Conference Reports

Nineteenth Conference on Great Lakes Research

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Introduction

The Great Lakes Conference is an annual event that allows exchange of ideas and discussions on various facets of research that have as a common goal, the better understanding of the basins of the Great Lakes. Much of the work deals with limnology, but the conference also fosters interaction among scientists of different disciplines who do not normally have the opportunity to meet. From this standpoint the conference is a success. However, as in any conference of this size one has to be either selective, or be prepared to sit through papers, the details of which may be beyond immediate comprehension. This exercise is becoming expensive nowadays and perhaps an extension of the time between conferences to two years would not only keep the cost down, but also serve to improve the quality of the contributions. This year the University of Guelph and the Ontario Ministry of the Environment were hosts to the conference.

We have dealt with three sessions of direct interest to geologists and geomorphologists: Stratigraphy and Geochronology, Coastal Sedimentation and Erosion, and Coastal Processes. However, many papers given in other sessions contained information useful to earth scientists concerned with environmental issues. Because such sessions were often run concurrently, we solicited opinions from colleagues in attendance; in particular we acknowledge Kathy La Hay (University of Guelph) and Dr. Marie Sanderson (University of Windsor) for their comments on the Land Use and Water Quality, and Climatology and Meterology sessions respectively.

Stratigraphy and Geochronology, and Coastal Sedimentation and Erosion

These two sessions contained eight papers delivered fairly well with good illustrations, but all of them were limited with respect to fresh content. Sitting through the afternoon, and remembering the reports of the last two conferences, was rather like watching a rerun on T.V. On the other hand we tend to forget that the Great Lakes cover a very large area, and until a few years ago very little was known about the contrasting environments that exist there. We are still at the information gathering stage on local settings, and no comprehensive models have yet been developed for the Great Lakes. Certainly nothing of the sort was forthcoming in any paper at this Conference. For the geological portion, much has been written about the problems of erosion along coasts, and longshore drift. This reflects the preoccupation of many funding agencies that are interested in immediate and applied aspects of geology rather than in long term studies of fundamental processes.

In a well presented paper Calkin and Brennan (SUNY, Buffalo) and Adams (State University College, Brockport) illustrated their ongoing studies of the well-exposed sections of glacial drift along the southern shore of Lake Ontario. Although the main preoccupation of the paper was with the stratigraphy of the sediments, they succeeded in providing glimpses of the sedimentology as well. Of particular interest was their preliminary sedimentological model for stratified drift and some young tills which were deposited in a pro-glacial lake with the glacier apparently floating at times. The main framework of the model does not differ significantly from similar ones illustrated in the 1975 SEPM Special Publication No. 23. However the regional exposure of Lake Ontario will allow the development of a more refined model that when finished will contribute significantly to our understanding of sedimentation processes in this type of glacial-periglacial environment.

The second paper (Dell, CCIW, Burlington) illustrated variations in carbonate content and other petrographic characteristics in a core taken in Holocene sediments of a bay in Manitoulin Island. Variation in dolomite and calcite content and in the character of carbonate grains was related to local sedimentation processes, the rate of deposition that may have affected the amount of solution of these particles in the cold waters of the lake, and to other processes among which were the effect of different sources for the component minerals of the core. Because of strong

post-glacial rebound, the inland bay that was cored was, for some periods, open to the influx of material from the Precambrian Shield. During these periods the locally derived carbonate contributed proportionally less to the constitution of some layers. This paper was a good example of old fashioned but useful petrography.

Joshi and Durham (CCIW, Burlington) illustrated the complexities encountered in the usage of ^{210}Pb and ^{117}Cs in determining age and sedimentation rates in recent sediments, up to 70 years old. Although the topic deviated somewhat from the main theme of the session, it was of extreme interest, but it appeared that more homework is required before the results are sufficently reliable to base interpretations on.

The last paper on stabilization of coastal bluffs by plants suffered on two counts. First it was out-of-place in this session, and secondly the contents were not tied to some fundamental principle of engineering or sedimentation. We have serious doubts whether work of this type is worth funding particularly when public funds are at stake.

Another example of this type of research was presented in the session on Environment and Society by Sonzogni *et al.* (Great Lakes Basin Commission, Ann Arbor). The title of their paper was "Public Priorities for Great Lakes Research". They sent a questionnaire requesting different local organizations to rank in order of importance 14 selected research topics dealing with environmental problems of the Great Lakes. Through an elegant set of statistics the authors succeeded in demonstrating that the public does not really know what topics should have priorities. The various organizations saw their own projects as top ranking ones, with the consequence that no one project stood out from all the others. Perhaps it was not planned, but some responses were inconsistent; for example, problems related to coastal erosion were ranked slightly higher than most of the others, but problems related to high water conditions were considered to be the very last priority, as if it would be possible to be concerned with erosional problems, but not with high water ones.

Coastal Processes

Nine papers were scheduled for this session but only seven were presented. For the purpose of review they can be grouped according to a comon theme, or methodology employed, notably descriptive, statistical, and model building.

The first in the descriptive category was a paper given by Epstein, Butler, and Miller (Wisconsin). They discussed ways of delineating the inland coastal boundary along 620 miles of Lake Michigan's shoreline, and recommended that the coastal resource be carefully categorized for planning purposes, and a legally definable boundary be delineated. In a similar descriptive approach, inlet changes and baymouth bar stability were discussed by Weir and Calkin (Buffalo) *et al.* in the case of a rather unique naturally protected bay at the eastern extremity of Lake Ontario, known locally as North Sandy Pond. Keillor (Wisconsin) focussed attention on the possible long-term effects of pollutants such as Hg and Zn which enter Lake Superior at Duluth from dredge spoil. The speaker found trace metal pollution in both lake and harbour sediments. Surprisingly the highest ratios of total Hg to background Hg in the clay size fraction were found in the former environment rather than in the harbour as might be expected. Possible explanations for this anomaly were suggested. The speaker concluded that such pollutants may adversely affect local benthic communities.

The proliferation of statistical analyses in coastal sedimentation studies is a phenomenon which hardly needs elaboration, and three of the papers in this session conformed to this tradition. Birkemeier (CECR Virginia) analyzed median sand-size, and gravel content of eastern Lake Michigan beach sediment from samples collected at foreshore and backshore locations across 18 profile lines between October 1973 and December 1974. Unfortunately the paper suffered from the lack of a scientifically meaningful research objective, with no attempt being made to relate the statistical information to formative processes.

Another statistically based study was presented by Chambers (NOAA, Michigan). He tackled the perennial problem of whether statistical tests are sufficiently sensitive to discriminate among contrasting depositional environments - in this case beach, bar, aeolian, and fluvial. For the audience, this paper was stimulating, and the tests employed were considerably more sophisticated than in the paper discussed above. However, the results of the study were somewhat inconclusive, since the techniques were successful in discriminating environments at only one of the two sites chosen for the study.

Another tool which has become fashionable among scientists studying coastal processes is that of model-building in which attempts are made to simulate real-world conditions, or to predict the effects of change. The objective of Saunders (Argonne) was to establish whether a linear transfer function, rather than a set of partial differential equations could offer a more precise prediction of near shore current velocities on the Wisconsin side of Lake Michigan. Despite the rather negative results due to the poor performance of the model, the rigorous nature of the material and the level of presentation made this paper the highlight of the session.

Diehl, Maanum, and Sydor (Minnesota) presented the results of their attempt to predict the current circulation pattern in Lake Superior as related to north-east and west winds. Sediment transport was a prime concern, and a transport model was used to try and explain the movement of red clay turbidity plumes from clay bank erosion on the south shore of the lake. Good correlations were found when the calculated transports were compared with movement based on satellite imagery.

Sediment activity and shoreline changes at Sodus Bay, New York was the topic of Brownlie and Apmann's (Buffalo) paper. These changes are attributed to the construction of piers and breakwaters in 1829. Tracers were used to gain an insight into current activity, and a computer model was established to simulate wave action along the shoreline.

Land Use and Water Quality

The topics of this session ranged from a general presentation of assessing and identifying pollution sources of two Great Lakes to a discussion of the surficial sediments of Lake Superior.

The first paper presented by Dooley (Natural Resources, Michigan), outlined the work on inventory of current land uses undertaken on both sides of the border as part of the IJC PLUARG Study. Furthermore, Dooley indicated the need for better definition of land use and inventory studies as well as better projection of land use to minimize loss of pollutants into the Great Lakes Basin. Unfortunately, the paper was rather long and lacked clarity. Another lengthy paper, by Konrad *et al.* (Natural Resources, Wisconsin) outlined a project on the Menomonee River watershed which was designed to investigate the impact of urban land use on water quality and to extrapolate these effects to the entire Great Lakes Basin. Since their project was designed to continue until 1977 the data were incomplete. However the authors did note a seasonal trend in nitrate-nitrite concentrations.

A paper on non-point source pollution from two Michigan watersheds (Bahr, Michigan State University) was well presented. In the one watershed, waste water was put through a series of four man-made lakes during a residence period of 40 to 60 days. Clodophora was used to precipitate the pollutants. The water quality from the fourth lake was acceptable and could be diverted to streams or used in spray irrigation. The water used for spray irrigation was also sampled for water quality after it had percolated through the soil. Spray irrigation was also carried on during the winter.

Mildner (Soil Conservation Service, Washington) presented the results from an interesting study on riverbank erosion in eight watersheds. Estimates of the percentage of stream banks with preventive treatment applied, and of banks needing treatment were given. Mildner calculated that less than 10 per cent of the total sediment load reaching the Great Lakes is from stream bank erosion.

The elemental distributions in the nearshore sediments of southeastern Lake Michigan were investigated by Rossman (University of Michigan). He found that quartz silica was the major sediment component and that P and Fe increased in an offshore direction.

Drake (Vermont) studied trace metal capacities of Lake Champlain sediments and found that trace metal content was generally below the capacity of the sediments to hold metals. Furthermore, the absorption rates of the sediments, when subjected to a multi-element solution, showed preference for Cu followed by Zn, then Ni. It was also noted that clay content, organic matter and carbonate affected the extraction ability of the sediments.

A paper on the magnitude and sources or non-point pollution in the Maumee River Basin by Cahill *et al.* was read by Imperato (Resource Management Associates, Pa.), followed by Costescu who presented some preliminary data on the distribution of trace elements in soils, water, suspended and bottom sediments of six agricultural watersheds in Ontario (Whitby *et al.*, Agriculture Canada). Thomas (CCIW) presented an interesting paper on the surficial sediments of Lake Superior. He noted the distribution of the different sediment basins throughout the lake and suggested that the north-south alignment of trenches in the eastern part of the lake was probably due to glacial scouring.

Climatology and Meteorology

In the two sessions on this theme, the main topics centred on IFYGL weather compared to average weather, vorticity and divergent fields over Lake Ontario, and wind speeds and ice growth during IFYGL.

Three speakers concerned themselves with ice growth and ice formation in various parts of the Great Lakes. In addition to the IFYGL ice growth paper, two excellent papers dealt with models of ice growth in Duluth Superior harbour and ice formation in Rochester harbour.

Automated Great Lakes wind and wave forecasts by the Techniques Development Laboratory of the National Weather Service (United States) were the subjects of two papers. Although the techniques were of interest, the speakers admitted that there had been no verification of the forecasts or actual feedback from the users.

A paper on air circulation in the Chicago and Rochester areas offered some interesting new information on the lake breeze. A paper on Lake St. Clair evaporation presented preliminary estimates of evaporation by various techniques from little studied Lake St. Clair, although the speaker admitted to a probable large error in the monthly estimates.

The importance of considering climatic change in regulation of Great Lakes levels was the subject of a well presented paper from the Institute for Environmental Studies at the University of Wisconsin. A final paper was on a new and most important topic - the atmospheric inputs of phosphorus and nitrogen to the lakes, in this case Lake Huron. Such data will soon be published in an International Joint Commission report on the upper Great Lakes.

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