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Science Management for the United States Component of the International Trans-Antarctic Expedition

Paul Mayewski
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Principal Investigator: Mayewski, Paul A. **Award ID:** 0096338
Organization: University of Maine
Title:
Science Management for the United States Component of the International Trans-Antarctic Expedition

Project Participants

Senior Personnel

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

Name: Twickler, Mark
Worked for more than 160 Hours: Yes
Contribution to Project:
Co-PI until June 2000, but no longer involved with project.

Name: Smith, D. Zachary
Worked for more than 160 Hours: Yes
Contribution to Project:
Zach coordinated the logistics for the field season, and served as a co-leader during the 2000-2001 traverse.2001-2002 Azch Smith is no longer part of the project.

Post-doc

Graduate Student

Name: Kaspari, Susan
Worked for more than 160 Hours: Yes
Contribution to Project:
Susan was field assistant for years 3 and 4. As such, she conducted science experiments and sample collection for PIs not in the field as well as assisting other projects as needed. Her salary (assistantship) was paid from this grant during the field season.

Name: Dixon, Daniel
Worked for more than 160 Hours: Yes
Contribution to Project:
Dan was field assistant for years 3 and 4. As such, he conducted science experiments and sample collection for PIs not in the field as well as assisting other projects as needed. His salary (assistantship) was paid from this grant during the field season.

Undergraduate Student

Name: Cavallari, Benjamin
Worked for more than 160 Hours: Yes
Contribution to Project:
Benjamin servied as a field assistant on the 2000- 2001 traverse.

Name: Lacey, Jessica
Worked for more than 160 Hours: Yes
Contribution to Project:
Jessica assists with web site updates and maintainence.

Technician, Programmer

Name: Zielinski, Ann

Worked for more than 160 Hours: Yes

Contribution to Project:

Ann put together the SIP for the field teams, and served as the main liason with Raytheon. Ann was the main contact person for the field party, daily updated the website, and continues to serve as webmaster for the USITASE site.
During 2001-2002, Ann coordinated the logistics and administrative details of the Science Management Office.

Other Participant

Research Experience for Undergraduates

Organizational Partners

Ohio State University

Saint Olaf College

University of Maryland

University of Nevada Desert Research Institute

University of Pennsylvania

University of Colorado at Boulder

University of Arizona

University of Washington

Boston Museum of Science

Motorola Inc

Use of Iridium phones and related equipment.

Marmot Mountain Ltd

Marmot Mountain contributed jackets to the field team members for 2002 - 2003. Team members were also able to purchase field clothing at the wholesale price.

Other Collaborators or Contacts

Albert, Mary USACRREL Snow and Firn Microstructure and Transport Properties: U.S. ITASE
Arcone, Steven USA CRREL High Resolution Radar Profiling of the Snow andIce Stratigraphy beneath the ITASE Traverses
Bales, Roger,U. of Arizona, McConnell, Joe, U. of Nevada Desert Research Institute,Hydrogen Peroxide, Formaldehyde, and Sub-Annual Snow Accumulation in West Antarctica: Participation in West Antarctic Traverse
Hamilton, Gordon, University of Maine, Whillans, Ian, Ohio State Univ. Mass Balance and Accumulation Rate Along US ITASE Routes
Jacobel, Robert, Saint Olaf College,Radar Studies of Internal Stratigraphy and Bedrock Topography along the US ITASE Traverse
Meese, Deb, Gow, Tony, Elder, Bruce USACRREL The Physical Properties of the US ITASE Ice Cores
McConnell, Joe, U of Nevada, DRI, Deposition of the HFC Degradation Product Trifluoroacetate in Antarctic Snow and Ice
Steig, Eric, Univ. of Washington, White, James, U. of Colorado, Shuman, Christopher, U. of Maryland, Stable Isotope Studies at West Antarctic ITASE Sites

Activities and Findings

Research and Education Activities:

US ITASE is effectively a polar research vessel. It offers the ground-based opportunities of traditional style traverse travel coupled with the modern technology of GPS, crevasse detecting radar, satellite communications and multi-disciplinary research. By operating as a ground-based transport system US ITASE offers scientists the opportunity to experience the dynamic environment they are studying. US ITASE also offers an important interactive venue for research (currently eleven integrated science projects) similar to that afforded by oceanographic research vessels and large polar field camps, without the cost of the former or the lack of mobility of the latter. More importantly the combination of disciplines represented by US ITASE provides a unique, multi-dimensional (x, y, z and time) view of the ice sheet and its history. Over the past four field seasons (1999-2003) US ITASE sampled the environment of West Antarctica into East Antarctica over spatial scales of >5000 km, depths of >3000 m, heights in the atmosphere of >20 km, and time periods of several hundred years (sub-annual scale) to hundreds of thousands of years (millennial scale).
Initial set-up for US ITASE season 1 and 2 required several C-130 flights (eg., a single flight per major oversnow vehicle) In field season 3 and 4 the bulk of the JP8 fuel used by the Challengers was air dropped to sites along the route.

The ô99-Æ00 austral summer field season was the first season for US ITASE operations. Despite unavoidable delays in weather that resulted in a loss of approximately half of the US ITASE 1 field season, two-thirds of the science was completed. Realizing time limitations, US ITASE 1 chose to undertake the traverse leg from Byrd Surface Camp to Swithinbank AWS because this leg would not have been feasible to include in plans for US ITASE 2 without a major detour.

The ô00-01ö austral summer field season was the second season for US ITASE operations. Unavoidable minimal delays in weather and the breakdown of the Tucker resulted in the loss of approximately 2 weeks of the US ITASE 2 field season. All of the science was completed with the exception of lost data due to equipment malfunction of the deep ice penetrating radar. US ITASE 2 chose to undertake the 1200 kilometer triangularly shaped traverse pattern starting and ending Byrd Surface Camp. The portion of US ITASE 2 not accomplished in Æ00-Æ01 (proposed ice coring site 2) will be undertaken next season through some adjustment to the traverse route during US ITASE 3. Site #7, near Mt. Sidley, was also excluded from the æ00-Æ01 itinerary because of concerns of safety to personnel and equipment.
The original plan for the 2000-2001 season was to have a traverse configuration that included one Tucker from the 1999-2000 US ITASE season, a new Challenger 55, one Berco sled (an Aalener was made available) for fuel, one Berco sled with a permanent shelter configured for 9 berths and science activities, one Berco sled configured with an active freezer system, one Polar Haven configured as a kitchen and an assortment of smaller sleds (eg., 2 Maudheims, one Polar Associate, 3 Nansens and one Komatik). Two LC-130 fuel drops (3 drops per flight) were scheduled for the season based on estimated fuel consumption.
On the first leg of the traverse, at a distance of 66.6 km from our starting point at Byrd, the Tucker (although hauling a significantly lighter load than that taken during the 1999-2000 season) had a catastrophic breakdown. During the 1999-2000 season the two Tuckers utilized by US ITASE did manage to complete the traverse but with considerable effort. It is clear now that they are not appropriate vehicles for heavy over-snow traverses. On a brighter note the Challenger 55 performed beyond expectation pulling significantly heavier loads than the Tuckers did in 1999-2000 and with slightly better fuel efficiency than expected
The loss of one of our two heavy traverse vehicles had a significant impact on our style of operation. The Challenger 55 is not large enough to accommodate a driver plus a scientist and crevasse detecting radar so we lost that capability. The Challenger was not able to pull the remaining load although it did significantly out perform the Tucker. After dedicating 5 days to retrograding the Tucker plus any possible additional equipment (this unfortunately had to include the freezer) the traverse proceeded. Under the new style of operation it was necessary to double shuttle loads and to request air support for the pick up of nearly 7000 out of the 8000 lbs of ice cores collected during the trip. In addition, without the freezer, the ice cores had to be buried at each work site. The new style of operation and the better than expected fuel usage of the Challenger 55 negated the need for a second round of LC-130 fuel drops, which we hope balanced our in-field request for air support to retrieve ice cores.

During the third US ITASE field season (2001-2002) the field team traversed 1825 km from Byrd to within 125 km of Siple Station and return to Byrd. The traverse was comprised of 12-14 members, two Challenger 55s and various heavy and light sleds. Route selection was based upon the science objectives of the US ITASE researchers and safe route selection was aided by examination of RADARSAT images and an onboard crevasse detection system.

Eleven integrated science programs were supported by US ITASE in 2001-2002. Science was conducted both during travel and at six sites. Continuous shallow (~120 m) and deep (>3000m) radar over 1800 km comprised the travel component of the science. Near real-time shallow radar information was used to finely tune the location of six study sites and to tie these sites together via identification of long distance subsurface marker horizons. At each site 3ö and 2ö diameter ice cores were collected that will provide samples for stable isotopes, major soluble ions, trace elements, organic acids, b activity, stratigraphy, porosity, permeability, and density. A total of 771 m of ice core was collected during the 2001-2002 season exceeding even the ice core recovery success of the previous US ITASE season. Atmospheric sampling of surface air and air to a height of 23 km was also conducted as well as high precision GPS surveys to determine mass balance, ice flow direction,

and ice velocity.

During the fourth US ITASE season (2002-2003) the field team traversed 1250 km from Byrd to South Pole. The traverse was comprised of 13 members, two Challenger 55s, and various heavy and light sleds. The bulk of the AN8 fuel used by the Challengers was air dropped to four sites along the route. Route selection was based upon the science objectives of the US ITASE researchers and safe route selection was aided by examination of RADARSAT images and an onboard crevasse detection system
Eleven, integrated science programs were supported by US ITASE in 2002-2003. Science was conducted both during travel and at eight sites. Continuous shallow (~120 m) and deep (>3000m) radar, high precision kinematic GPS, and surface snow sampling comprised the travel component of the science. Near real-time shallow radar information was used to finely tune the location of study sites and to tie these sites together via identification of long distance subsurface marker horizons. At each site 3ö and 2ö diameter ice cores were collected that will provide samples for stable isotopes, major soluble ions, water soluble trace gases, trace elements, organic acids, b activity, stratigraphy, porosity, permeability, and density. A total of 920 m of ice core was collected. Atmospheric sampling of surface air and air to a height of 23 km was conducted as well as high precision GPS surveys to determine mass balance, ice flow direction and speeds, and ice surface topography.

Findings:

Major Scientific and Logistical Accomplishments of the 1999-2000 Field Season

1. Two 1990 vintage, refurbished Tucker Sno-Cats (nicknamed Ellie May and Jethro) traversed in excess of 450 km, with each towing close to their maximum limit of 20,000 lbs.
2. A high resolution 400-MHz radar profile to at least 50 m depth was acquired along the entire 185 km traverse from the Byrd to the Swithinbank core site
3. Experimental 400-MHz radar profiles were acquired at longer time ranges, and faint, dipping horizons were detected to about 75 m depth.
4. 3-4 km radar profiles were acquired in orthogonal directions about the Byrd, Midpoint, and Swithinbank core sites. The profiles appear to show local horizontal layering in the vicinity of each site.
5. Experimental profiles were acquired using an FM-CW radar at L-Band (1.1-1.8 GHz) and at X-Band (8.2-10.4 GHz), simultaneously with many of the 400-MHz core site profiles..
6. Snowpits samples were collected adjacent to two AWS sites, Byrd and Swithinbank, affording the opportunity to calibrate the records from these snowpits with instrumented meteorological data. Previous calibration of the pre-1995 Byrd AWS and snowpit demonstrated strong associations between ice chemistry and major atmospheric circulation systems.
7. Ice cores collected during US ITASE 1 and in 1995 at Byrd will be used to help determine which physical and chemical parameters control major radar reflectors. The penetration of three 50-60 m deep ice cores into the high resolution radar array developed by Arcone and Yankielun represents a unique opportunity to define depth-age scales for major radar reflectors.
8. A total of 106 meters of 3 inch ice cores were collected.
9. New mass balance measurement sites were installed close to the æMidpointÆ and æSwithinbankÆ camps.
10. GPS support was provided for other ITASE investigators. This included kinematic positioning for radar studies conducted by CRREL and St Olaf College.

Major Scientific and Logistical Accomplishments of the 2000-2001 Field Season Between 16 November 2000 when the US ITASE team arrived at Byrd and 3 January 2001 when the team departed the field the following major scientific and logistic goals were accomplished:

1. The Challenger 55 traversed a total of 2400 km.
2. Continuous radar observations were made over 800 km of the traverse route.
3. Seven out of the original nine projected science stations were occupied for periods of 2-9 days depending upon workload per site. Two sites were dropped from the original list. One site to save time after the Tucker failure. We will be able to work at this site in 2001-2002 enroute our Siple Station traverse. A second site was deleted, close to Mt. Sidley, because it has too many local climatological effects, the area may have some crevassing and a snowmobile based radar survey we conducted indicated highly contorted glacier flow unsuitable for the recovery of ice cores.
4. Reconnaissance for the proposed inland WAIS deep drilling site that was cancelled during the 1999-2000 season was accomplished.
5. A total of 664 m of ice core were recovered.
6. Seven 2m snowpits were sampled for chemistry, stable isotopes, density and stratigraphy.
7. Pemeability and porosity experiments were conducted from two snowpits and three ice cores were collected for this purpose.
8. Twenty-one days of atmospheric chemistry observations were conducted at seven sites.
9. Observations were made for purposes of ground truthing for satellite imagery.
10. Three automatic weather stations were deployed.
11. Eight high precision GPS æcoffee canÆ experiments were deployed to measure mass balance.

Major Scientific and Logistical Accomplishments of the 2001-2002 Field Season Between 16 November 2001 when the US ITASE team

arrived at Byrd and 4 January 2002 when the team departed the field the following major scientific and logistic goals were accomplished:

(1) Two Challenger 55s traversed a total of 1825 km on the main traverse and ~200 km of day trips.
(2) Continuous radar observations (crevasse detection (400 MHz), shallow depth (400 MHz), deep (2.5 MHz)) were made over the 1825 km of the main traverse route and ~200 km of day trips. In addition, intermediate depth radar (100 and 12.5 MHz) data were collected over 200 km.
(3) Six out of the original seven projected science sites were occupied for periods of 2-6 days depending upon workload per site.
Site Latitude Longitude Elevation Ice Cores 1
1 79o 09Æ 34.99ö 104o 58Æ 01.98ö 1842 m 73.164 m
2 77o 50Æ 37.01ö 102o 54Æ 37.41ö 1353 m 71.149 m
3 78o 07Æ 12.79ö 95o 38Æ 46.73ö 1633 m 70.964 m (1)
70.008 m (2)
4 77o 36Æ 41.93ö 92o 14Æ 54.08ö 1484 m 68.198 m
5 2 77o 03Æ 33.59ö 89o 08Æ 15.28ö 1246 m 114.726 m
6 3 76o 05Æ 50.59 89o 01Æ 03.98ö 1240 m 18.00 m 4

Notes:
1 only primary cores listed here.
2 12 km from the original site 5 (new location determined from surface radar.
3 50 km from the original site 6.
4 depth limited due to drill circuitry failure produced as a consequence of moisture penetrating circuitry housing during storm.

(4) A total of 771 m of ice cores were recovered utilizing both the 3ö diameter Eclipse drill purchased by NSF for use by US ITASE and a 2.2ö diameter lightweight drill built by Glacier Data for the University of Maine. A total of seven 3ö diameter ice cores were collected from six sites. Ice cores will be sampled for chemistry, stable isotopes, density and total b activity in lieu of snowpits.
(5) Permeability and porosity experiments were conducted from two snowpits and two 18 m ice cores were collected for this purpose. One more snowpit and an 18 m core were planned for Site 6 but were not collected due to conditions encountered at Site 6.
(6) Stratigraphy was sampled at sites 1-5 utilizing snowpits excavated either exclusively for this purpose, snowpits excavated as access for 3ö ice coring, or ~10 m wide pits excavated using a Challenger 55.
(7) Twenty-one days of atmospheric and shallow chemistry observations were conducted at five sites. This sampling included real-time, continuous observations of peroxides (H2O2 and organic peroxides), formaldehyde and ozone near surface and ozone profiles up to an altitude of 23 km. 2ö-cores (3 m length) from 3 sites were analyzed for H2O2 and HCHO on site using a continuous flow analysis melter system.
(8) Basic meteorological observations were collected at all sites and 10 m depth temperatures for comparison with infrared satellite estimates of mean annual temperature.
(9) Six high precision GPS ækoffee canÆ experiments were deployed to measure mass balance.

Major Scientific and Logistical Accomplishments of the 2002-2003 Field Season Between 23 November 2002 when the US ITASE team arrived at Byrd and 7 January 2003 when the team departed South Pole the following major scientific and logistic goals were accomplished:

1. Two Challenger 55s traversed a total of 1250 km on the main traverse and ~500 km on day trips.
2. Continuous radar observations (crevasse detection (400 MHz) and shallow depth (400 MHz) were made over the 1250 km of the main traverse route. Deep (2.5 MHz) radar was conducted over all but 166 km of the full 1250 km and over ~200 km of day trips. High precision kinematic GPS data were collected in tandem with the radar profiling along the entire traverse route.
3. Five original science sites were occupied for periods of 2-3 days, plus work at Byrd conducted during the wait for the Alaaner and wide tracks, plus one reconnaissance site in preparation for phase two of US ITASE..
Site Latitude Longitude Elevation Ice Core Total (m)_

Byrd 80 S 120 W 1520 m 71
1 82 01Æ S 110 03Æ W 1745 m 118
2 83 30Æ S 104 59Æ W 1964 m 119
3 85 00Æ S 104 59ÆW 2401 m 75
4 86 30Æ S 107 59Æ W 2595 m 123
5 88 00Æ S 108 00Æ W 2600 m 78
SPRESO 89 55Æ S 147 34Æ E 2810 m 319*
X9 89 S 59 58 W 2790 m 17
*300 m collected by ICDS SPRESO team for US ITASE

4. A total of 920 m of ice cores were recovered utilizing both the 3ö diameter Eclipse drill purchased by NSF for use by US ITASE and a 2.2ö

diameter lightweight drill built by Glacier Data for the University of Maine. Analyses to be conducted on these cores include: stable isotopes, major ion chemistry, trace and reversible species chemistry, beta activity, stratigraphy, porosity, and permeability.
5. Atmospheric and shallow chemistry observations were conducted at eight sites for periods of 24-48 hours. This sampling included real-time, continuous observations of peroxides (H2O2 and organic peroxides), formaldehyde and ozone near surface and ozone profiles up to an altitude of ~20 km. 2ö-cores (total length 38 m) from 7 sites were analyzed for H2O2 and HCHO on site using a continuous flow analysis melter system. The seasonal signal of H2O2 provided an on site estimate of the mean annual accumulation over the past 10-15 yr and was used along with stratigraphic determination of annual accumulation as an orientation for the minimum drilling depth.
6. Five high precision GPS ækoffee canÆ experiments were deployed (Sites 1-5) to calculate mass balance and the distribution of basal sliding motion.
High precision GPS mapping was conducted at Byrd and Site 3 as validation for NASAÆs ICESat experiment.

Training and Development:

Several students are involved in this project each year including:
Tyler Cruickshank PhD student University of New Hampshire 1999
Joe Souney - graduate student University of New Hampshire 1999
Benjamin Cavallari - undergraduate U Maine 2000
Leigh Stearns- graduate student The Ohio State and U Maine 2000, and 2002
David Schneider- graduate student University of Washington 2000, and 2001
Dan Dixon û graduate student University of Maine 2001 and 2002
Susan Kaspari û graduate student U Maine 2001 and 2002
Tom Neumann û graduate student University of Washington, 2001
Markus Frey û PhD candidate University of Arizona 2000,2001, and 2002
Vandy Spikes û PhD candidate University of Maine 2002 and 2002
James Laatsch û undergraduate student Dartmouth College 2002
Data collected as part of this program will be used as an integral part of a senior/graduate level course in Climate and Paleoclimate Analysis. Data is shared with other US ITASE colleagues in order to maximize multi-disciplinary interpretations, with NSIDC, NOAA Paleoclimatology and other ITASE national programs.

Outreach Activities:

During the US ITASE field seasons the field team participated in several outreach activities. These included: a lecture in McMurdo, news articles for the Antarctic Sun, and in 2002-03 a Sunday night lecture at South Pole. Biweekly live interviews with the Boston Museum of Science (1 November to mid January (entire team)), were conducted every year along with daily updates for the websites via Iridium data link. US ITASE had a TEA assigned for the 2001-02 field season. However, the TEA was injured while in McMurdo and returned home. Due to logistics and monetary considerations, it was determined that a TEA accompanying the team during the 2002-2003 field season was not feasible. Instead US ITASE under took a somewhat novel approach. An experienced teacher was involved to correspond with the team and develop curriculum materials. She acted as a mentor and resource for classroom teachers nation wide through the US ITASE web site (www.ume,maine.edu/USITASE/teachers). As a result of her efforts, an extensive Teachers Resource section was added to the US ITASE web site with 19+ well researched and tested lessons and activities available for use. The target age for these lessons is middle school with several easily converted for younger grades as well as older.

We were also fortunate in 2002-03 to have a former TEA (Betsy Youngman) join the team as a field technician. She maintained a TEA like involvement while conducting her regular ITASE science activities. A live web broadcast question and answer session was conducted by TEA with Betsy from McMurdo.

Ann Zielinski maintained the link between US ITASE, MOS, and various other outreach activities from her office at the University of Maine. The daily journal entries were posted on three separate web sites: Secrets of the Ice, Boston Museum of Science, www.secretsoftheice.org, US ITASE website, www.ume.maine.edu/USITASE/logbook, and the Teachers Experiencing Antarctica and the Arctic, http://tea.rice.edu/.

Direct contact, either presentations/lectures or correspondence from the field, was made with an average of 12 schools per year from Maine to Oregon, as well as the Maine Discovery Museum, a childrenÆs museum in Bangor, Maine. Additional contacts with schools were made by Betsy Youngman, teacher and field assistant, through the TEA program.

When US ITASE successfully reached South Pole Station on 2 January, 2003, it generated media attention. Numerous interviews were conducted with television, radio and print media, coordinated through NSF office of public affairs. News stories were carried by Reuters News, United Press International, and published in numerous major newspapers. Stories were broadcast on National Public Radio as well as mentioned on the major broadcast networks. See: http://www.ume.maine.edu/USITASE/Archives02/newsstories.html

Recent interviews included ôThe Weather Notebookö, produced by the Mount Washington Observatory and carried on National Public Radio.

Public lectures were given to municipal groups such as Rotary Clubs, Library lecture series, and local college workshops on average of 5 times each year, for more that twenty public lectures in all.

Journal Publications

Paul A. Mayewski and Ian Goodwin, "Antarctica's role pursued in global climate change", EOS Transactions, American Geophysical Union, p. 398, vol. 80, (1999). Published

Paul A. Mayewski and the US ITASE team, "Toward A High Resolution Southern Hemisphere Climate Reconstruction: Mapping the Antarctic Ice Sheet in Space and Time", EOS, p. , vol. , ( ). Submitted

Books or Other One-time Publications

Paul A. Mayewski
and
Frank White, "The Ice Chronicles", (2002). Book, Published
Bibliography: University Press of New England

Paul A. Mayewski
and
Ian Goodwin, "200 Years of Past Antarctic Climate and Environmental Change, International Trans Antarctic Scientific Expedition (ITASE) Science and Implementation Plan", (1997). pamphlet, Published
Bibliography: PAGES Workshop Report Series 97-1

Web/Internet Site

URL(s):

http://www.ume.maine.edu/USITASE
http://www.secretsoftheice.org

Description:

The USITASE site is maintained by the University of Maine as the official science web site. Science and Implementation Plans, links to researchers, abstracts of projects, field reports, and draft proposals are all available here. Daily logs from the team while they are in the field along with photos are archived here for use by schools and the gerneral public. Logbook entries are posted daily during the field season. An extensive Teacher's Resource section was added in 2002 including activities and lesson plans.

Secrets of the Ice is maintained by the Boston Museum of Science, with the assistance of the Science Management Office, University of Maine, and contributions from the PI"s. Resources for teachers, general information about Antarctica, and activities designed for school children are available on this site. Daily Logbook entries from the USITASE site are also here.

Other Specific Products

Product Type: Data or databases

Product Description:

Ice core data (Universities of Maine, Arizona, Colorado, Washington, CRREL)
Radar data (CRREL, St. Olaf's College)

Sharing Information:

Data will be given to WDC-Paleoclimatology.

Product Type: Physical collection (samples, etc.)

Product Description:

Snow and ice samples
Atmospheric samples

Sharing Information:

Shared between Universities of Maine, Arizona, Colorado and Washington.

Product Type: Audio or video products

Product Description:

Video footage available for 1999-2000, 2000-2001 and 2001-2002 seasons.

Sharing Information:

Boston Museum has utilized this footage for their US ITASE display and it is available on reuest (eg., National Geographic Special Documentary on Wallace Broecker).
Footage from the 2000-2001 season was used in the 'Passport to Knowledge Antarctica Update' produced 2001. Passport to Knowledge PBS project for elementary schools.

Product Type: Teaching aids

Product Description:

Elementary and Middle school laboraory exercises and a poster have been developed from US ITASE.
Teaching Mentor Peggy Lewis is available to assist teachers in developing lessons and curriculum plans.

Sharing Information:

The exercises and posters are distributed at teacher workshops run by the Wright Center (Boston University) and the Institute for Quaternary and Climate Studies (University of Maine).
19+ lesson plans have been developed in 2002 - 2003 and are posted on the US ITASE web site. US ITASE teaching mentor Peggy Lewis can be contacted at: itase.teacher@maine.edu. Contact information maintained on the Teachers Resource section of US ITASE web site.

Contributions

Contributions within Discipline:

Data resulting from US ITASE will contribute to the understanding of the following disciplines within US ITASE: meteorology, geophysics, remote sensing, surface glaciology and ice cores.

Contributions to Other Disciplines:

Contributions from US ITASE will be important to climate modelers, glacier modelers, meteorologists, remote sensors, glaciologists, atmospheric chemists, and geophysicists.

Contributions to Human Resource Development:

Several students are involved in this project each year including:
Tyler Cruickshank PhD student University of New Hampshire 1999
Joe Souney - graduate student University of New Hampshire 1999
Benjamin Cavallari - undergraduate U Maine 2000
Leigh Stearns - graduate student The Ohio State and U Maine 2000, and 2002
David Schneider- graduate student University of Washington 2000, and 2001
Dan Dixon û graduate student University of Maine 2001 and 2002
Susan Kaspari û graduate student U Maine 2001 and 2002
Tom Neumann û graduate student University of Washington, 2001
Markus Frey û PhD candidate University of Arizona 2000,2001, and 2002
Vandy Spikes û PhD candidate University of Maine 2002 and 2002
James Laatsch û undergraduate student Dartmouth College 2002
All students involved have used the data or are using the data as part of their graduate program. Undergraduates have been invited to use data and the experience as the basis for senior thesis. Data collected as part of this program will be used as an integral part of a senior/graduate level course in Paleoclimate Analysis. Data is shared with other US ITASE colleagues in order to maximize multi-disciplinary interpretations, with NSIDC, NOAA Paleoclimatology and other ITASE national programs.

Contributions to Resources for Research and Education:

Data sets are regularly incorporated in upper level undergrad and grad courses.
A data set was made available to the National Public Broadcasting' NOVA program for an activity included in their Teacher's Guide. US ITASE SMO personnel assisted with developement, advised and reviewed the resulting lesson. Published in 'NOVA Spring 2003 Teacher's Guide'p.18

Contributions Beyond Science and Engineering:

Results from this project have direct implications for understanding change in climate and chemistry of the atmosphere. Antarctica provides the largest storehouse on Earth for the recovery of such information. Scientific results from this project are presented to the public several times per year. Focus for talks deals with Antarctica's unique resources (eg., fresh water, marine biology), the continent's influence on the rest

of the Earth (eg., through controls on oceanic and atmospheric circulation) and, the continent's vulnerability to human activities (eg., CFC influence on the Antarctic ozone hole and human source acidity and toxics in the Antarctic atmosphere).

Categories for which nothing is reported: