using satellite imagery
- Characterize the spatial and temporal variability of Lake Winnipeg water chemistry
- Assess sedimentation rates in Lake Winnipeg
- Determine influences of riverine chemistry and biota on lake habitat
- Assess nitrous oxide (a greenhouse gas) production
- Assess respiration and photosynthesis for Carbon budgeting
- Assess the extent of water column oxygen depletion
- Assess (fluoroprobe) algal community structure, DOC and water transparency

METHODS: Not yet available

RESULTS: Complete results are not yet available.

The continuous (off the bow of the ship while ship in motion and at anchor at stations) measurement of solar irradiance spectra and reflectance spectra from lake surface as part of research to calibrate MODIS and MERIS satellite images for the ***quantitative mapping of surface chlorophyll and turbidity was very successful.***

Collection of a ***one metre sediment core in the North basin*** at the same location as one taken in 1994 was accomplished. This new core will be used to validate observations and conclusions reached (increases in sedimentation rate since the mid 1960's) from the 1994 core and will further document these changes (increases) over the past nine years.

The preliminary surveys of several of the ***major rivers*** that enter the east side of Lake Winnipeg - notably the Berens and Bloodvein rivers, and the Red River provided measurements and sampling similar to lake stations (above) and were taken to **determine the influence of riverine chemistry and biota on nearby lake habitat.**

Extensive ***monitoring of the production of nitrous oxide*** (N_20) at 24 stations provides information on the production and release of a ***potent greenhouse gas***. Levels are indicative of the process of de-nitrification, a bacterial process in lakes that converts inorganic nitrogen to nitrogen gas which is then lost to the atmosphere.

Measurement of ***rates of respiration and photosynthesis*** at 35 stations show the rates at which bacteria are respiring and algae are fixing (photosynthesizing) carbon and are part of studies to understand the carbon budget and productive capacity of Lake Winnipeg

Detailed chemical and biological profiles were made at several stations in the North basin of Lake Winnipeg. During station work in the North basin it was noted that many of the temperature profiles showed that the bottom 1 to 2 metres of the lake were 6 to 7 degrees cooler that the mixed waters above (14 to 15 C vs. 21 C). This ***thermal stratification*** was not expected as Lake Winnipeg is a shallow lake with a long fetch and frequent high winds so has commonly been viewed to have water that is well mixed to the bottom. The fact that the cooler bottom waters were at 14 to 15 degrees implies that this water became isolated some time in June when the lake temperature was 14 to 15 degrees or 6 to 8 weeks before our sampling efforts.

From profile samples, taken this bottom water clearly shows ***oxygen depletion*** (2 to 3 ppm oxygen vs surface levels of 8 to 9 ppm) and CO2 and NH3 enrichment. Most bottom water

samples had significant accumulations of algal remains. **This is a disturbing observation as previous oxygen profiles taken in 1999, in the presence of heavy algal blooms, showed little change in oxygen levels with depth.**

Plans include sampling these stations in winter to determine if oxygen depletion has occurred over the winter months. It will be interesting to see if these low O2 levels have had any impact on the composition and abundance of the benthic community.

A ***"Fluoroprobe" instrument*** was evaluated. This instrument is capable of continuously monitoring algal community structure (the relative abundance of four major algal groups). Dissolved Organic Carbon (DOC) and water transparency at five different wavelengths was evaluated. The instrument was leased for the cruise and installed so as to continuously monitor surface water pumped from the bow of the ship. Data collected are being evaluated against traditional lab-based analysis of water samples.