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Acquisition of Ion Chromatographs and Related Glaciochemistry Equipment

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Principal Investigator: Mayewski, Paul A. **Award ID:** 0096291
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Title:
Acquisition of Ion Chromatographs and Related Glaciochemistry Equipment

Project Participants

Senior Personnel

Name: Mayewski, Paul
Worked for more than 160 Hours: Yes
Contribution to Project:

Post-doc

Graduate Student

Name: Souney, Joseph
Worked for more than 160 Hours: Yes
Contribution to Project:
All of the samples for Joe's MS thesis project at Law Dome, Antarctica, were analysed using the new ion chromatographs purchased under this grant. As part of his studies, Joe received training on ion chromatography.

Name: Meyerson, Eric
Worked for more than 160 Hours: Yes
Contribution to Project:
Eric is currently working towards his Ph.D on the NSF sponsored project for Siple Dome, Antarctica. Eric's MS thesis project, South Pole glaciochemistry, was also a NSF funded project. In both studies, all analyses are made using the new ion chromatogra[hs. Eric's training includes theory and operation of the instruments.

Undergraduate Student

Research Experience for Undergraduates

Organizational Partners

University of New Hampshire
The configuration and purchase of the ion chromatographs was organized by UNH staff. The first attempt of the continuous melting system was accomplished at UNH.

Other Collaborators or Contacts

Activities and Findings

Research and Education Activities:
The goal of this project has been to upgrade the ice core processing and analytical equipment. This has been accomplished in three major areas: the design and construction of an ice core lathe, develpoment of a continuous melting system, and new ion chromatographs.

The lathe is a unique ice core processing tool that operates similiar to a wood lathe. The lathe will reduce or eliminate the need for the cores to

be hand scraped, the first cleaning step of core preparation.

Our continuous melting system is a modification of existing designs. Unlike other systems, we will collect discrete samples for analysis of both cations and anions.

The new ion chromatographs are state of the art. Conductivity detectors provide high sensitivity and the associated autosamplers support high sample throughput.

Findings:

The improvements made to our ice core processing and analysis have an infulence on many programs. Results can be seen in ongoing NSF projects such as ITASE Glaciochemistry (0096299), Siple Dome Deep Ice Core (0096305), and Holocene Climate Variability (0096331), as well as projects in other regions such as the Tibetan Plateau, Mt. Everest locations, and the Canadian Arctic. A significant number of journal articles with analytical results from the new instrumentation have been published.

In addition to reaseach applications, the new facilities are being extensivly used in education. Graduate and undergraduate courses, graduate research projects, and teacher workshops all benefit from the new equipment.

Training and Development:

The new instrumentation contributes to the research carried out by many students. Undergraduate students enrolled in an Analytical Methods class are introduced to the techniques of core processing, continuous melting, and ion chromatography. The facilities are also part of a graduate course in Climate Analysis. Students are trained in core processing, instrumental analysis, and data manipulation. More in-depth instruction is provided to students with graduate projects that are based on ice core processing and analysis.

Outreach Activities:

The new ice core processing and analytical facilities were featured in a workshop for high school science teachers. This will be an annual event.

The Greenland Ice Sheet Project and the International Trans-Antarctic Scientific Expedition are included in displays at Boston's Museum of Science. Data generated using the new equipment is also on the Museum's web site, www.secretsoftheice.org.

Journal Publications

Books or Other One-time Publications

Web/Internet Site

URL(s):

www.ume.maine.edu/iceage
www.ume.maine.edu/itase
www.ume.maine.edu/USITASE

Description:

Ice core processing and analytical facilities are featured on the Institute for Quaternary and Climate Studies web site (iceage).

Contributions made by these new facilities are incorporated on the international and US International Trans-Antarctic Scientific Expedition sites.

Other Specific Products

Contributions

Contributions within Discipline:

An important application of the equipment developed and purchased under this grant is within the discipline of climatology. The lathe, continuous melter, and ion chromatographs define a unique and state of the art facility. The results obtained have been and will be useful in exploring climate variables such as El Nino, North Atlantic Oscillation, and rapid climate change events.

Contributions to Other Disciplines:

Other areas directly related to the primary dicipline are paleoclimatology, ice core goechemistry, and analytical chemistry. Understanding the Earth's current climate is a necessary step toward reconstruction of past climatic conditions. Chemistry measurements, when combined with other parameters, make up the ice core geochemical record. Techinques developed as a result of the continuous melting system and new ion chromatographs are an intergral part of the science of analyzing ice cores.

Contributions to Human Resource Development:

The ice core facilities have been presented in open house forum. Groups from non-research university departments and local media have toured the freezer and lab areas.

Our department also has participated in Upward Bound for high school students. During the summer term, the students perform various tasks within the ice processing facilities.

Contributions to Resources for Research and Education:

A direct result of the new facilities and instrumentation is the creation of databases. This information resource is available to the ice core community as well as other users of ice core geochemical data. Oceanographers, meterologists, glaciologists, and others may incorporate our findings with their own results.

Contributions Beyond Science and Engineering:

Findings from our work directly contribute to the understanding of climate and human perturbations upon it. Some questions of current interest include global warming, ozone depleation, or more locally, water resources and storm frequency.

Categories for which nothing is reported:

Any Journal

Any Book

Any Product