

## PROJECT INFORMATION

<b>Lead Principal Investigator</b>	Rick Forster
<b>Institute</b>	University of Utah, Department of Geology & Geophysics
<b>Project Title / Grant #</b>	Collaborative Research: Greenland Ice Sheet Snow Accumulation Variability: Filling Knowledge and Data Voids (0909499)
<b>NSF Program and Manager</b>	NSFOD\OPPARCVANS, Dr. Martin Jeffries
<b>PFS Project Manager</b>	Susan Zager

## LOGISTICS SUMMARY

Researchers on this collaborative project--0909499 (Forster, U of Utah, LEAD) and 0909469 (Box, OSU)--will measure snow accumulation from four new and four update firn cores along two strategically located transects continuously connected by accumulation measurements from ground penetrating radar (GPR) in southeast Greenland. The four new 50 m cores will be taken from ice located between 1400 and 1700 m elevation within 60 km from the coast. The update cores at previous firn core sites along with the new cores will allow the researchers to date and compute densities for annual layers and associate them with GPR reflections continuously along a total of 1,000 km of transects over two field seasons. This effort will expand on the recently successful Arctic Circle Transverse (ACT) using the same team to date the cores and produce the GPR-derived accumulation measurements.

Researchers will conduct field work in 2010 and 2011.

For 2010, a team of 4 researchers will conduct a ~six week field effort with two main phases: an overland field camping/drilling traverse, and an airborne GPR survey.

For the former, after arriving in Kangerlussuaq around 7 April and preparing for the field work, four researchers (including one ICDS drilling expert) will put in to the first of three field sites via Twin Otter. They will spend ~four days drilling before the Twin Otter returns and moves the team/gear to the second site. The team will spend about four days drilling at the second site before moving via Twin Otter to the third (and final) site. When the work is completed, the Twin Otter will pull the team/camp out of the field and return all to Kangerlussuaq to regroup.

The researchers, joined by Jason Box, will spend several days in Kangerlussuaq preparing for the work ahead before flying via ANG to Camp Raven around 24 April. From there, they will begin a snowmobile traverse to collect ground-penetrating radar images, using Twin Otter support to make camp moves and established caches to refuel their vehicles. Ten to 14 days after beginning the traverse, the team will return to Raven Camp, fly via ANG back to Kangerlussuaq and dekit. Box and Forster will depart via commercial air around 5 May. The rest of the team will return to the US via the ANG logistics chain.

Cores and samples will be removed from the field via the Twin Otter supporting the drilling effort and retrograded to Kangerlussuaq via ANG. There, they will be stored in freezers until the combined shipment can be returned to the US via ANG cold deck for onward transport to the home institute.

CPS will provide ANG coordination, fixed-wing charters, Kangerlussuaq user days, snowmachines, sleds, camping/safety/comms gear, and fuel. ICDS will provide drill support; ESA will provide geophysical data collection/processing support. All other logistics (including core transport for analysis at DRI) will be paid by the researchers from the grant.

For the complete CPS online project record for this grant, including science objectives, go to:

[http://www.polar.ch2m.com/arlss\\_reports/arlss\\_projectsdetail.asp?cbPropNum=0909499](http://www.polar.ch2m.com/arlss_reports/arlss_projectsdetail.asp?cbPropNum=0909499)

For up-to-date information on the project's schedule, please view the online Greenland calendar

([www.polar.ch2m.com](http://www.polar.ch2m.com) > Greenland > Calendars/Schedules).

## OUTSTANDING ACTIONS AND NOTES

Issue	Responsibility	Date Due	Date Completed
Review support plan for accuracy and distribute to all field team members	PI		
Obtain all necessary permits for fieldwork	PI	24 Mar 10	24 Mar 10
Visit all hyperlinks and review all documents referred to in the support plan	Entire Field Team		
Provide a copy of aircraft contracts for field POC	CPS		
Complete medical clearance process 6-8 weeks before desired deployment date	Entire field team		Completed
<b>Note: Passports are required for Air National Guard and international travel. Also, please bring TWO copies of your passport to Greenland with you.</b>	Entire field team		
Complete Critical Success Factors	PI		Completed

## ALLOCATIONS AND SERVICES

### Allocations from Inventory -- Summary

Item	QTY
Camping gear	lot
Lumber, 2x4x8	10
Bunny Boots	4
Bamboo deadman + anchors Bamboo needed for flags as well	lot
Generator, 5kW, 2kW, 1kW	1 ea for 3 total
First Aid Kit	2
Snowmobiles and parts	4
Engine oil for drill and generators	Lot
Fuel for snowmachines, drill, stoves	Lot
core boxes	1
core tubes	140
PLB's	2
Iridium phones	4
PICO drill	1

Please see appendix for a complete list of equipment/gear.

## Other Services

Service	Comments
Twin Otter support for drilling work, camp moves, ice core retrograde	AirGL, Borek. Scope increase approved by NSF 3.26.2010
Fuel caches: mogas for snowmachine traverse	Saddle 91 gal. ACT10C 86 gal. ACT10B 60 gal. ACT10A 55 gal. Low cache 53 gal.
Air National Guard Coordination	Scotia>SFJ for all but Box; SFJ><Raven Camp SFJ>Scotia cold deck for shipment of cores SFJ>Scotia for Burgess, Miede
Freezer space Kangerlussuaq	Core storage
Kangerlussuaq user days	
Remote medical call-in support	See MAS information in safety section

## LOCATION INFORMATION

Please visit <http://www.polar.ch2m.com/> and navigate to the Greenland menu for en route and location-specific Greenland information. Prior to deployment, your entire field team should be familiar with the content of the *Greenland Guide* and, if traveling to Summit, with the guidelines provided in the *Summit Users' Guide*. Both are available electronically via our Web site's Greenland menu.

## CARGO AND CUSTOMS

All cargo required for your project should arrive in Scotia, NY, **no later than 2 weeks prior** to the desired northbound Air National Guard (ANG) flight, must be entered into our online Cargo Tracking System, and must be properly registered with Customs.

For the most current ANG flight schedule go to <http://www.polar.ch2m.com/> and navigate to Greenland > Calendars/Schedules.

If you are a **new user** requiring access to the Cargo Tracking System, contact [Jason Buenning](#).

(If you need **technical support** with the Cargo Tracking System, contact [Mike Dover](#).)

Customs instructions are available on our Web site at <http://www.polar.ch2m.com/> (go to Greenland > Customs). More information is available via the *Greenland Guide*, under Greenland on the CPS site.

The following is our current understanding of your overall cargo requirements:

### Cargo List

Items	Weight/Cube
C-130 Field gear, subsistence	950 kg
C-5 GPR, batteries	350kg
Cold deck retrograde of ice core	

**SUPPORT SCHEDULE**

Approx Date	Location	Activity
07 Apr 10	NY – SFJ via C-130	Burgess, Miede, Forster, Gacke
08 Apr	SFJ	Begin to prepare for drilling and field camp
09 Apr	SFJ	Continue preparations.
10 Apr	SFJ – ACT10A	Camp put in and drill set up, Burgess, Miede, Forster, Gacke.
11 – 13 Apr	ACT10A	Continue drilling, tear down
14 Apr	ACT10A – ACT10B	Twin Otter picks up first camp, moves to next site
14 Apr	NY – SFJ	Box arrives via C-5
15-17 Apr	ACT10B	Camp put in, set up drill
18 Apr	ACT10B – ACT10C	Twin Otter (Borek) picks up camp and moves to next site
17-20 Apr	Site	Continue drilling, tear down
21 Apr	Site - SFJ	Twin Otter (Borek) retrogrades camp, Burgess, Miede, Forster, Gacke
22 Apr	SFJ	Prepare for traverse (Box joins team)
24 Apr	SFJ - RAV	Gear plus Box, Burgess, Forster, Miede, flown into Raven (to follow RAV put in flights)
24 Apr – 04 May	RAV – Saddle	GPR traverse departs Raven to Saddle Cache and then visits all sites: ACT10D, ACT10-C, ACT10-D, ACT10-C, ACT10-B, ACT10-B, ACT10-A, Low Elevation, ACT10-A, ACT10-B, around ACT10-B, ACT10-C, ACT10-D, return to Raven.
05 May	RAV – SFJ	Gear plus Box, Burgess, Forster, Miede, flown back to SFJ via C-130
11 May	SFJ – NY	Forster, Box via commair.
21 May	SFJ - NY	May 21 Burgess & Miede return on Herc flight to NY.

For the most up-to-date information on the project's schedule, please view the online Greenland calendar (<http://www.polar.ch2m.com/> > Greenland > Calendars/Schedules).

**FIELD TEAM INFORMATION**

Name	Email
Box, Jason	<a href="mailto:box.11@osu.edu">box.11 at osu.edu</a>
Burgess, Evan	<a href="mailto:evanburgess@gmail.com">evanburgess at gmail.com</a>
Forster, Rick	<a href="mailto:rick.forster@geog.utah.edu">rick.forster at geog.utah.edu</a>
Miede, Clement	<a href="mailto:clement.miede@gmail.com">clement.miede at gmail.com</a>
Gacke, Terry	<a href="mailto:tlgontheice@hotmail.com">tlgontheice at hotmail.com</a>

**PROJECT CONTACT INFORMATION**

## Research Team

Role	Name	Email	Phone / Fax
Collaborator	Jason Box	<a href="mailto:box.11@osu.edu">box.11 at osu.edu</a>	614 247.6899 /
Principal Investigator	Rick Forster	<a href="mailto:rick.forster@geog.utah.edu">rick.forster at geog.utah.edu</a>	801 581.3611 /801 581.8219

## CPS Team Members

Contact for	Name	Email	Primary Phone
Greenland science planning & support	Susan Zager	<a href="mailto:Susan_at_polarfield.com">Susan at polarfield.com</a>	Denver: 720.320.6159
Greenland science planning & support	Robin Abbott	<a href="mailto:Robin_at_polarfield.com">Robin at polarfield.com</a>	Denver: 303.748.8507
Kangerlussuaq base operations	Kathy Young	<a href="mailto:Kathy_at_polarfield.com">Kathy at polarfield.com</a>	Denver: 720.320.6160 Greenland: 011.299.524218
Scotia (Stratton Air Base) operations & customs	Earl Vaughn	<a href="mailto:Earl_Vaughn_at_gmail.com">Earl Vaughn at gmail.com</a>	Scotia cell: 518.605.0979
Sat phones & comms	Roy Stehle	<a href="mailto:Roy.Stehle_at_sri.com">Roy.Stehle at sri.com</a>	Menlo Park: 650.859.2552
Remote Medical (kits & service) and Medical/Dental Clearance (PQ)	Robbie Score	<a href="mailto:Robbie_at_polarfield.com">Robbie at polarfield.com</a>	Denver: 303.906.0093

## CPS Offices

Denver	Kangerlussuaq	Scotia
Polar Field Services 8110 Shaffer Parkway Suite 150 Littleton, CO 80127 Tel: 303.984.1450/1439 Fax: 303.984.1445	CH2M HILL Polar Services Attn: Name of Employee/Researcher Postboks 1015 DK-3910 Kangerlussuaq, Greenland Tel: 011.299.841598 Fax: 011.299.841599	Earl Vaughn C/O 109 <sup>th</sup> Aerial Port Bldg. 20 Stratton Air Base Scotia, NY 12302-9752 Tel: 518.344.2635 Cell: 518.605.0979 Fax: 518.344.2537

## Other

Organization	Internet	Phone
Medical Advisory Service (MAS) <b>(see below for Remote Telemed #)</b>	<a href="http://www.medaire.com/corp_meldlink.html">http://www.medaire.com/corp_meldlink.html</a>	Office: 480.333.3771

## SAFETY, ENVIRONMENT, HEALTH and PERMITS

Effective January 1, 2010 the Government of Greenland assumed responsibility for the permitting process for research in Greenland. All science teams planning to conduct research in Greenland must complete an **annual application** in order to obtain approval from the Government of Greenland. The application forms are available from the Department of Domestic Affairs, Nature and Environment at <http://www.nanoq.gl/expeditions> or by sending an email to [ekspeditioner at gh.gl](mailto:ekspeditioner@gh.gl). Applications are submitted directly through the Department of Domestic Affairs, Nature and Environment. Be advised that a new fee of 4000 DKK has been put in place for permits. For assistance with the application process, contact:

Martin Schiøtz  
 Head of Section  
 Section of Nature  
 Department of Domestic Affairs, Nature and Environment P.O. Box 1614  
 3900 Nuuk  
 Greenland  
 e-mail: [ekspeditioner at gh.gl](mailto:ekspeditioner@gh.gl)

### Medical Clearance

Arctic Program participants traveling into the Greenland field generally must pass a National Science Foundation-mandated physical and dental exam. All field team members should plan to complete their Physical Qualification (medical and dental clearance) process 6-8 weeks prior to travelling to Greenland. For more information, refer to CPS' *Greenland Guide*, available at <http://www.polar.ch2m.com/> under Greenland.

### Medical Advisory Service (MAS) Support

If you need medical advice/assistance, do not hesitate to contact Medical Advisory Service (MAS) using the card included with the medical kit or the information below. Be sure that each team member knows where the kit is located and understands how to use the MAS service in the field. For further information on MAS, please visit our Web site <http://www.polar.ch2m.com/> and navigate to Medical>Remote Medical Services/Kits.

#### **MAS 24/7 Telemed Service**

Worldwide Phone: 1.480.333.3876  
 Fax: 1.480.333.3821  
 Member ID: CH2M HILL Polar Services

### RISK ASSESSMENT

See Appendix for Risk Factors and Mitigation.

### CRITICAL SUCCESS FACTORS

Please list the factors that are most important for the success of your science. We track these factors in order to measure the success of CPS' support. Examples might be the availability of the helicopter or camp gear.

<b>Factors</b>
availability of TO flights to relocate between 3 core locations.
caches placed by TO to support snowmobile traverse.
snowmobiles and camp gear provided for traverse.
Herc flights into and out of Raven for traverse.

### GOVERNMENT AND PERFORMANCE REPORTING ACT OF 1993 (GPRA)

NSF/OPP requires your help in complying with the Government Performance and Reporting Act of 1993 (GPRA). One measure of CPS' performance is a "facility-performance metric" which counts the number of productive days your project has in the field while relying on CPS facilities or support. Please keep track of any "lost days" and report these to us at the end of the season.

### APPENDICES

- Risk Assessment**
- Allocations from Inventory**

**2010 Risk Assessment – Forster/Box ACT-10**

Following is a risk assessment exercise. CPS has provided some suggestions but this is neither a comprehensive document nor a static process. The risks inherent in field operations and the ways to mitigate these risks should be discussed with all team members.

Factor	Mitigation & control
Bears	<ul style="list-style-type: none"> <li>-Hire Native guides (Provide clear expectations/procedure)</li> <li>-Install bear fence. Designate a fence monitor to check daily.</li> <li>-Carry radios to alert others to bear in area.</li> <li>-Develop a plan for bear in or near camp</li> <li>-Keep a clean camp</li> <li>-Participate in bear safety training</li> <li>-Carry bear spray</li> <li>-Use bear Containers</li> </ul>
Chainsaw	<ul style="list-style-type: none"> <li>-Participate in chainsaw training</li> <li>-Use appropriate PPE (Personal Protection Equipment)</li> </ul>
Cold Related Injuries-weather	<ul style="list-style-type: none"> <li>-Team members participate in a cold weather injury training course such as Wilderness First Aid or Wilderness First Responder</li> <li>-Wear proper clothing</li> <li>-Appropriate camping gear, insure sleeping bags are adequately rated</li> <li>-Check the forecast before going out of camp/town</li> <li>-Watch the weather while out</li> <li>-Be mindful of hydration, carry sufficient food</li> <li>-Develop and share your travel plans</li> <li>-Have and share an emergency plan for bad weather</li> </ul>
Communications	<ul style="list-style-type: none"> <li>Carry the appropriate communications system: PLB, Iridium, air TO ground, HF radios</li> <li>-Assure your phone and/or radio is fully charged before going out and Carry a spare battery.</li> </ul>
Drills/augers	<ul style="list-style-type: none"> <li>Participate in drill/auger training</li> </ul>
Emergency Plan	<ul style="list-style-type: none"> <li>Compile a list of emergency contacts for your field team and share it with critical participants including your home institution and CPS.C12 share your satellite phone number as a means for others TO contact you.</li> </ul>
Fixed Wing Travel	<ul style="list-style-type: none"> <li>-SAR plan in place</li> <li>-Attend a pilot briefing</li> <li>-Carry survival bags on the aircraft if doing day trips, or if multiple put in flights insure people travel with survival items from camp supplies</li> </ul>
Fuel Handling	<ul style="list-style-type: none"> <li>Participate in fuel handling training</li> <li>-Review current AHA (Activity Hazard Analysis)</li> <li>-Have a plan for fuel spills/first aid</li> </ul>
Gas Cylinder Handling	<ul style="list-style-type: none"> <li>- Review Haz Comm</li> <li>- Review MSDS (Material Safety Data Sheet)</li> </ul>
Generator	<ul style="list-style-type: none"> <li>-Attend generator training</li> <li>-Review current AHA (Activity Hazard Analysis)</li> </ul>

Glacier Travel	<ul style="list-style-type: none"> <li>-Participate in glacier travel/crevasse rescue training</li> <li>-Include a mountaineer on team</li> <li>-Have a SAR plan in place</li> <li>-Carry and use equipment and gear properly</li> </ul>
Hazardous Materials	<ul style="list-style-type: none"> <li>-Haz Comm SMS (Safety Management Standard)</li> <li>-Identify items for hazardous material transportation</li> <li>-Review MSDS (Material Safety Data Sheet)</li> </ul>
Heavy lifting/body strains and sprains	<ul style="list-style-type: none"> <li>-Use proper lifting techniques</li> </ul>
High Altitude	<ul style="list-style-type: none"> <li>-Participate in high altitude training</li> <li>-Have medical call in service available</li> <li>-Have SAR plan in place</li> <li>-Have oxygen available in high altitude camps</li> <li>-Develop plan to acclimatize</li> <li>-Consult with physician on use of medication for acclimatization</li> </ul>
Medical fitness for remote work outside ANG flight period	<ul style="list-style-type: none"> <li>Follow NSF Physical Qualification process</li> </ul>
Power Tools	<ul style="list-style-type: none"> <li>-Participate in a power tools training</li> <li>-Review current AHA (Activity Hazard Analysis)</li> </ul>
Remote Camp	<ul style="list-style-type: none"> <li>-Have a remote medical call in service</li> <li>-Have a SAR plan in place</li> <li>-Have a First Aid kit available</li> <li>-Participate in First Aid training- be sure that someone or all field personnel have Basic First Aid training at a minimum</li> <li>-Have a communication/ check-out/check-in plan in place</li> <li>-Keep a camp roster by each radio to be used in conjunction with the check-out/check-in plan</li> <li>-Develop a list of current camp member's training levels and certifications</li> <li>-Maintain back-up equipment and supplies in case of emergency (comms, generators, tents, food)</li> <li>-Maintian an emergency contact list, include all applicable agencies, field team members, provide camp location and description to local SAR groups</li> <li>-Develop a plan for general camp operations including camp hygiene and handling human waste</li> <li>-Participate in PLB (Personal Locator Beacon) training</li> <li>-Participate in GPS (Global Positioning System) training</li> </ul>
Snowmobile Travel	<ul style="list-style-type: none"> <li>-Participate in a snowmobile training</li> <li>-Have SAR plan in place</li> <li>-Use appropriate Personal Protection Equipment/helmets</li> <li>-Carry Survival Gear on extended trips</li> <li>-Use radio communications between snowmachines</li> <li>-Carry a PLB (Personal Locator Beacon)</li> <li>-Carry a GPS (Global Positioning System) unit</li> </ul>
Structure Fire	<ul style="list-style-type: none"> <li>-Maintain appropriate fire extinguisher units for building</li> <li>-Develop or review EAP (? from kc: I don't know what this stands for)</li> </ul>

	<ul style="list-style-type: none"> <li>-Have a SAR in place for remote camps</li> <li>-Maintain redundant shelters in case of loss of structure due to fire</li> </ul>
Tower Climbing	<ul style="list-style-type: none"> <li>-Participate in tower climbing training</li> <li>-Use the correct tower climbing equipment at all times</li> <li>-Review Tower Climbing AHA (Activity Hazard Analysis)</li> </ul>
Trench/pit Work	<ul style="list-style-type: none"> <li>-Use appropriate PPE (Personal Protection Equipment)</li> </ul>
Water – Availability, Potability	<ul style="list-style-type: none"> <li>-Investigate the use of a filtration system and acquire one if necessary</li> <li>-Carry water in</li> </ul>
Twin Otter specific	TO called away to SAR, breakdown, weather, two clients, other delay

Allocations from Inventory

Item	QTY
Lumber, 2x4x8	10
stove lighting paste	
Bunny Boots	4
Arctic Oven tent	1
Bamboo deadman + anchors Bamboo needed for flags as well	multiple
GeoMtn. 3; 2 person tents, 4 season	4
sleeping cot	4
sleeping pads	4
Generator	1
Generator	1
plywood: 2' x 8' 1/4" thickness	6
plywood w/ hole for drilling	1
2 x 4s	6
toilet box	1
electric chainsaw	1
First Aid Kit	2
Toolset	1
Cook kit, Includes: various size pots, skillet, thermos, 5 plates, 5 cups, 5 forks, 5 knives, cooking knives	1
shovel, chopping	2
snowmobiles	4
drive belts	4
injection oil	1 litre per 15 gal
tow-hitches	4
Fuel for drilling, snowmachines	
Engine oil for drill and generators	1
Generator	1
core boxes	25
core tubes	140
electric drill	1
Coleman multifuel stoves. Recommend Coleman dual fuel stoves (white gas or mogas)... propane won't flow in cold temps	1
land mobile transceivers	4
AC charging cradles	2
air band transceiver	1
PLB's	2

Iridiums	4
External antenna for iridium phone	1
PICO drill	1
thermos	4
plastic funnel for stove and snowmachine	2
Rags	5
bungies	Bunch
Whisperlite	2
water pots	1
fire extinguisher	1
duct tape	2
extension cords, regular	1
fuel pump, plastic funnel	1 kit
light anywhere matches	1 box
lighters	3
fire paste	1

