Field season 2022

East GReenland Ice core Project (EGRIP) 2015-2021(2023): Fifth year of EGRIP deep drilling.

Prepared by Ice and Climate Group, NBI
for
The EGRIP project responsibles and participants and Danish and Greenlandic authorities.

Picture 1: Carpenters garage and main dome. Picture taken by GEUS team 17th August 2021

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EGRIP 2022 introduction

This report provides international partners and Danish and Greenlandic authorities information on field activities in Greenland and it provides information to the participants on the conditions in Kangerlussuaq, and the field camp. It includes a summary of all individual travel dates and information on science programs. It also contains information and rules on environmental issues, work safety and disaster preparedness. All participants are assumed to be familiar with the content of this report.

In addition to general information, the report contains reference information of special interest for the Field Operation Managers and Field Leaders.

The SARS-Cov-2 pandemic has really upset all planning of completing the deep drilling and surface science work at EGRIP. The entire field seasons of 2020 an 2021 were cancelled. This season, 2022, is the field season that cannot be cancelled. After three years of abandonment, the EGRIP camp is disappearing in the snow and we need to go to EGRIP to dig out camp and continue drilling.

The authors wish to express sincere gratitude to the U.S. National Science Foundation and their logistical agent Batelle ARO Polar Field Services (PFS) and to the New York Air National Guard (109th) for their assistance and their supportive actions in anticipation of the upcoming EGRIP field campaign. Without this assistance, little of what is planned for the 2022 season could be realized.

Copenhagen, February 11th, 2022

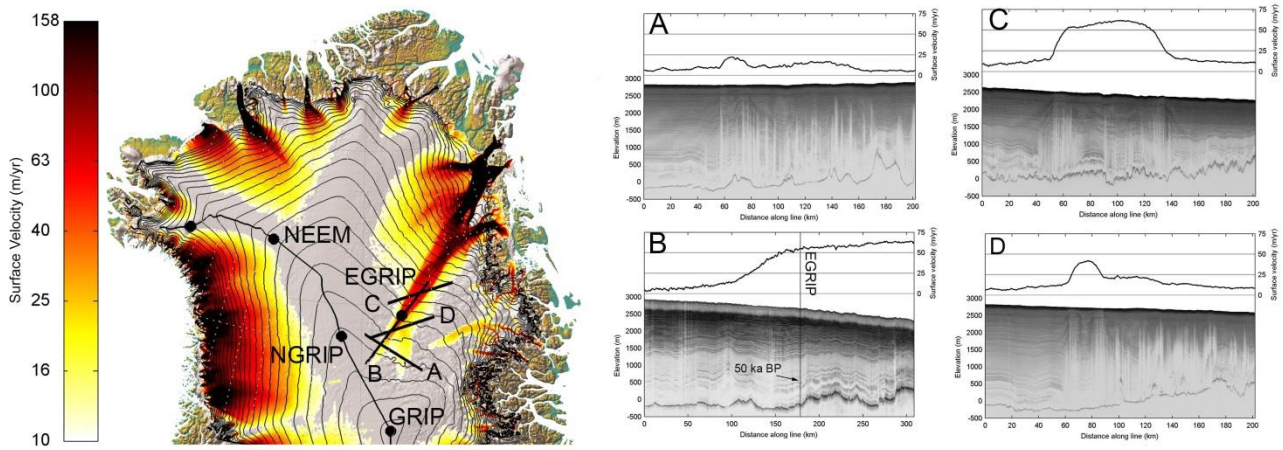
Iben Koldtoft, Trevor Popp, Dorthe Dahl-Jensen, Marie Kirk and J.P. Steffensen

The East Greenland Ice drilling Project (EGRIP)

EGRIP 2015-2023: Season 2022

Background:

The behavior of the fast flowing ice, ice streams through the Greenland ice sheet, is not well understood. The ice streams discharge ice into the ocean that accounts for half the loss of mass from the Greenland ice sheet and many ice streams have doubled their velocities during the last decade. There is a need to understand the processes of the ice streams before they properly can be included in ice sheet models which will enable predictions of future loss of mass from the ice streams and thus improve estimates of future sea level rise.



Map of Greenland and the North East Greenland Ice Stream (NEGIS). Velocities from RADARSAT synthetic aperture radar data are shown in color (Joughin, Journal of Glaciology, 2010) The deep drill sites and the main ice ridge are marked as well as the profiles (A-D) where radio echo sounding profiles have been recorded by aeroplane and surface velocities have been extracted from the map to the left. (B) Profile from University of Kansas 1999 (19990525_01_09, 19990525_01_10, 1990525_01_16) *showing that the ice thickness at the drill site, EGRIP, is 2550 m and that climatic undisturbed layers are detected to 50.000 years before present. The surface velocity is 51 m/yr at the drill site, EGRIP. (A,C,D) Profile from NASA Operation IceBridge 2013 using the University of Kansas depth penetrating radar across the ice stream clearly showing the margins disturbed by shear deformation (*profiles from 20120404_01_16 to 20120404_01_19 (A); *20130402_01_24 to 20130402_01_27 (C); 20130423_01_3 to 20130423_01_6 (D)) (figure produced by D.Dahl-Jensen)*

In North East Greenland, the largest ice stream in Greenland begins right at the central ice divide and cuts through the ice sheet in a wedge shape to feed into the ocean through three large ice streams (Nioghalvfjerds isstrømmen, Zachariae isbræ and Storstrømmen). The onset of the ice stream on the ice divide is believed to be caused by strong melting at the base and the ice reaches velocities over 100 m/yr 200 km from the ice divide, but still 500 km from the coast where the ice is heavily crevassed. It is possible to find a site without crevasses, where the ice is flowing as an ice stream. Drilling an ice core through the 2550 m of ice reaching to the bedrock would allow us to reach the following goals:

-study the dynamics of the ice flow in an ice stream by ice rheology and deformation studies of the ice core.

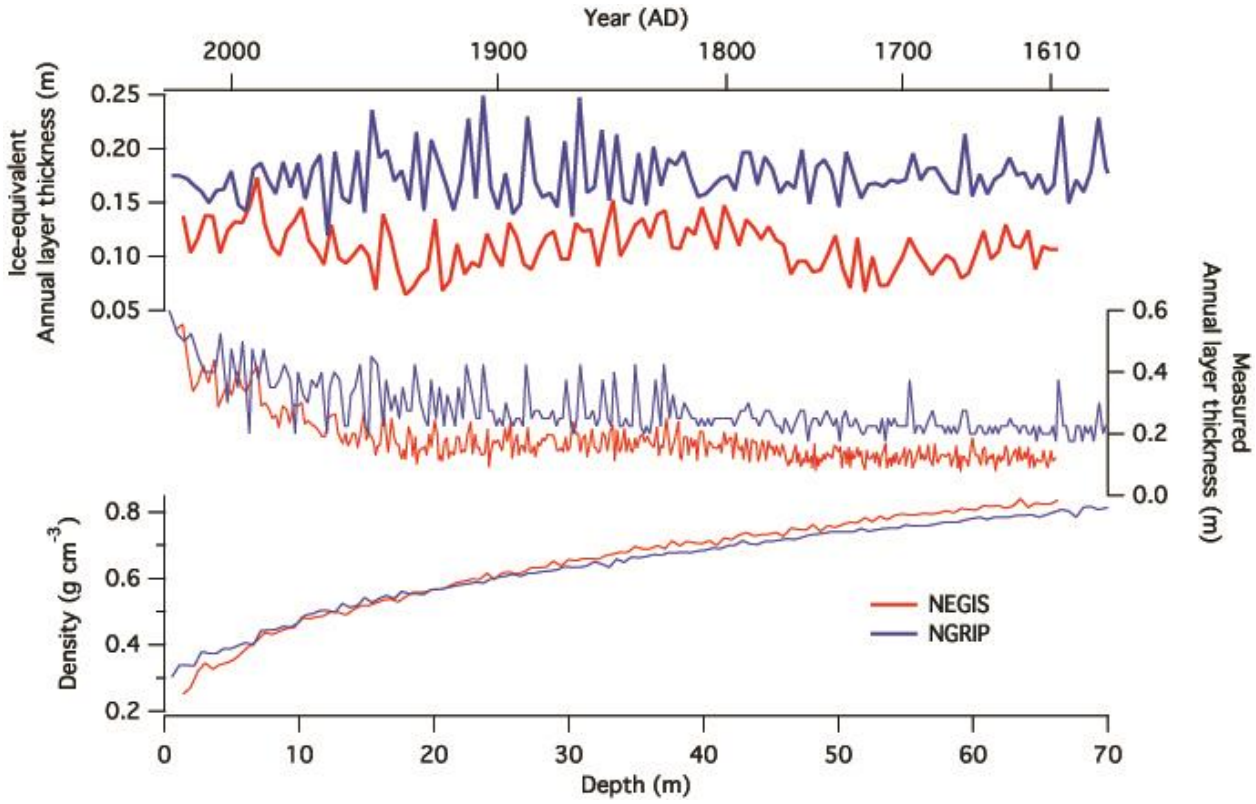
-study the dynamics of the ice flow by borehole observations of basal sliding, borehole deformation, and basal water processes.

Besides from the ice dynamic goals the internal radio echos sounding layers traces layers that are more than 50.000 years old. The layers have been traced back to other deep ice cores in Greenland (P.Vallelonga et al.: Preliminary glaciochemical and geophysical study of the Northeast Greenland Ice Stream (NEGIS), Cryosphere). Climatic studies of this period and especially the present interglacial (the last 11.000 years), a period where records of high resolution chemistry and greenhouse gasses are not available from other Greenland ice cores is an important goal for the project:

-high resolution climate records of greenhouse gasses, water isotopes and impurities through the last 25.000 years covering the onset of the present interglacial, the climatic optimum 8,000 years ago and the industrial period of the past two hundred years.

In 2012 a 67 m long pilot ice core was drilled in collaboration with researchers from the Alfred Wegener Institute (Germany) and the Penn State University (USA). The ice core properties are well preserved and the site is promising. The AWI ski equipped DC3 (Polar 6) supports the mission.

In 2012 a 67 m long pilot ice core was drilled from the proposed EGRIP drill site (75.6268N 35.9915W). The annual layer thickness is 11 cm and annual cycles are detected in water isotopes, dust and chemical impurities. Also, in 2012 detailed radio echo sounding and seismic work was done by researchers from the Penn. State University. The ice flows 50+ m/yr horizontally to the Northeast at the selected site. The shear margins of the ice stream are observable on the surface but the bedrock topography does not show a trough in which the ice stream flows. The radio echo sounding and seismic measurements show zones with basal water and also zones with less water. Studies of the flow pattern from the internal layers and from ice stream models could determine if the ice stream has been permanent or if it can switch on and off.



Reconstruction of the annual layer thickness from the 67 m shallow ice core from NEGIS. The accumulation rate is 0.11 m/yr and a significant increase of accumulation in the more recent warmer years is not observed. The results are compared with records from NGRIP. (P.Vallelonga et al, Preliminary glaciochemical and geophysical study of the Northeast Greenland Ice Stream (NEGIS), Cryosphere)

The deep drilling project was originally planned for the years 2016 to 2020 however, due to the global COVID pandemic field work in 2020 and 2021 was completely cancelled and the project was extended to 2023. The project is an international collaboration between several nations. National funding agencies in Denmark, Germany, Japan, Norway and the U.S. have committed themselves to support EGRIP, both financially and logistically. The in-kind support by U.S. NSF, by making ski equipped LC-130 available to the project and by sharing costs for flights and fuel and German in-kind support by ski equipped Basler (DC3) and vehicles is tremendously valuable to the project. At the EGRIP steering committee meeting in Copenhagen in the fall of 2016, Switzerland, France and China became contributing partners. In 2019 Canada became a partner. The U.K., Italy, Sweden, South Korea and Iceland are accociated partners that would supplement the EGRIP research plan well.
The main part of equipment and infrastructure needed to establish the EGRIP camp was at the NEEM site. In 2015 heavy sleds with cargo were excavated, the two garages were taken down and stowed and everything was hauled 460 km from NEEM to EGRIP by traverse train. The main building, the Dome, which was put on skis in 2011, was pulled to the EGRIP site with tractor support by the National Science Foundation. At EGRIP, the dome was parked on the ski, the two garages were built and outfitted, while the rest of the cargo was stored on sledges.


Left: The main dome at its parking position at EGRIP in June 2015.The undercarriage is covered by plywood before snow is packed around the base. Right: Photo from June 9 2015 just before the door is closed and crew leaves camp. Note the snow pack around the base.

In 2016, the EGRIP camp became almost fully equipped, and a trench system consisting of drill trench, science trench, ice core buffer, storage cave, tunnels, ramp and stairwells was constructed using the balloon technique. Drill trench and science trench were partially outfitted and the first 110 m of the deep ice core was drilled.

In 2017, the infrastructure of both science and drill trenches were completed. A freezer unit was installed inside the connecting tunnel between drill trench and core buffer. It was kept at -30 C and served as core logging area. At the end of 2017 season, the drillers reached a depth of 900 m. The top 300 m ice core was processed in the science trench, while the rest was stored in the buffer for de-stressing. Due to the core logging freezer, the crew managed to keep the cores from the brittle zone (550 m – 900 m) at very high quality. Besides drilling and processing, EGRIP camp also supported surface snow studies, studies of water vapour and aerosols, a firn air sampling program, the Swiss RADIX fast access drill test and some associated programs.

In 2018 the main drilling continued to a depth of 1750 m, past the brittle zone and well into ice from the last glacial period. In the processing line, staff managed the complicated task of logging fresh brittle ice and put it into storage, logging brittle ice from 2017 and processing it, and finally catching up with the drillers and ending processing at 1750m. The CFA isotope laboratory was unable to complete their measurements. As the brittle zone is past, the freezer unit of the logging cabin was dismantled.

In 2019, the CFA isotope laboratory got a head start to catch up with the processing line. The EGRIP main drilling progressed slowly. The drillers had issues with high amounts of chips in the fluid, which required intensive filtering and progressively harder core breaks. At one time, the drill became disengaged from the cable, which required the manifacture of a special hook to collect the drill from the bottom of the hole. As the number of hard core breaks grew, the winch and the cable was damaged and the winch motor was not stong enough. Drilling was halted on July 9th at a depth of

2122m. This had implications on ice core processing, as most of the core was processed by mid-July. It was decided to cancel ice core processing for the remainder of the season, except for CFA isotopes and Physical Properties. Also, the EGRIP Executive Committee decided that all future EGRIP main core processing should take place in at cold room at AWI, Bremerhaven.

The field seasons of 2020 and 2021 were both cancelled due to the COVID pandemic.

Many of the deep drillings in Greenland have been made as collaborations between Denmark, US and other nations. We have a proud record of very efficient and successful projects. Part of our tradition is to bring science and scientists to the field camp. Many measurements are performed on the fresh ice core in the field camp in a clean environment. At EGRIP we are able to continue staffing in a similar way as NEEM, where 270 individuals spent 12,500 man days in camp with a man day distribution of 52 % young scientists, 26 % senior scientists and only 22 % logistics. Thus the project not only produces a deep ice core, but also provides education for young researchers and enhanced international collaboration.

We believe that the EGRIP project will give unique knowledge of the flow of the very important and unknown ice streams which will lead to improved predictions of sea level rise. The deep ice core drilling should be followed by additional studies of the NEGIS ice stream, and at the moment the research vessel Polarstern from AWI has a program planned in the ocean in front of the ice stream and in 2018 AWI carried out an airborne radar campaign. Penn. State University research group is planning seismic work on the whole NEGIS ice stream and especially the onset zone of the ice stream in the center of the Greenland ice sheet to understand why the ice stream is here. We will work towards bringing further projects to the NEGIS ice stream and the EGRIP ice camp with infrastructure and airfield for ski planes opens the gateway for additional projects.

Drilling at EGRIP 2022

<u>Short summary of the situation for deep drilling in 2022:</u>

In 2019, the damaged cable was unwound from the winch and transported to the surface. A new cable was placed in the drill trench but not yet mounted on the winch. The winch drum may need repairs. A new and stronger winch motor will be mounted. However, due to the COVID cancellations, the trenches have been abandoned for three years and the ceiling height is reduced to an unknown degree. Large amounts of snow will have to be removed from the ceilings and connecting tunnels and the drilling infrastructure will have to be realigned. We do therefore not expect any drilling in the first two months of field work. It is our hope that drilling may begin and progress for a few weeks before the end of the season. It is the hope that the EGRIP deep drilling may be completed in 2023.

Surface Drilling 2022:

AWI will conduct shallow drilling at the shear margin Southeast of EGRIP camp. The AWI shallow drill will be used. There are no plans to engage the Danish shallow drill.

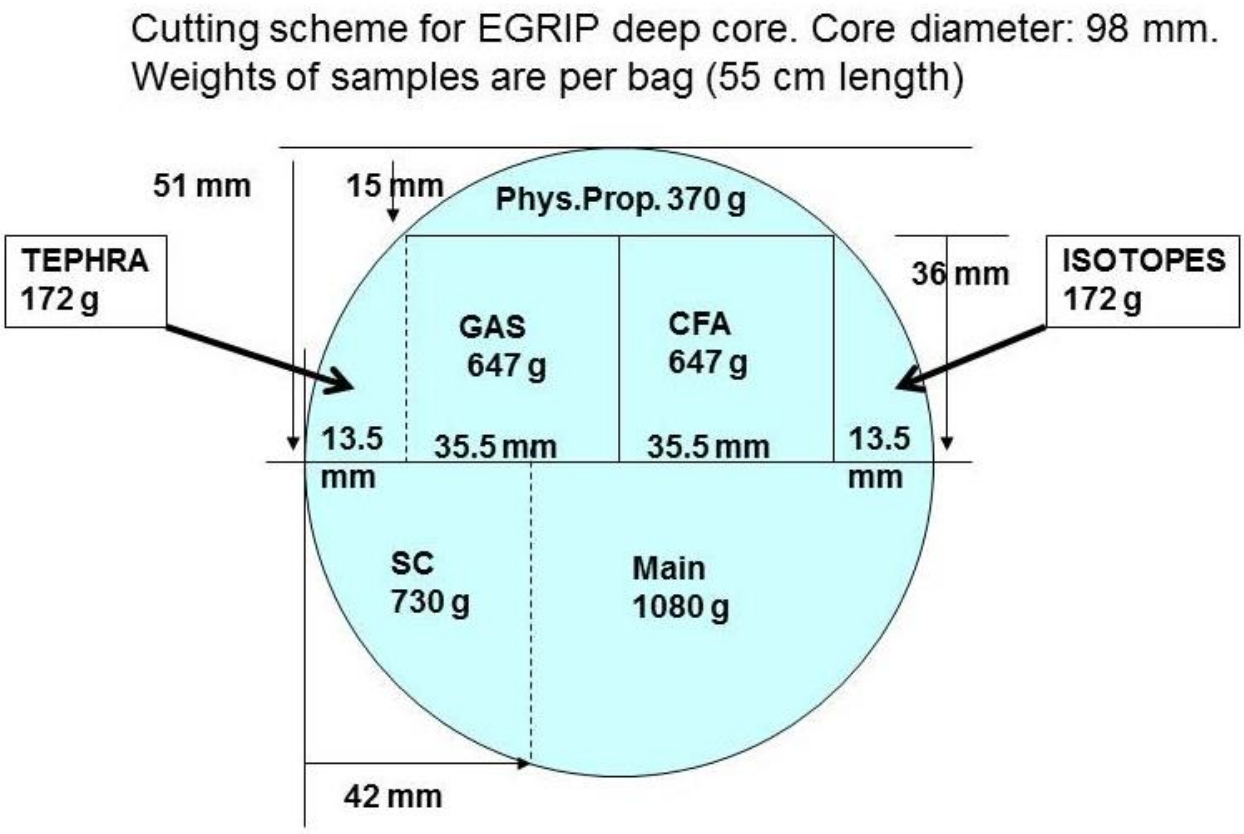
Scientific plan for EGRIP 2022

Most of the processing line has been closed down, and all warm labs. in the science trench have been taken down. The deep ice cores produced in 2022 will be logged and a reduced program of DEP, cuts with horizontal saw and subsequent ECM and line scanning will be done before the core is packed for later processing at AWI. The Physical Properties team will continue to monitor the ice samples.

Details on science and processing plan.

The following studies and analyses are planned:

Logging and documentation:
All freshly drilled ice cores will be fitted to previous runs and core quality and integrity documented. Core depth and bag numbers will be assigned. Logging and documentation is done inside the logging cabin.



Di-electric properties measurements (DEP). This integrated AWI system records di-electric properties on the full and uncut core.

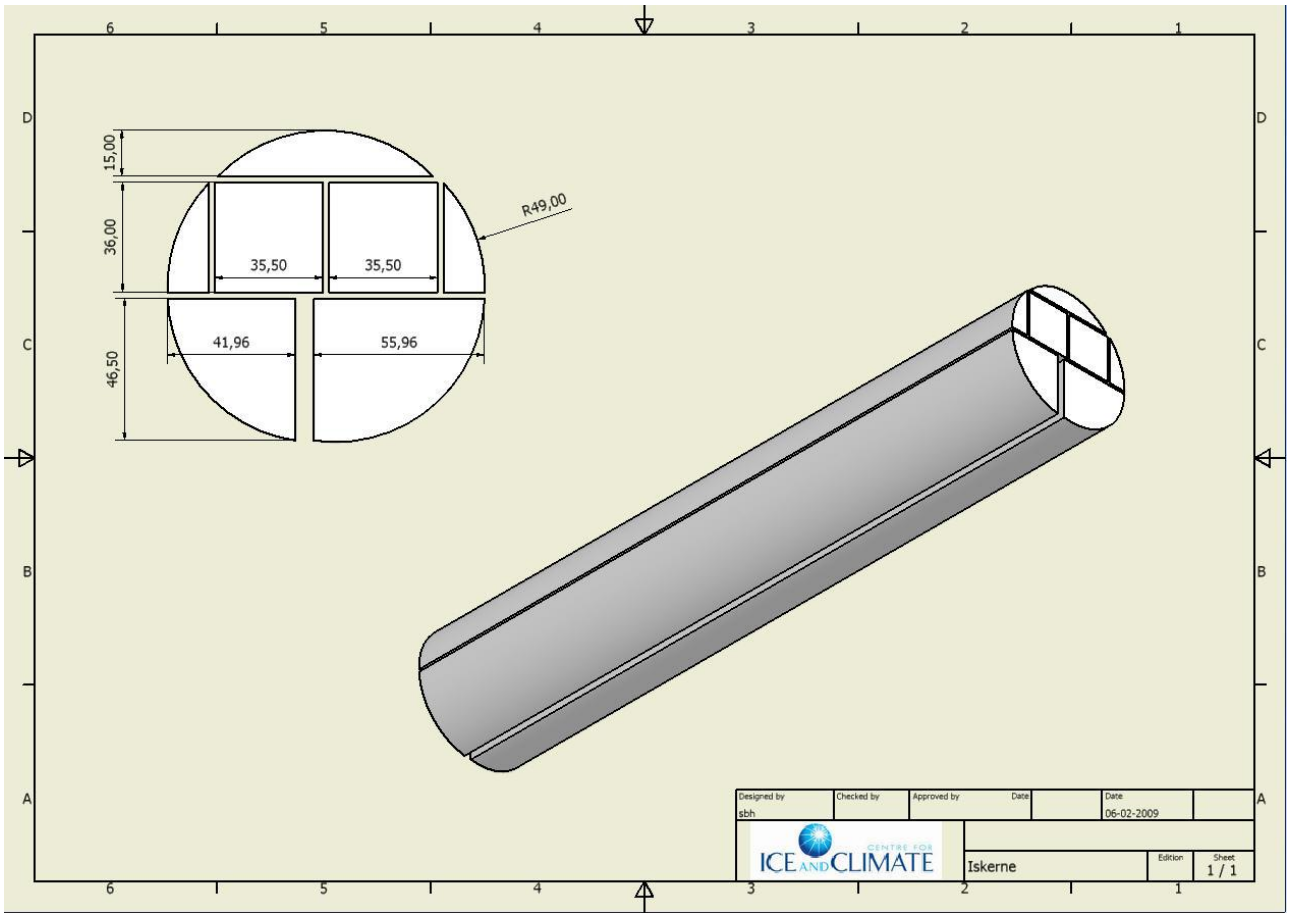
Cutting of sample sections (Horizontal band saw, or Swiss saw). The core will not routinely be split in camp however, the Swiss saw will on occasion be used by the PP team to cut specific samples.

Measurements of physical properties. Samples for measurements of physical properties will be packed; but for those analyses that require fresh ice, some measurements will be done in the field.

Ice core packing. All of core sections for Europe and processing at AWI will be packed in crates and sent to Copenhagen.

Both Viessmann cabin warm laboratories in the science trench have been taken down. One cabin will be setup on the surface for the drone isotope project.

Processors will follow a detailed ice core cutting, processing and sampling plan that has been made to comply with EGRIP Steering Committee decisions.



Associated projects at EGRIP:

Surface movement by GPS (Christine Hvidberg, Aslak Grinsted).

Surface velocity and strain rates will be measured by GPS in 2022 at EGRIP. The purpose is to provide 8 year long records 2015-2022 of surface movement at EGRIP and along NEGIS to validate satellite observations and reveal spatial and temporal variations of flow speed and elevation.

In 2015, a strain net of 17 GPS poles were established at EGRIP and their 3D positions were measured (latitude, longitude, height). These poles were re-measured in 2017, 2018 and 2019 and will be measured again in 2022. See figure. A permanent GPS pole was established in 2015 at EGRIP. The station is planned as part of a survey along the NEGIS ice stream from the ice divide to the coast done in collaboration with DTU-Space, and the station will be monitored continuously. The station will be maintained and checked in 2022. More permanent poles were established in 2016, both upstream and downstream from EGRIP. Additional detailed surveys of surface movement are planned in 2022 in particular regions near EGRIP using surface GPS.

At this time, it is not known how many marker poles have disappeared in the past three years.

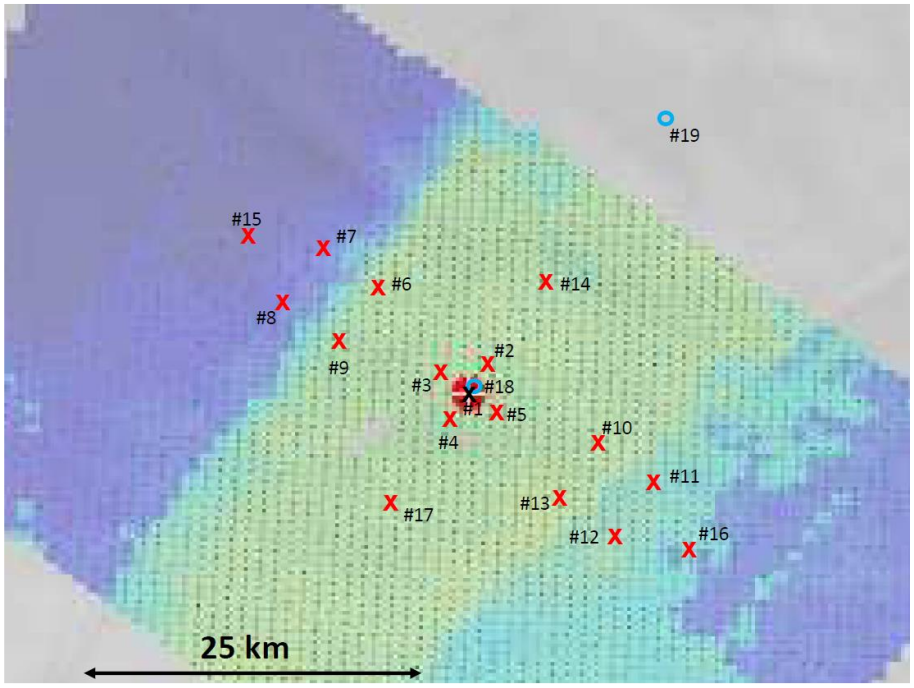


Figure: Map of the strain net at EGRIP showing the 17 poles established in 2015 (red crosses) and the two permanent GPS stations (blue circles). Only the permanent station close to the EGRIP camp as established in 2015. The EGRIP camp is indicated by the black cross. The background shows surface velocity derived from an optical IV method (Imgraft/Grinsted).

AWI ice stream margin S5 shallow coring (Maria Hörhold and Daniel Steinhage, AWI).

Several shallow core drillings are planned at shear margin of the ice stream, close to EGRIP. The team will use the AWI shallow drill.

EGRIP surface processes program (Hans Christian Steen-Larsen (Hans.Christian.Steen-Larsen@uib.no) and Maria Hoerhold (Maria.Hoerhold@awi.de), Wang Feiyue (Feiyue.Wang@umanitoba.ca)

As the bamboo forest has been abandoned for three years, it is considered lost. The team will focus on sampling two long (50 m) linear trenches that will be excavated in the clean zone with the Pistenbully snow blower.

There will be a Canadian sampling program for Mercury.

Ground based deep ice sounder (Prasad Gogineni, University of Alabama and Dorthe Dahl-Jensen, UCPH and U. Manitoba).

Four people from the University of Alabama, AWI and Copenhagen will run the CPH ice deep sounder in the EGRIP area from mid June to mid July. The radar assembly will be pulled by a Pistenbuly with transmit and receive antennas resting on inflated cushions (balloons).

AWI DAS seismics (Olaf Eisen, AWI)

From late July to mid August, several lines of optical seismic cable arrays will be laid out around EGRIP camp. In the first phase, passive seismic recording will be done while the deep ice core drill is active. In the second phase, active seismic recording will be done using explosives that have been flow to EGRIP by the AWI Basler.

AWI Phase sensitive radar, P-RES (Angelika Humbolt, AWI)

P-RES data collection will occur from mid-June to mid-July.

AWI airborne radar survey (Daniel Steinhage, AWI and Daniela Jansen, AWI)

The measurement campaign will last for three weeks where EGRIP will serve as the logistical hub and refuelling site the the AWI Basler Polar 5.

CryoEgg (Elizabeth Bagshaw, University of Cardiff).

The Cryoegg Project will develop a wireless system which uses radio frequency to measure the properties of deep ice and subglacial meltwater and return data to the surface. We are creating a ‘Cryoegg’, a small, wireless sensor that can measure the temperature, pressure and chemistry of the meltwater underneath the ice. The project is funded by the UK Engineering and Physical Sciences Research Council, and harnesses communications engineering methods to design a bespoke subglacial sensor for fast flowing ice. The Cryoegg must be able to collect fundamental measurements of water beneath up to 2.5 km of ice, be free to move within meltwater present beneath the ice, and transmit data to the surface. The sensor suite must be able to operate in low temperature, high pressure conditions, with no external power supply for up to 12 months. The radio data transmission must be efficient, able to pass through mixed media (ice, sediment, water, cracks), and received and recorded at the surface by a low power, small footprint receiver which can operate for prolonged timescales. Our tests at EGRIP will ensure the sensor is capable of operating in its

target environment, and eventually collect data from beneath the ice stream. The project will enable the investigation of one of the last frontiers on planet Earth: subglacial environments, the cold, dark, high pressure zones beneath kilometres of ice.
In 2022, the cryoegg team will perform tests during the pull-out period an August.

400 m ice coring at TUNU site (Joe McConnell, DRI).

As arranged with the National Science Foundation, EGRIP will support the 400 m ice coring project at TUNU. The TUNU team will use the EGRIP camp as staging area for Arctic trucks and equipment. The team will traverse to TUNU from EGRIP and return a month later. The team will fly out of EGRIP by AWI Basler and EGRIP will ship trucks, equipment and ice cores back to Kangerlussuaq in July.

Earthquake station at EGRIP (Trine Dahl-Jensen and Tine B. Larsen, GEUS)

Starting in 2000, the seismological groups at KMS and GEUS – now all at GEUS – have placed earthquake seismic stations at over 20 sites in Greenland, both on the coast and on the ice sheet. We record globally occurring earthquakes, and use the data to investigate the local structure beneath and between the stations. A station was placed placed at EGRIP in a garage tent in 2015, and in 2016 the station was moved to the newly constructed core buffer trench. The station is solar/battery powered and collects data onto a memory chip. Once a year the memory chip is exchanged and the station is maintained.

AWS station system (Greenland Climate Network, former PARCA) maintenance (Nanna Karlsson, GEUS Copenhagen)

During the annual maintenance of the Automated Weather Stations in N-Greenland, the EGRIP camp will be re-fuelling station and base for the GC team for few days in May. GC team uses a Twin Otter air craft.

Logistic plan for EGRIP 2022

Airborne picture of EGRIP dome and garages, Summer 2021. The forst month of work in camp will be to reset the camp after three years of abandonment. Photo: AWI

The logistic plan for 2022 is centered on bringing camp infrastructure back in good shape after three years of abandonment. We need to excavate the main dome and the garages, move them away and push them back on new berms. Then we need gain access to the trenches and remove a lot of snow from the ceilings to regain proper ceiling height. Following that, we need to repair and maintain the infrastructure of the drill trench and science trench. The satellite dish will be mounted again, but not in the first month. We plan to mount the polar bear Doppler radar again in 2022. The radar is capable of detecting movement in a 3 km radius of camp. Since 2017 EGRIP has a LIDAR to measure cloud base to improve weather reporting and reduce the risk of aborted flights.

The overall logistical goal is keep running a fully operational deep drilling camp with ice core storage facilities, science trench, drill trench, workshops, warm laboratories and housing for up to 35 people.

To accomplish the overall goals, the campaign can be broken down into the following steps:

1. First Month: Open and re-activate EGRIP camp by lifting and resetting all buried surface infrastructure.
2. As all skiway markers are considered lost, place new markers for skiway and approaches. Skiway will not be ready before mid-May
3. Hosting the 2022 NSF TUNU drilling team and crew during their put-in and their pull-out (EGRIP is a staging station for the TUNU drilling).
4. Hosting an AWI airborne radar survey team with Basler Polar 5 for three weeks
5. Reopening of all entrances to the trenches and making necessary repairs and adjustments.

6. Re-activating infrastructure in drill trench and science trench.
7. With full manning, drill, log and pack ice cores from 2122 m (2019 depth).
8. Support Univ. of CPH/Alabama deep sounder radar campaign.
9. Support Greenland Climate Network program.
10. Support surface snow, water vapour drone sampling.
11. Support surface measurement programs, e.g GPS strain net, P-RES radar, DAS seismics, Cryoegg, AWI ice margin drilling.
12. Support several visits from Distinguished Visitors.
13. Support media and special events people.

2022 calendar overview.

18/04/2022	Thursday		FOMS arrive. Kanger activities
20/04/2022	Wednesday		Period 1
25/04/2022	Monday		Mission 1 put-in.
03/05/2022	Tuesday		Mission 1a PLACEHOLDER back-up put-in.
20/05/2022	Friday		Mission 1b. Equipment, food, drill
23/05/2022	Monday		Mission 1c and Mission 1d. Joe McConnell put-in. DOUBLE MISSION
24/05/2022	Tuesday		Mission 1e. PLACEHOLDER
26/05/2022	Thursday		Joe McConnell for TUNU
27/05/2022	Friday	1700	Basler arrives in Kanger
30/05/2022	Monday	0800	Basler to EGRIP
31/05/2022	Tuesday		Basler radar begins
02/06/2022	Thursday		Period 2
06/06/2022	Monday	0800	mission 2.
13/06/2022	Monday	0800	Mission 2a and 2b. 109th airdrop. Double mission. One 109th and one EGRIP
14/06/2022	Tuesday		Mission 2c and 2d. Joe McConnell pull-out DOUBLE MISSION. One cold deck. OPTIONAL
19/06/2022	Sunday		Basler radar end.
20/06/2022	Monday		Basler to Kangerlussuaq
23/06/2022	Thursday		Basler ready for logistics
24/06/2022	Friday		Joe McConnell from TUNU
26/06/2022	Sunday		Basler mission 1 for Joe McConnell
28/06/2022	Tuesday		Basler mission 2
30/06/2022	Thursday		End Basler logistics
02/07/2022	Saturday		Basler departs Greenland
12/07/2022	Tuesday		Period 3
19/07/2022	Tuesday		Mission 3. PB300. TUNU material to Kanger
23/07/2022	Saturday		Mission 3a. PB 300. TUNU material to Kanger
26/07/2022	Tuesday		Mission 3b.
10/08/2022	Wednesday		Period 4
15/08/2022	Monday		Mission 4. First pull-out.
20/08/2022	Saturday		Mission 4a. Final pull-out. Placeholder
21/08/2022	Sunday		Moskus run
22/08/2022	Monday		Row club?
26/08/2022	Friday		FOMs leave Kangerlussuaq

EGRIP Manning 2022 (sorted by name)

Note: The dates of arrival and departure to and from Kangerlussuaq (SFJ) are dates of reference for booking tickets/flights to and from SFJ only. They are not fixed dates for the project. Dates in blue are artificaial dates for calculation and dates in red are for non-109th flights.

Sorted by name	Name	Country	Latest arrival to SFJ	To EGRIP	From EGRIP	Earliest departure from SFJ
Associated (Mills Radar)	Alabama guy	US	11/Jun	13/Jun	19/Jul	21/Jul
Cryo Egg	Bagshaw, Elizabeth	UK	13/Aug	15/Aug	20/Aug	22/Aug
Surface (vapour and snow)	Bashear, Chloe	US	04/Jun	06/Jun	19/Jul	21/Jul
Surface (vapour and snow)	Bennett, Haley	US	18/May	20/May	13/Jun	15/Jun
FOM	Blunier, Thomas	DK/CH	15/Jun			05/Jul
Drill Coordinator	Boeckmann, Grant	DK/US	11/Jun	13/Jun	26/Jul	28/Jul
Drill Mechanic	Børsting, Søren	DK	17/Jul	19/Jul	15/Aug	17/Aug
Associated (TUNU drill)	Brugger, Sandra	US	21/May	23/May	26/May	26/May
Associated (TUNU drill)	Brugger, Sandra	US	24/Jun	24/Jun	26/Jun	28/Jun
COOK	Bugge Nielsen, Frederik	DK	23/Apr	25/Apr	23/May	25/May
COOK	Bugge Nielsen, Frederik	DK	17/Jul	19/Jul	20/Aug	22/Aug
Doctor	Buschsieweke, Anna-Maria	D/DK	23/Apr	25/Apr	23/May	25/May
Associated (TUNU drill)	Campos, Jennifer	US	21/May	23/May	26/May	26/May
Associated (TUNU drill)	Campos, Jennifer	US	24/Jun	24/Jun	26/Jun	28/Jun
Associated (TUNU drill)	Chellman, Nathan	US	21/May	23/May	26/May	26/May
Associated (TUNU drill)	Chellman, Nathan	US	24/Jun	24/Jun	26/Jun	28/Jun
COOK	Christensen, Kevin	DK	18/May	20/May	14/Jun	16/Jun
FOM	Cook, Eliza	DK/UK	27/May			16/Jun
Chief scientist	Dahl-Jensen, Dorthe	DK	11/Jun	13/Jun	19/Jul	19/Jul
FIELD LEADER	Dahl-Jensen, Dorthe	DK	19/Jul	19/Jul	20/Aug	22/Aug
Field Assistant	de Fleurian, Basile	N/F	23/Apr	25/Apr	20/May	22/May
Surface (vapour and snow)	Dietrich, Laura	N	11/Jun	13/Jun	19/Jul	21/Jul
Surface (GPS strain)	Döring, Michael	CH/DK	11/Jun	13/Jun	19/Jul	21/Jul
Drill Mechanic	Duphil, Romain	F	11/Jun	13/Jun	19/Jul	21/Jul
DV and Media	DV 1	D	21/Jul	23/Jul	26/Jul	28/Jul
DV and Media	DV 2	D	21/Jul	23/Jul	26/Jul	28/Jul
DV and Media	DV 3	D	21/Jul	23/Jul	26/Jul	28/Jul
DV and Media	DV 4	DK	21/Jul	23/Jul	26/Jul	28/Jul
DV and Media	DV 5	DK	21/Jul	23/Jul	26/Jul	28/Jul
DV and Media	DV 6	DK	21/Jul	23/Jul	26/Jul	28/Jul
DAS project	Fichtner, Andreas	CH	21/Jul	23/Jul	15/Aug	17/Aug
Carpenter	Fløisdorff, Thomas	DK	23/Apr	25/Apr	23/Jul	25/Jul
Shear margin	Freitag, Johannes	D	11/Jun	13/Jun	19/Jul	21/Jul
Surface (mercury)	Gao, Zhiyuan (Jeff)	CAN	24/Jul	26/Jul	15/Aug	17/Aug
Associated (Mills Radar)	Gerber, Tamara	DK/CH	11/Jun	13/Jun	19/Jul	21/Jul
Associated (GEUS)	GEUS	DK	26/May	26/May	30/May	30/May

Associated (GEUS)	GEUS	DK	26/May	26/May	30/May	30/May
Polar 5 radar	Gollin, Clemens	D	21/May	23/May	20/Jun	22/Jun
IT and comms	Grinsted, Aslak	DK	04/Jun	06/Jun	13/Jun	15/Jun
Surface (GPS strain)	Grinsted, Aslak	DK	11/Jun	13/Jun	19/Jul	21/Jul
Drill Coordinator	Hansen, Steffen bo	DK	17/Jul	19/Jul	15/Aug	17/Aug
Driller	Hedegaard, Thomas	DK	04/Jun	06/Jun	19/Jul	21/Jul
IT and comms	Hillerup, Jens Christian	DK	04/Jun	06/Jun	13/Jun	15/Jun
MECHANIC	Hilmarsson, Sverrir Æ.	IS	23/Apr	25/Apr	13/Jun	15/Jun
MECHANIC	Hilmarsson, Sverrir Æ.	IS	17/Jul	19/Jul	20/Aug	22/Aug
DAS project	Hofstede, Coen	D	21/Jul	23/Jul	15/Aug	17/Aug
Doctor	Hornnes Pedersen, Caroline	DK	17/Jul	19/Jul	20/Aug	22/Aug
Field Assistant	Hvidberg, Niels	DK	24/Jul	26/Jul	20/Aug	22/Aug
MECHANIC	Jacobs, Chris	UK	23/Apr	25/Apr	23/Jul	25/Jul
Polar 5 radar	Jansen, Daniela	D	21/May	23/May	20/Jun	22/Jun
processing + PP	Jansen, Daniela	D	18/Jun	20/Jun	19/Jul	21/Jul
electronics	Jensen, Bent Neumann	DK	17/Jul	19/Jul	15/Aug	17/Aug
Associated (GEUS)	Karlsson, Nanna	DK	26/May	26/May	30/May	30/May
MECHANIC	Kässbohrer Mech.	D	17/Jul	19/Jul	26/Jul	28/Jul
Polar 5 radar	KBA crew	CAN	28/May	30/May	20/Jun	22/Jun
Polar 5 radar	KBA crew	CAN	28/May	30/May	20/Jun	22/Jun
Polar 5 radar	KBA crew	CAN	28/May	30/May	20/Jun	22/Jun
Field Assistant	Kipfstuhl, Sepp	D	23/Apr	25/Apr	13/Jun	13/Jun
Shear margin	Kipfstuhl, Sepp	D	13/Jun	13/Jun	19/Jul	21/Jul
FOM	Kirk, Marie	DK	19/Apr			10/May
FOM	Kirk, Marie	DK	03/Jul			28/Jul
FOM	Kirk, Marie	DK	14/Aug			26/Aug
FOM	Kock, Jesper	DK	19/Apr			10/May
FOM	Koldtoft, Iben	DK	19/Apr			30/May
FOM	Koldtoft, Iben	DK	10/Jun			30/Jun
Driller	Koldtoft, Iben	DK	17/Jul	19/Jul	20/Aug	22/Aug
COOK	Kromann Laursen, Jeppe	DK	11/Jun	13/Jun	23/Jul	25/Jul
FOM	Lauritzen, Mikkel Langgaard	DK	12/Jul			27/Jul
Driller	Leonhard, Martin	D	17/Jul	19/Jul	15/Aug	17/Aug
Associated (Mills Radar)	Lilien, David	US	11/Jun	13/Jun	19/Jul	21/Jul
Driller	Lohmann, Johannes	DK/D	17/Jul	19/Jul	15/Aug	17/Aug
FOM	Malegiannaki, Eirini	DK/GR	15/Jun			30/Jun
Associated (TUNU drill)	McDonald, Brandon	US	21/May	23/May	26/May	26/May
Associated (TUNU drill)	McDonald, Brandon	US	24/Jun	24/Jun	26/Jun	28/Jun
Associated (TUNU drill)	Mconnell, Joe	D	21/May	23/May	26/May	26/May
Associated (TUNU drill)	Mconnell, Joe	US	24/Jun	24/Jun	26/Jun	28/Jun
Surface (vapour and snow)	Morris, Valerie	US	18/May	20/May	19/Jul	21/Jul
Field Assistant	Nisancioglu, Kerim	N	18/May	20/May	06/Jun	08/Jun
Associated (GEUS)	nn (GEUS flt crew)	IS	26/May	26/May	30/May	30/May
Associated (GEUS)	nn (GEUS flt crew)	IS	26/May	26/May	30/May	30/May
DV and Media	Norwegian DV 1	N	29/May	29/May	02/Jun	02/Jun
DV and Media	Norwegian DV 2	N	29/May	29/May	02/Jun	02/Jun

DV and Media	Norwegian DV 3	N	29/May	29/May	02/Jun	02/Jun
DV and Media	Norwegian DV 4	N	29/May	29/May	02/Jun	02/Jun
DV and Media	Norwegian DV 5	N	29/May	29/May	02/Jun	02/Jun
DV and Media	Norwegian DV 6	N	29/May	29/May	02/Jun	02/Jun
DV and Media	Norwegian DV 7	N	29/May	29/May	02/Jun	02/Jun
Field Assistant	Nymand, Niels Fabrin	DK	11/Jun	13/Jun	26/Jul	28/Jul
Polar 5 radar	Paden, John	US/D	21/May	23/May	13/Jun	15/Jun
Field Assistant	Paleari, Chiara	S/I	18/May	20/May	06/Jun	08/Jun
FOM	Pehrsson, Helene	DK	12/May			14/Jun
Doctor	Preisler, Henrik Park	DK	11/Jun	13/Jun	19/Jul	21/Jul
Cryo Egg	Prior-Jones, Michael	UK	13/Aug	15/Aug	20/Aug	22/Aug
FOM	Rasmussen, Sune O.	DK	10/May			16/Jun
Driller	Rathmann, Nicholas	DK	11/Jun	13/Jun	19/Jul	21/Jul
Surface (vapour and snow)	Rozmiarek, Kevin	US	18/May	20/May	19/Jul	21/Jul
Doctor	Runge, Charlotte	DK	21/May	23/May	06/Jun	08/Jun
Driller	Seth, Barbara	CH	17/Jul	19/Jul	15/Aug	17/Aug
MECHANIC	Simonsen, Jens Jacob	GRL	11/Jun	13/Jun	19/Jul	21/Jul
electronics	Sørensen, Claus B.	DK	11/Jun	13/Jun	19/Jul	21/Jul
FOM	Stark, Heather	CAN	11/Jul			28/Jul
Surface (vapour and snow)	Steen-Larsen, Hans Christian	N	18/May	20/May	06/Jun	08/Jun
FIELD LEADER	Steffensen, Jørgen Peder	DK	23/Apr	25/Apr	13/Jun	15/Jun
FOM	Steffensen, Jørgen Peder	DK	10/Jul			26/Aug
Associated (Mills Radar)	Steinhage, Daniel	D	11/Jun	13/Jun	19/Jul	21/Jul
Electric Engineer	Stocker, Bruno	CH	18/May	20/May	28/Jun	30/Jun
processing + logging	Stoll, Nicolas	D	17/Jul	19/Jul	20/Aug	22/Aug
FIELD LEADER	Svensson, Anders	DK	24/Jun	26/Jun	19/Jul	21/Jul
Surface (vapour and snow)	Town, Michael	US	18/May	20/May	13/Jun	15/Jun
Surface (vapour and snow)	Vaughn, Bruce	US	18/May	20/May	13/Jun	15/Jun
Driller	Veale, James	UK	11/Jun	13/Jun	19/Jul	21/Jul
Field Assistant	Vinther, Bo	DK	23/Apr	25/Apr	13/Jun	13/Jun
FIELD LEADER	Vinther, Bo	DK	13/Jun	13/Jun	28/Jun	30/Jun
Surface (mercury)	Wang, Feiyue	CAN	24/Jul	26/Jul	15/Aug	17/Aug
DV and Media	Warsecha, Lukasz Larsson (Getty Images)	US	24/Jul	26/Jul	15/Aug	17/Aug
Associated (TUNU drill)	Wensman, Sophie	US	21/May	23/May	26/May	26/May
Associated (TUNU drill)	Wensman, Sophie	US	24/Jun	24/Jun	26/Jun	28/Jun
Driller	Westhoff, Julien	DK/D	04/Jun	06/Jun	26/Jul	26/Jul
processing + PP	Westhoff, Julien	DK/D	26/Jul	26/Jul	15/Aug	17/Aug
P-Res radar	Zeising, Ole	D	11/Jun	13/Jun	19/Jul	21/Jul
Surface (vapour and snow)	Zeppenfeld, Chantal	CH	18/May	20/May	13/Jun	15/Jun
Driller	Zhang, Nan ?	CHN	17/Jul	19/Jul	15/Aug	17/Aug

Important: Sudden changes in manning plan due unforeseen issues.

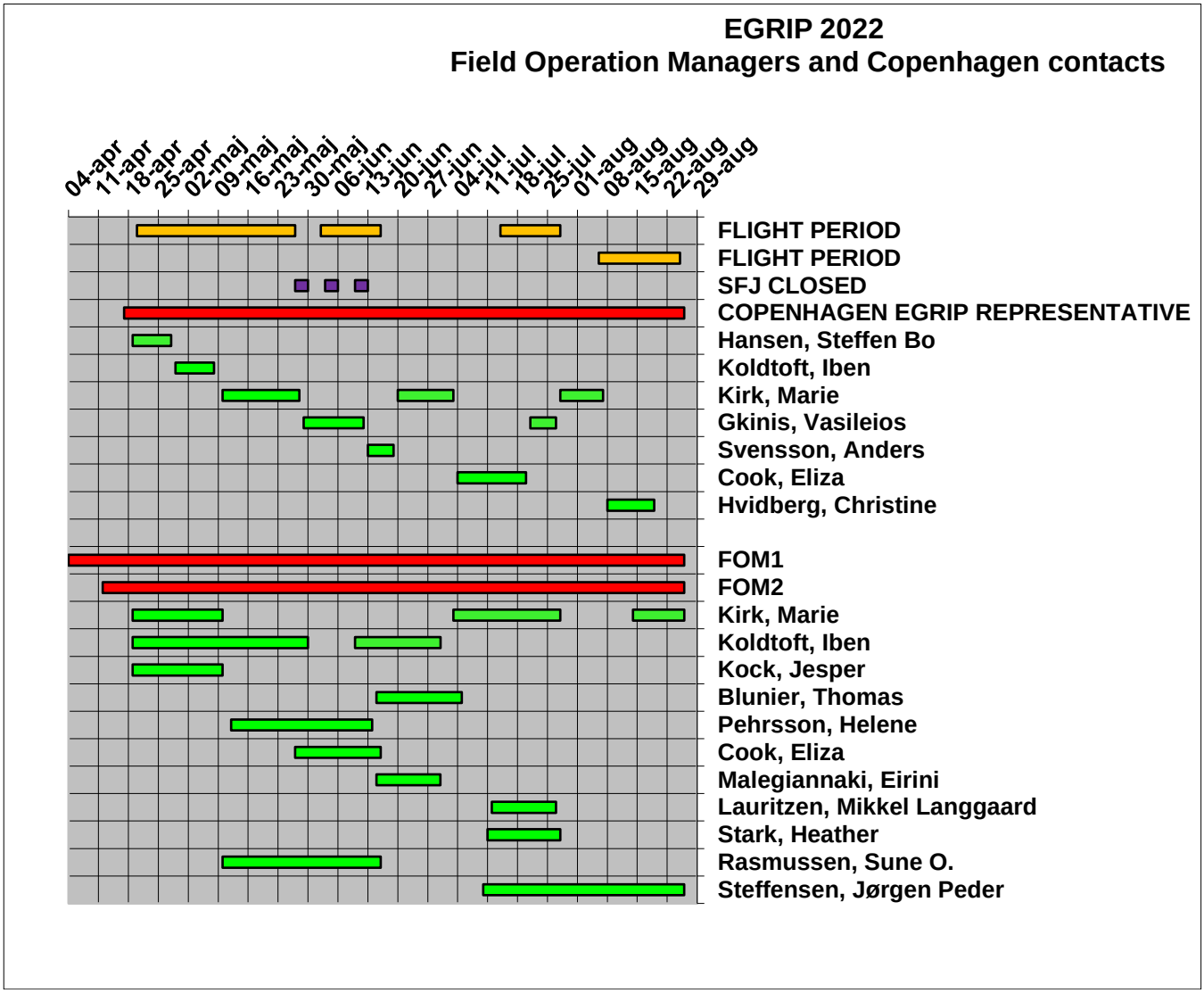
Please keep in mind, that being on the manning plan for 2022 is not a guarantee that you will go to EGRIP and stay there for the scheduled time. In this line of work, even small incidents may have large consequences. Even though we are scientists, we also share a treat with sea-men – we are superstitious. Therefore, we hesitate to mention specific incidents as it could become self-fulfilling. So, at this time let us just say, that a broken vital part with a long delivery time may cause severe delays.

THEREFORE: PEOPLE WHO ARE SCHEDULED FOR DEEP DRILLING, ICE CORE PROCESSING AND CFA IN JUNE, JULY AND AUGUST SHOULD PREPARE THEMSELVES OF THE POSSIBILITY OF EITHER HAVING TO LEAVE CAMP EARLIER THAN PLANNED OR TO HAVE THEIR STAY CANCELLED. PLEASE FOLLOW THE DEVELOPMENTS ON THE EGRIP HOME PAGE BEFORE YOU LEAVE FOR GREENLAND.

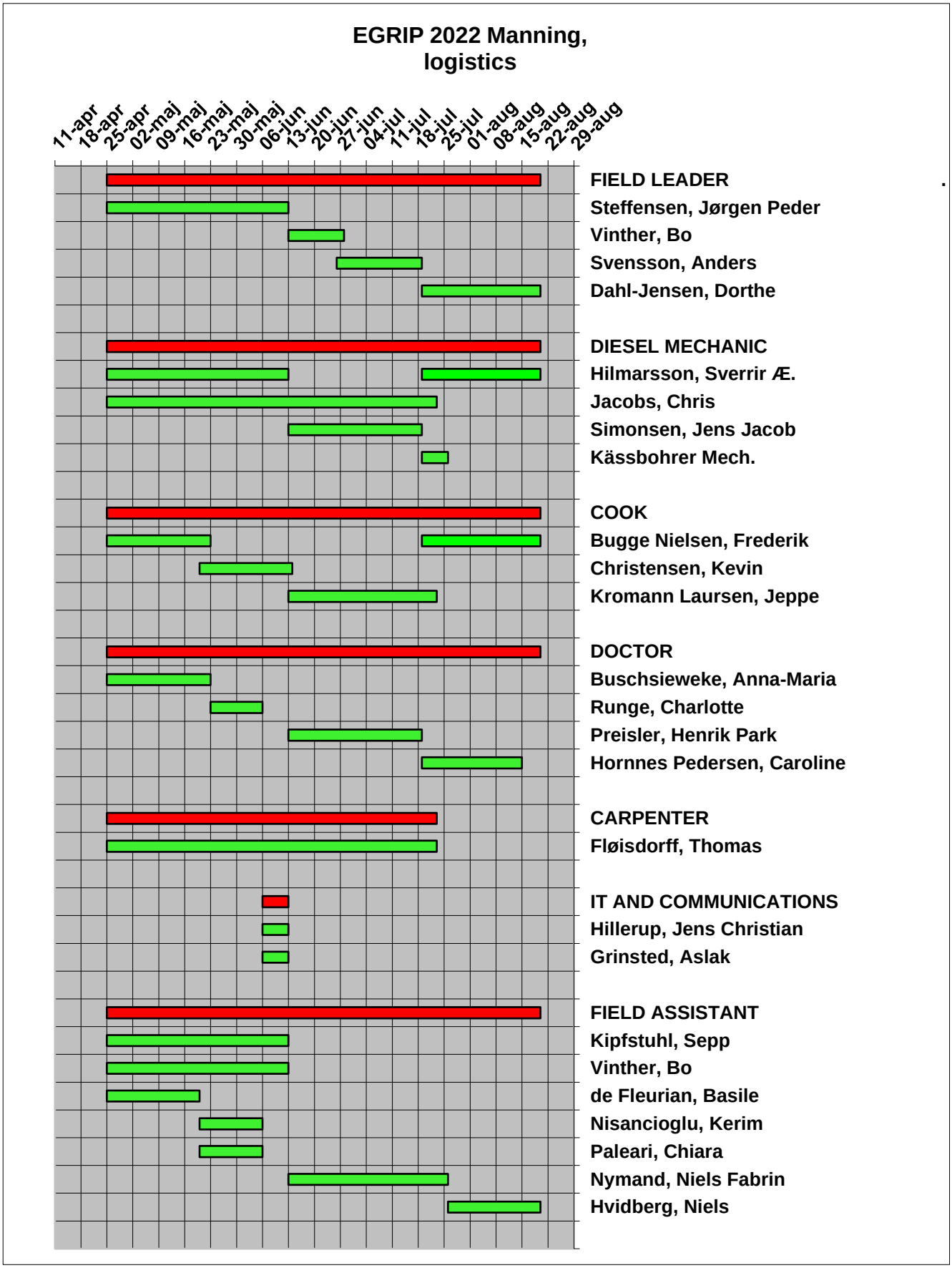
We are sorry for this inconvenience, but in our planning we have been forced to assume the most optimistic outcome of activity, i.e. the situation where the most people are needed in camp. If we had planned for less, a smaller number of people would have been planned for, and we could end up in a situation where activities had to be stopped due to lack of man-power.

EGRIP GANNT sheets.

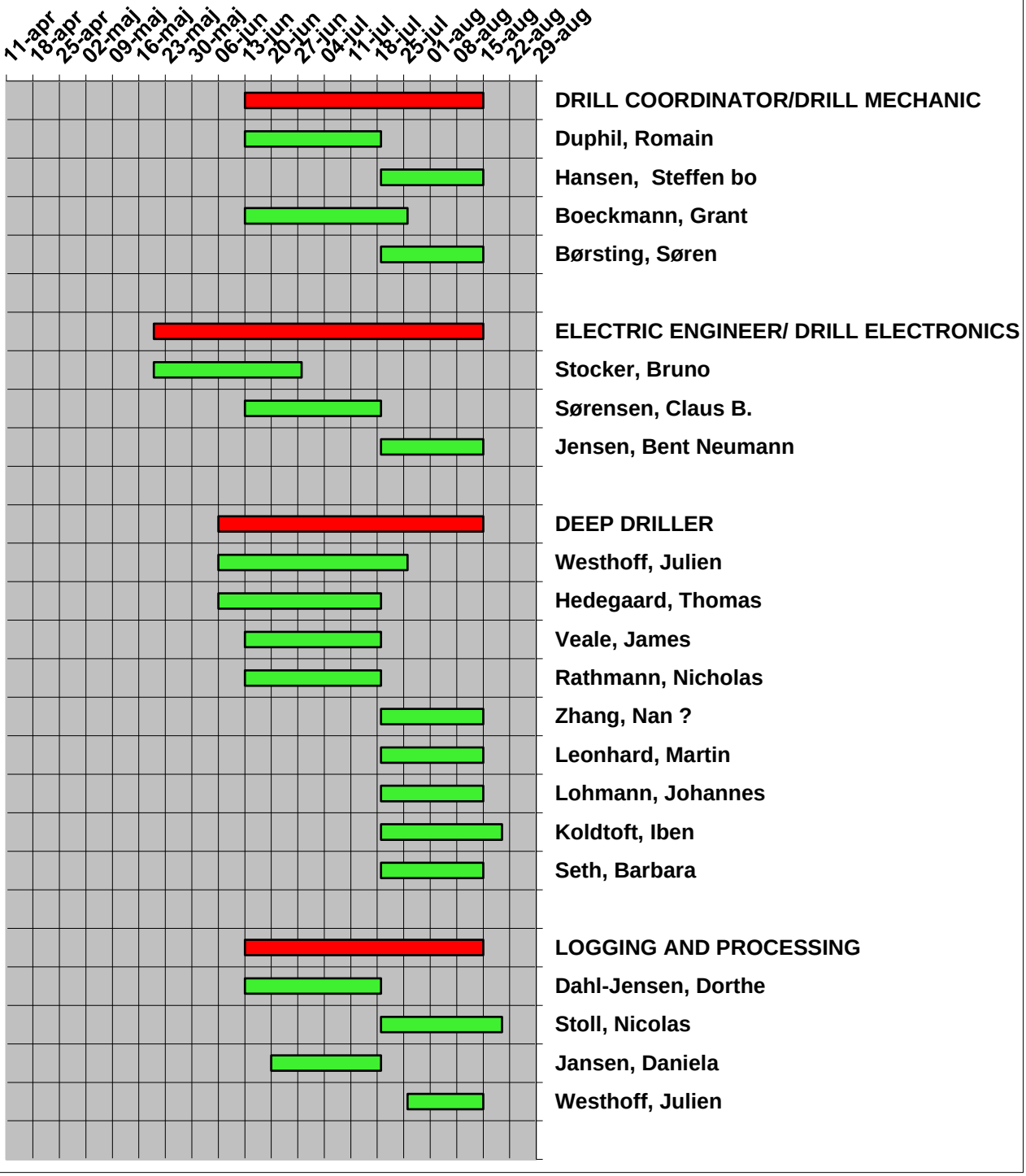
FOM's:



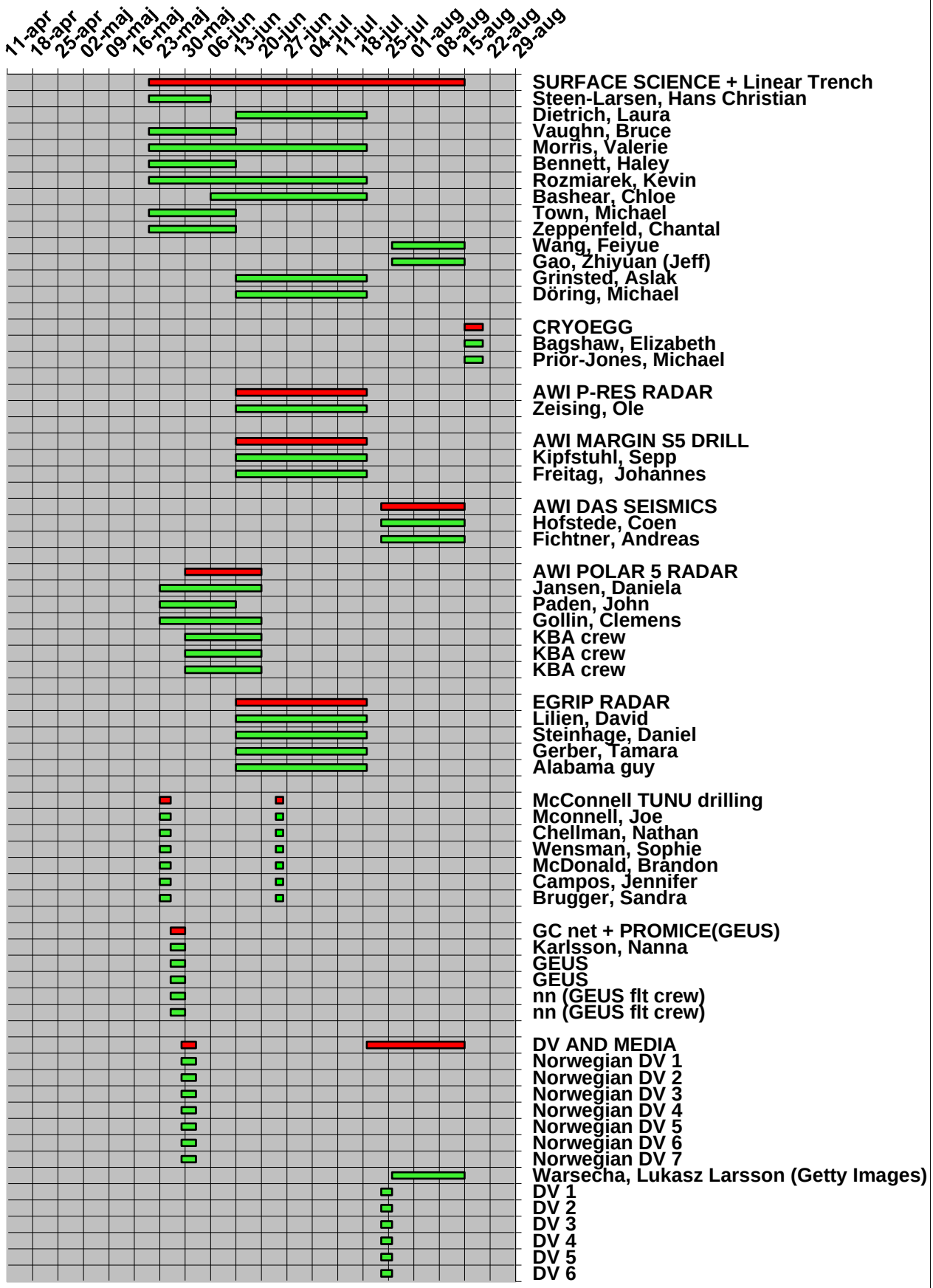
EGRIP manning:



EGRIP 2022 Manning, drilling and processing

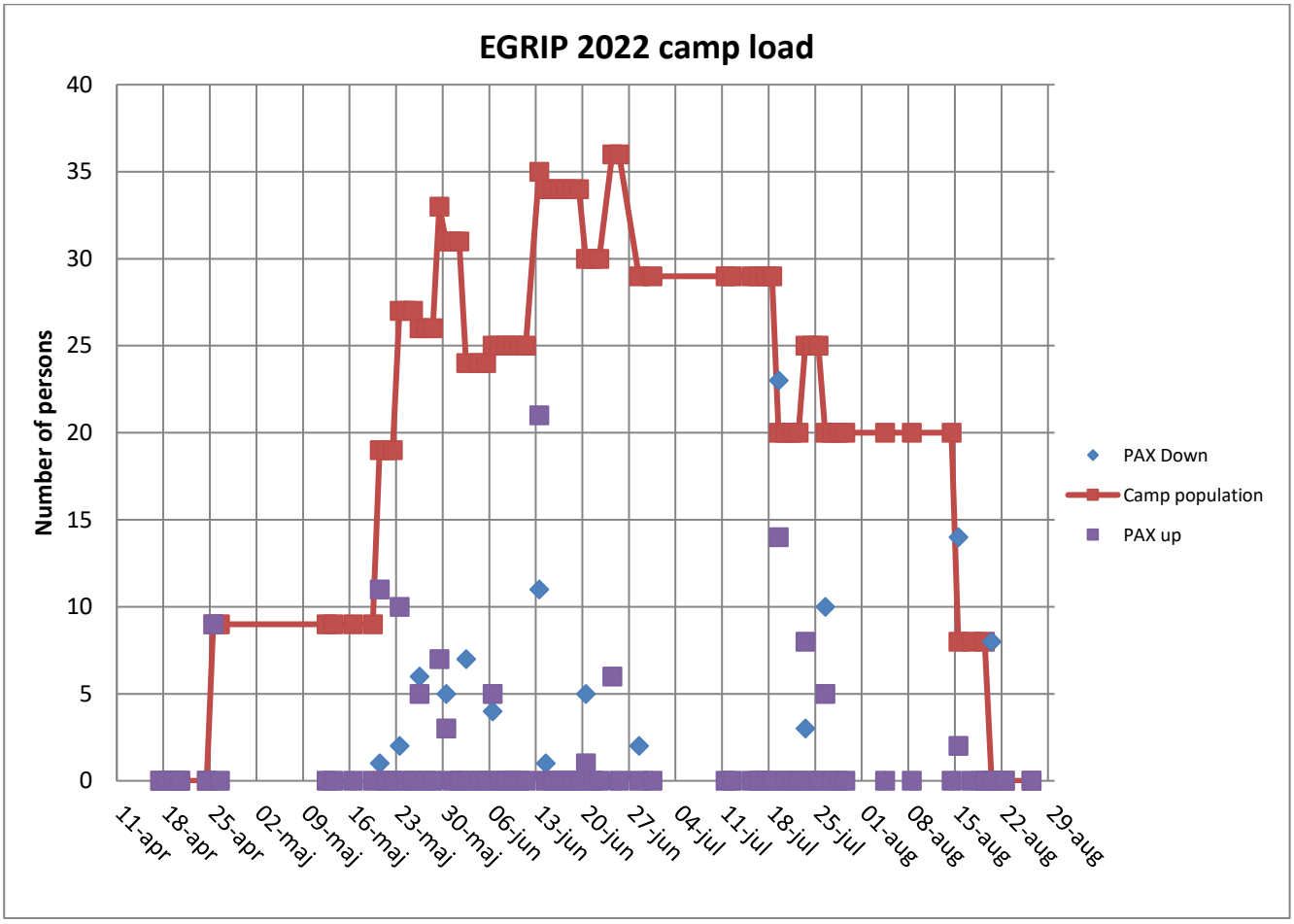


EGRIP 2022 Manning,associated programs



Camp population

The diagram below gives an overview on the population in camp.



Personnel Transport 2022 and COVID quarantine issues.

The field participants will deploy to Kangerlussuaq, Greenland mostly via Copenhagen and in a some cases from Stratton AB, Scotia, N.Y. The transport to and from EGRIP camp will be direct from/to Kangerlussuaq with a U.S. air force LC130. Some field participants will arrive and leave with Polar 5 operated by field radar campaign of AWI.

During the stay in **Kangerlussuaq**, people will be billeted in Kangerlussuaq International Science Support (KISS). At KISS, all participants will be provided with bed linen but are responsible for cleaning their room.

Note, unless arranged otherwise, each nation must take care of tickets and insurances of their own participants. If trouble arises at making ticket reservations we should be notified. The increasing number of tourists travelling to Greenland results in a long waiting list, so please make the reservations as early as possible. EGRIP has a general financial guarantee for extraordinary Search

and Rescue operations (SAR). Medical Evacuations (MEDEVAC) will be organized and covered up front by EGRIP.

We have negotiated new COVID/quarantine procedures with the National Science Foundation(NSF). NSF wants to maintain a high level of COVID safety at Summit station and have a special quarantine program. However, it will be possible for EGRIP to follow a less restrictive set of rules, provided that EGRIP personnel will respect the COVID "bubble" of Summit personnel.
EGRIP crew arriving from Copenhagen will not have to go into quarantine in Kangerlussuaq before flying to EGRIP. However, all people boarding a plane to EGRIP will have to be antigen tested (quick test) negative 24 hours before departure and on the day of departure. A person with a positive test will have to go into quarantine and miss the flight to EGRIP. EGRIP passengers will have to arrive in Kangerlussuaq 48 hour before departure.

This setup requires:

1. All persons going to Greenland for EGRIP should maintain a degree of social distancing (avoiding concerts, large bar gatherings, large family affairs etc.) one week before travelling.
2. All persons going to Greenland should only fly to Kangerlussuaq after a fresh negative PCR test.
3. All persons going to EGRIP will have to be fully vaccinated, including a booster shot (This is a requirement to obtain medical clearance for work at EGRIP).
4. The FOMs in Kangerlussuaq have received training and are certified to perform antigen tests with test kits that have a 95% detection rate. EGRIP provides the test kits.
5. There will be antigen tests available at EGRIP station.
6. EGRIP will have a physician (doctor) at EGRIP the entire season.

For the operations with Polar 5 (Basler), it is sufficient to follow the EGRIP rules; but in order to maintain the Summit "bubble", Polar 5 cannot have planned landings or operations at Summit station. Similarly, the GEUS Twin Otter may visit EGRIP, provided that all persons on board have a fresh negative antigen test.
The agreement with the NSF entails that all EGRIP participants arriving to Greenland from the U.S. by 109th will have to follow NSF/Batelle ARO guidelines regarding quarantine and testing in New York as these participants will mix with Summit personnel on the plane. On arrival in Kangerlussuaq, the U.S. EGRIP participants may exit quarantine and join the EGRIP crew. The EGRIP FOM will perform antigen tests 24 hours before and on the day of departure to EGRIP. A person with a positive test will have to go into quarantine and miss the flight to EGRIP.
The deployment of the U.S. TUNU drilling team (Joe McConnells group) via EGRIP may bring TUNU team members in contact with the EGRIP team. If the TUNU team and NSF want to maintain the high level of COVID safety inside the Summit "bubble", the TUNU team may have to stay segregated at EGRIP before departure for TUNU. However, we are also looking at a possibility to swap the planned flights to EGRIP from May 20 (EGRIP), 23 (TUNU) and 25 (TUNU) to May 19(TUNU), May 20(TUNU), May 23 (EGRIP). This way, the TUNU team will arrive at EGRIP to an EGRIP team that has been in "quarantine" since April 25, and the teams will be able to interact without compromizing the Summit "bubble".

Personal field equipment

All participants, except for those who have special arrangements with EGRIP operations, are expected to provide their own polar field equipment and personal clothing, including normal winter garments, towels, toiletries, soap, facecloth, etc. A typical polar field bag should contain:

Polar Survival Kit

2 Woolen underwear, terry cloth, trousers and jacket
1 Fleeced trousers and jacket
1 Overall trousers
1 Polar boots, including extra liners, preferably 2 pairs.
3 thick woolen polar socks
1 polar parka coat
1 Insulated work leather gloves
1 Thin inner gloves
1 Insulated leather gloves, or ski type gloves
1 *Mittens. Optional*
1 Dark sunglasses
1 Sleeping bag, -10 degC or lower
1 Fleece liner for sleeping bag
1 fleece or woolen cap or hat, preferably of the balaclava type
1 Ear gear, fleece or rubber.
1 Face mask, *optional, only for those involved in snowmobile traverses.*
1 Personal medicine (pls inform the doctor)

Please bring also

1 Neck Tie or Dress
1 Solid hiking boots
1 A sturdy cup for coffee or tea
1 Your favourite cooking book
1 Your favourite music on IPOD
1 Your favourite game
1 Your favorite instrument - if it allows for transportation
1 A good portion of good humor

The polar field bag must follow the individual on the flight from Kangerlussuaq to the camp. It is not permitted to board aircraft or engage in traverses without a suitable survival kit. Please expect your luggage to be stowed on a pallet for transportation to camp, and like on commercial air lines, only one small carry-on bag is normally allowed. In special cases, like put-in missions, you will be allowed also to keep ONE sea bag with survival equipment with you in the LC-130.

READ CAREFULLY THIS SECTION: Welcome to the EGRIP Camp (Rules and information)

EGRIP camp at pull out August 2016 with Main dome and three garages and the cargo line. (photo: DDJ).

The living conditions on the ice cap are quite different from those back home, therefore we would like to tell you some simple rules to follow. Some of them are even new for old-timers.

- The ski-way area and apron are **off limits** unless approved by the Field Leader.
- When an aeroplane is expected, the Field Leader has assigned a person in charge of the apron activities. You are obliged to act as instructed by this person.
- Never leave the camp without informing somebody, the weather can change very quickly. If you go more than 2 km away from camp, the field leader should be informed. Remember to bring a PLB (Personal Locator Beacon), a Garmin In-Reach unit and Iridium phone or VHF radio. The Field Leader will hand out PLB, In-Reach, phone and radio.
- The eating hours are (please be in time, to make is easy for the cook).
    - Breakfast is individual (normally between 7:00 and 8:00),
    - Lunch is at 13:00 (On Sundays a special brunch is sometimes served),
    - Dinner is at 19:00. While eating outside of lunch and dinner hours, make sure that all plates, etc. are cleaned after use.
- Heavy vehicles and snow blowers are only operated by few people assigned by the Field Leader.
- Skidoos –
    - Everybody can use the skidoos when not in specific use, but please follow these rules:
        - Drive slowly in camp, and never use 2nd gear.
        - Park the scooters with the gear in non-engaged position and plugged to power.
        - Skidoos can only be removed from the camp area after an agreement with the Field Leader.
        - When attaching a sledge to a skidoo, always use the hook. Only connect the sledge with a rope if no other option exists, and keep the rope as short as possible.
        - Make sure the main drive belt is not frozen by shaking the skidoo from side to side before start.
        - Skidoos are not toys - only drive skidoos when necessary.

  - Do not drive in the clean zone, South and West of camp unless permitted by the Field Leader.

- NEVER operate vehicles and machinery under the influence of alcohol. Offenders will immediately be expelled from camp.

- Never leave any cargo or items on the surface without marking it with a bamboo pole, otherwise it may be lost due to snow drift overnight. Roll up cargo straps and put them in designated piles. Collect metal and nylon packing straps as these are dangerous for snowmobile traffic.
- If you remove marked items on the snow, then also remove the bamboo marker in order to avoid disorder and digging for nothing.
- Drinking water originates from a marked area. So never drive or walk through this area or contaminate it with any bodily fluid. Just keep out of the marked area.
- Drinking water will be produced in the cooks snow melter. To keep a steady water supply in the camp, refill it with snow from the marked area when there is room in the pot.
- In order to keep the camp clean there are only a few bamboo poles where you are allowed to take a leak. The poles are close to the outhouse tents.
- During blizzards visibility goes down. If visibility becomes so poor, that you cannot see adjacent tents or buildings from where you are, there is a serious risk of getting lost. **Stay inside where you are until you are picked up by a team member from the main dome.**

Booze and Drugs.

You can bring the following tax free to Greenland: 200 cigarettes or 100 cigarillos and 50 ml perfume or 250 ml Eau de toilette are allowed.

1 liter strong alcohol, 2 liter beer (typical six-pack) and 2.25 liter wine (typical 3 bottles) are allowed. If you are caught with excess tobacco, perfume or alcoholic beverages on arrival, it will be confiscated and you will be fined around 1,200 DKK.

You cannot import goods in excess of the allowance and declare it. You'll have to buy it in Kangerlussuaq.

In case you have not purchased the allowed duty free items in Copenhagen, you can do it in Kangerlussuaq on arrival, showing the boarding pass, and before you leave the secure area.

You can buy alcoholic beverages and tobacco in the local store in Kangerlussuaq. The price of one beer in Greenland is approximately 20 DKK, one liter hard liqueur costs approximately 500 DKK.

People can bring their own prescription medicine. If prescription medicine is needed, make sure camp physician is informed. In case of illness, necessary drugs will be supplied by the camp physician. Greenland law forbids any import and consumption of drugs, such as cannabis, morphine and designer drugs. Any person who attempts to bring in or use illegal drugs in Greenland will be expelled from camp immediately and FOMs and Field Leader will contact Greenland police.

Policy for use and handling of pictures/recordings

Prepared for the NEEM-SC meeting by Sune Olander Rasmussen, Copenhagen, olander@gfy.ku.dk. Final version adopted by the EGRIP-SC October, 2016.

All persons, including visitors, going to Greenland as part of the EGRIP field campaign implicitly give their consent to the following use of pictures/recordings by accepting to participate in the field campaign. Additional rules or limitations may be enforced by the field leader in special cases.

Participants appearing on pictures and in recordings:

The EGRIP field work participant approves use of digital and analogue pictures, filmed material, and sound recordings made during the EGRIP campaign (defined here as the period from arrival in Greenland until departure from Greenland) in which the participant appears.
The approved use comp rises, but is not limited to; use on the internet, in print, in television broadcasts, but only applies to material depicting field participants during work and daily life situations.

Any field member may withdraw this consent for any given photo or film sequence without further explanation.

Pictures/recordings depicting participants in situations not mentioned above should never be made public without explicit consent from all recognizable persons on the pictures/recordings. Field members taking pictures or making film and/or sound recordings must accept to delete pictures/recordings if requested to do so by a participant that appears in the material.

Rights of use

When material is shared with other field participants or uploaded to field computers, the photographer by doing so gives permission for the material to be used by the EGRIP project. Photographers wanting personal acknowledgment must make sure that their pictures are named with the photographer's name as the last part of the file name, e.g. " EGRIP-main-dome-4-July-2017-John-Doe.jpg".

Material produced as part of the field campaign or obtained from participants can be used by all EGRIP collaborators crediting the EGRIP project as a community: "Photo/Source: EGRIP ice core drilling project, www.eastgrip.org". For media files containing the name of the photographer, use the credit line with the name of the photographer included, e.g. "Photo/Source: John-Doe , EGRIP ice-core drilling project, www.eastgrip.org".

The original photographer retains the rights to any other use of the material, including any commercial use.

Declaration of liability release for EastGRIP field participants

The EastGRIP project aims to have a medical doctor/physician in camp at all times, and is prepared to arrange medical evacuation to a medical facility on the Greenlandic coast of a field participant or visitor if deemed necessary by the doctor and field leader. However, participation in the EastGRIP field work or visits to the EastGRIP camp is at the participant's (and/or their institution's) own risk, and each participant (or his/her institution) is responsible for medical and proper insurance cover.

Each institution should be prepared to contribute to costs related to evacuation of their participants from camp to a medical facility at the coast, and in particular, each participant (or their institution) is responsible for securing cover of costs of medical treatment and repatriation (and/or for taking out insurance against these costs).

In extreme cases, a Search and Rescue operation (SAR) may be necessary. Once initiated, a SAR is carried out by the Joint Rescue Coordination Centre (JRCC) Denmark, and is out of the hands of the EastGRIP project. The JRCC staff collects and distributes essential information concerning a distress situation, arranges the dispatch of rescue assets to aircraft or ships in distress and coordinates the efforts of all responding resources. Each nation is responsible for covering SAR costs for their participants (and/or for taking out insurance against this cost).

All field participants are required to sign a liability waiver accepting these terms before boarding a plane to EastGRIP.

By joining the Eastgrip fieldwork, each participant waive any rights to hold University of Copenhagen, the EastGRIP project, or any project staff members liable for any non-deliberate injury or damage caused e.g. by accidents, failure of equipment, or during medical treatment.

By signing the participant declare that he/she understands that is it the responsibility of himself/herself or his/her home institution to arrange appropriate insurance cover for personal injury or liability.

By signing the declaration, each participant also expresses understanding that it is the responsibility of himself/herself or his/her home institution to securing cover of costs of medical treatment and repatriation (and/or for taking out insurance against these costs).

By signature, each participant also confirms that he/she will follow the safety guidelines outlined in the field plan and follow instructions given by the field operations manager, the field leader, and flight crews.

The declaration is signed before deployment to EGRIP camp and uploaded in the medical system. The declaration will be kept in the field operations office in Kangerlussuaq.

Policy on handling cases of work place accidents, safety issues, mobbing, harassment and sexual harassment at EGRIP.

In accordance with the law on physical and psychical working environment at Danish/Greenlandic workplaces, and the Arctic safety manual for University of Copenhagen, the Field Leader at EGRIP is the project appointed safety officer. All work related incidents should be reported to the Field Leader.

In case of sensitive issues such as harassment or sexual harassment, incidents may be reported to one of two NAMED PERSONS (one male, one female) who will then inform the Field Leader about the issues in an anonymized version. The Field Leader or the camp physician may also be approached directly about such issues. The Field leader shall post the two NAMED PERSONS on a note on the board next to the bathroom entrance.

Assigned Duties

Everybody in camp will be assigned extra duties on a rotary basis. These duties include:

Cooking. Although there will be a cook, Saturday night dinners are prepared by the camp crew. Sunday morning breakfast is self-service. If you skip meals, please inform the cook(s) in advance.

The field Leader will make a roster with rotating duties on the following:

Dishwashing. We expect all to help keeping the dishwashing an easy duty.

Snow melter. Although one person is assigned, everybody has the duty to keep the snow melter full. Check the water level before and after you have taken a shower and after doing laundry.

Drinking water snow melter.
Each day one person is assigned to be responsible for keeping the drinking water snow melter full. Use ONLY the assigned buckets and shovels and take ONLY snow at the assigned spot. Hygiene is very important.

House mouse duty.
One or two persons will be assigned to keep toilets and common areas in the main dome clean.

Terms of reference for the EGRIP 2022 Field Season (formal control and command)

During the field season J.P. Steffensen, Bo Vinther, Anders Svensson and Dorthe Dahl-Jensen will be Field Leaders at EGRIP having formal command & responsibility of operations in camp. All field participants must follow all instructions from the Field Leaders (The Field Leader role is similar to the role of a captain of a ship at sea).

In Kangerlussuaq, Marie Kirk, Thomas Blunier, Sune Olander Rasmussen, Iben Koldtoft, J.P. Steffensen will be field Operations Managers (FOMs). There will be FOM assistants as well. The FOM is the official spokesperson for EGRIP and the FOM has control of all EGRIP assets in Kangerlussuaq, such as the office, cars, bicycles etc. The FOM is the formal liaison between EGRIP and U.S. logistics (CPS), New York Air National Guard and Greenland authorities. The FOM has final say on composition of cargo and on passenger lists for all flights to and from EGRIP.

Dangerous goods (HAZMAT) Lithium batteries.

While certification of dangerous goods and the packing thereof rests with qualified personnel, Marie Kirk and J.P.Steffensen has IATA, DOT (49 CFR) and U.S.Air Force certification (AFMAN 24-204), we want to point out some new important regulations,

Under normal circumstances people travelling do not carry HAZMAT in amounts that require certification and declaration. As there have been a series of incidents involving fires on aircraft from shorted lithium batteries, you must take special care.

All modern electronics: Cell phones, GPS, laptops, cameras etc. contain lithium batteries. Most of these batteries are considered “small” in the new regulations, except for laptop batteries with extended life time. They are considered “medium”. And for “medium” batteries the following apply:

Quote from IATA regulations 2.3.3.2 Lithium Ion Batteries:
“Lithium ion batteries exceeding a watt-hour rating of 100 Wh but not exceeding 160 Wh may be carried as spare batteries in carry on baggage, or in equipment in either checked or carry on baggage. No more than two individually protected spare batteries per person may be carried.”

As long as the batteries are installed in the appropriate equipment, they are not considered HAZMAT, but loose spare batteries have to be packed in such a manner that shortening is impossible by e.g. covering the poles with tape. The quoted IATA regulation says, that you may not put medium sized spare batteries into your checked baggage. You may be allowed to have two spares in your carry on – HOWEVER, THIS DEPENDS ON THE AIRLINE. CHECK RULES FOR LITHIUM BATTERIES WITH THE AIRLINES YOU ARE USING.

When travelling with the 109th to and from EGRIP keep all your batteries in your carry on. Do not put spare batteries in your luggage (suitcase or duffel bag).

For all scientists that ship lithium batteries by cargo, please note that Lithium batteries are Dangerous Goods and have to be packed and certified by authorized companies. It is still possible to pack a

laptop in a zarges box, but be careful with spare batteries. If in doubt, consult us or your local HAZMAT company.

Note: There is a huge distinction between “lithium batteries” and “lithium ion batteries”.

“lithium batteries” are non-rechargeable high-power cells that work very well in the cold. They are always HAZMAT. In size they vary from button cells in remote controls to car battery size. Automatic defilibrators (AEDs) contain Lithium batteries.

“lithium ion batteries” are rechargeable batteries that are in almost any computer, cell phone or GPS. They are only HAZMAT under the regulations mentioned above.

Personal Locator Beacon (PLB) and Garmin In-Reach.

A personal locator beacon, PLB, will be issued to everyone who has to leave camp. It is a unit with the size of a hand held radio. The unit is registered at the radio authority of Greenland. When activated, the unit contacts a satellite with a distress signal. The unit transmits its identity code and GPS position (it has a built in GPS). The radio authority will contact the FOM in Kangerlussuaq with specifics of identity and position. The PLB is a last resort emergency device.

EGRIP camp will have a number of Garmin In-Reach devices to give to people working away from camp. The In-Reach will be set up so that the Field leader receives position updates on remote field teams. If you’re interested, it is possible to buy these devices on the web. The device can be set to transmit your position at a fixed time each day by e-mail to your family and friends.

Accidents and Illness

There will be a doctor at EGRIP this field season. Also, the doctor will have a hot line to doctors in Denmark. In case of illness the camps will be able to treat a patient with a wide selection of drugs. In case of accidents, the patients will first be given First Aid and if evacuation is needed an aeroplane will be called in from Kangerlussuaq, East Greenland, Thule, Summit, Station Nord, etc. to transport the patient(s) to a suitable emergency site/hospital.

Good communication (Satellite broad band, Iridium handheld, Iridium OpenPort, Radio, personal locator beacons) and navigation equipment (GPS) should ensure fast evacuation if needed. Under most circumstances, we can move a patient to a hospital within 24 hours.

Handling of Waste and environmentally hazardous chemicals

EGRIP has been imposed with strict environmental conditions on EGRIP camp operations by the Greenland government. As EGRIP camp is located in a pristine area of the Greenland ice sheet and is inside the NE-Greenland National Park, the camp is constructed to reduce the environmental impact as much as possible, e.g. by using wood and snow as primary construction materials and by using temporary tent structures to maximum extent.

In EGRIP camp strict guidelines of waste management will be enforced.

LITTERING IS NOT ALLOWED. It is the duty of everybody to pick up any litter encountered.
Any traffic outside the general camp area has to be sanctioned by the Field Leader.
All waste will have to be sorted into the following categories:

- Natural combustible (e.g. wood, card board).
- Kitchen Waste.
- Glassware.
- Metal (e.g. cans, nails and screws).
- Hazardous solids (e.g. batteries, PVC).
- Hazardous fluids (e.g. fuel, hydraulic fluid, drill fluid).

All glassware, metal and hazardous material and kitchen waste will be retrograded to Kangerlussuaq for further processing.
To limit possible spills of fuel, only authorized personnel is allowed to operate pumps for fuel transfer.
All spills of hazardous fluids to the snow have to be excavated and the polluted snow has to be deposited in a salvage drum.
Use only designated toilets. Urination is only allowed at designated spots (pee-poles).

Special rules apply for fuel handlers, heavy vehicle operators and mechanics: A daily check on fuel tanks, pump system, hydraulics and hazardous chemical storage is necessary to insure no leakage to the environment.

Fire hazards

Camp structures are spaced so that an accidental fire will not spread to other structures. Carbon dioxide extinguishers and fire blankets will be placed at all locations where fuel is handled, at EGRIP in the kitchen and on the first floor of the main dome.
Only one of the three main fuel tanks will be in camp at any time. The other two tanks will be at the apron on in the cargo line.

An emergency response plan for spills and fire has been made for EGRIP camp. This plan is available in the main dome kitchen (Evacuation Zone A) and the Field leader office and in the carpenters garage (Evacuation Zone B). Camp personnel should know the contents of this plan.

Power Supply

Within all operations during 2019, 230 Volts, 50Hz will be the standard supply. The camp will be powered by diesel generators. For projects away from camp, such as shallow coring and radar surveys, we have both gasoline diesel generators available.

EGRIP:

Diesel

1 – Iveco	125KVA	3 x 230V (400V/50Hz)	Main generator.
1 – SDMO	40KVA	3 x 230V (400V/50Hz)	Backup generator
1 – SDMO	15KVA	3 x 230V (400V/50Hz)	2nd backup
1 – Hatz	5 KVA	1 x 230V / 50Hz	available

MoGas

1 – Honda	4.5KVA	1 x 230V / 50Hz	available
1 – Robin	4KVA	1 x 230V / 50Hz	

Reserves in Kangerlussuaq:

Diesel

3 - SDMO	12KVA	1 x 230V/50Hz

MoGas (i.e. petrol/benzin)

1 – Honda	4KVA	1 x 230V / 50Hz

Please help to conserve fuel by conserving power.

EGRIP 2022 – Address and useful numbers

Official address: EGRIP 2022
Box 12
DK-3910 Kangerlussuaq
Greenland
Phone +299 84 11 51; or +299 84 12 27 FOM cell +299 52 41 25
e-mail: fom@egrip.camp

This is the address of the Field Operations Manager (FOM) office in Kangerlussuaq which is located in the KISS building room 208

During the field season contact to the participants at the EGRIP camp can be made as described below:

Camp Internet Connection - VSAT

At EGRIP in 2022, we continue using the satellite communication system, VSAT, which is connected to a geostationary satellite. In 2016-2019, the system worked well, and while it was operational, all communications and data traffic was handled through a flat rate package with unlimited data and communications. This system will be set up again at EGRIP 2022, with an even higher bandwidth than in 2018 and 2019. The system will not be operational before late May.

Camp Cell phones - VSAT

For telephony in camp, people can use their smartphones on the EGRIP wireless network to make calls between each other. There will be an app to download. Installation guides will be available in the dome. The system will not be operational before late May.

We plan to install a computer that will act as a hub for WIFI connection of all cell phones in camp. It is the intention to link this computer to the internet via the VSAT system. If the VSAT connection is available, participants can also make international calls from their phones, and the outside world can call into camp. The system will not be operational before late May.

The number for the EGRIP exchange will be published in daily reports and SITREPs when active.

The caller will be asked to put in the local extension for the desired participant.

EGRIP field Leader will have ext. 401, EGRIP FOM will have ext. 301, public phone in EGRIP Dome will be ext. 402.

Details on how to connect and when the system is on-line will be posted on the EGRIP webpage.

Camp Iridium OpenPort system

EGRIP camp will utilize the Iridium OpenPort system in the first month, and then the system will act as backup in case the VSAT system goes off-line. This system consists of an array of antennae and receivers that multiplex to obtain two ingoing phone lines and internet connection. This system has been reliable in previous years. At EGRIP there are two complete OpenPort systems (One emergency back-up). While the Field Leader has unrestricted access to telephones and the internet via OpenPort, camp personnel are in general restricted from access to the internet.

When camp is communicating via OpenPort, Please Note:
Using the internet over Iridium OpenPort is paid for per Mbyte (price is about 10 USD per Mb). If unlimited, unnecessary uploads & downloads of software updates, large email attachments, images, movies, etc. by EGRIP participants will very quickly cost the EGRIP budget a fortune! Please, turn off all automatic downloads and all banners and pictures on your browser before connecting.
Communication costs for NEEM 2010: 360,000 DKK

<u>Iridium OpenPort telephone to EGRIP Camp</u>

This number may change. Please be aware that calling camp on Iridium can be as expensive as 6 USD per minute. Please ask the Field Operations Manager which number is current.

Only some of the Iridium numbers will be available at any given time. Please ask the Field Operations Manager (FOM) which number is current.

Initially **NO** external bell will be connected to the phones so arriving calls are not always heard.

Good times to call are during

Lunch	15:00 – 16:00 GMT
Evening dinner	21:00 – 22:00 GMT

The Iridium system OpenPort will be operational 24 hours if VSAT connection is not active.

EMAIL:

The Field Operations Manager will check arriving E-mail at least once a day on the following email: fom@egrip.camp (Don't forward large attached files).

For Field leader at EGRIP: fl@egrip.camp

On the ice, when we use the Iridium OpenPort system to send & receive E-mails, we will still be able to send & receive any E-mail via the above address; BUT at a high cost! PLEASE Remember to avoid attaching image files with your e-mails. The field leader will send images for the EGRIP diary on the EGRIP home page every day on behalf of everybody.

Please look up on the EGRIP web-page to check if EGRIP camp is communicating by VSAT or OpenPort.

EGRIP official communications:

SITREP

Field Leader and FOM will Sunday night prepare a **SIT**uation **REP**ort "SITREP", i.e. a report on the preceding week's field activity. This report will be transmitted by E-mail to the Copenhagen office. From here, it will be retyped and put on the EGRIP home page for download and and the relevant Greenlandic and Danish authorities.

The Sitrep follows the following format:

1. Number, date and time
2. Passenger movements
3. Cargo movements
4. Camp activities
5. Sub programs
6. Drill depth and time

7. Status for drilling
8. Other info
9. Signature of the Field Operations Manager

Daily reports on the web (www.eastgrip.org) and SITREPs on www.eastgrip.nbi.ku.dk

Daily, a short “What we have done today” report and stories from camp will be placed on the web. Information will be sent from the EGRIP camp to the Field Operations Manager office in Kangerlussuaq who, in turn, will take care of the home page together with the logistical team in Copenhagen (logistics@egrip.camp). The Field Operations Manager (fom@egrip.camp) will coordinate this activity.

Description of EGRIP camp

Quartering and buildings

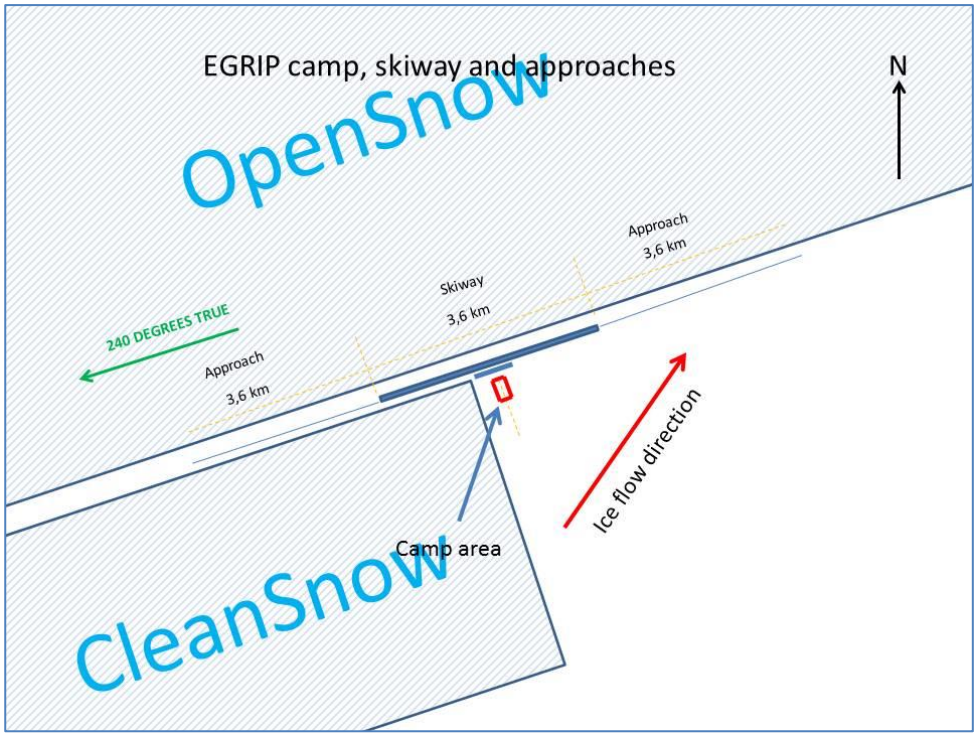
EGRIP camp July 2016.

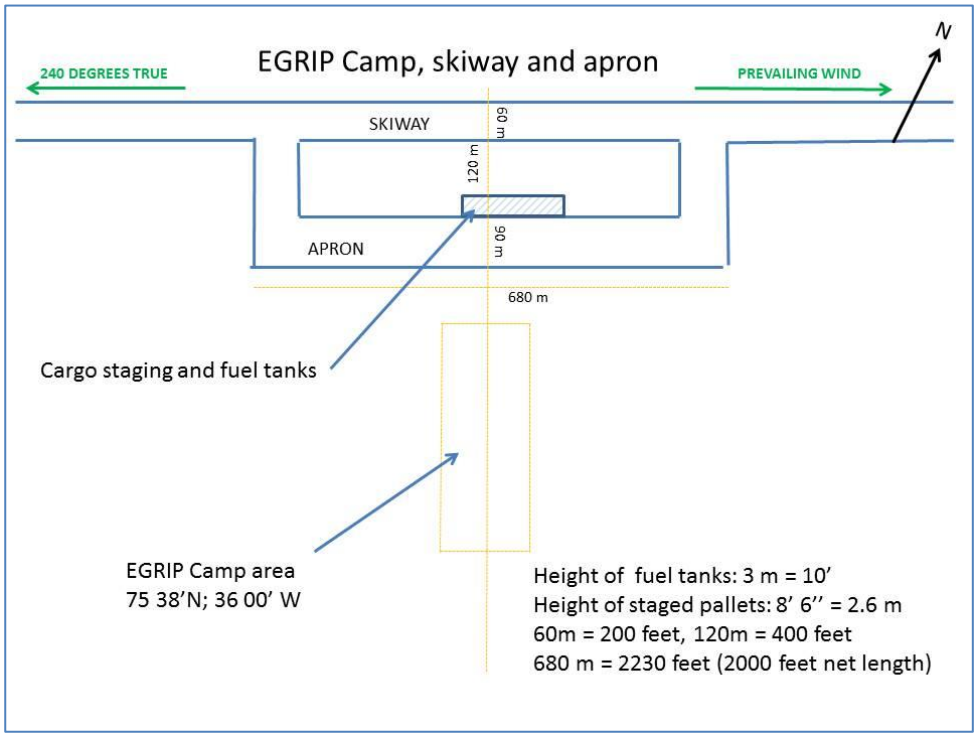
EGRIP	until May 20: PAX Normal(max)	after May 20: Pax Normal(max)	
Kitchen/office	4(10)	4(10)	40’ wooden dome
Big tomato	1(2)	1(2)	Fiberglass hut
Small tomato	1(1)	1(1)	Fiberglass hut
Flexmobil	0(1)	0(1)	Cabin
Flexmobil	0(1)	0(1)	Cabin
New Pistenbully	0(1)	0(1)	Cabin
Garage, mechanic			26’ x 40’ Weatherport
Garage, carpenter			26’ x 40’ Weatherport
Garage, storage			24’ x 28’ Weatherport
Quarter (WP 1)		2(4)	10’ x 15’ Weatherport
Quarter (WP 8)		3(6)	12’ x 20’ Weatherport
Quarter (WP 2)		3(6)	12’ x 20’ Weatherport
Freshie shack (WP 9)		0(2)	12’ x 20’ Weatherport
New quarter (WP 8)		3(6)	12’ x 20’ Weatherport
New quarter (WP 4)		3(6)	12’ x 20’ Weatherport
Quarter (WP 3)		3(6)	12’ x 20’ Weatherport
Quarter (WP 5)		2(4)	10’ x 15’ Weatherport
Quarter (WP 7)		1(2)	10’ x 10’ Weatherport
New quarter (WP 6)		1(2)	12’ x 10’ Weatherport
Total	6(16)	27(60)	

For those individuals who prefer to sleep in small tents, EGRIP has a few tents to lend out.

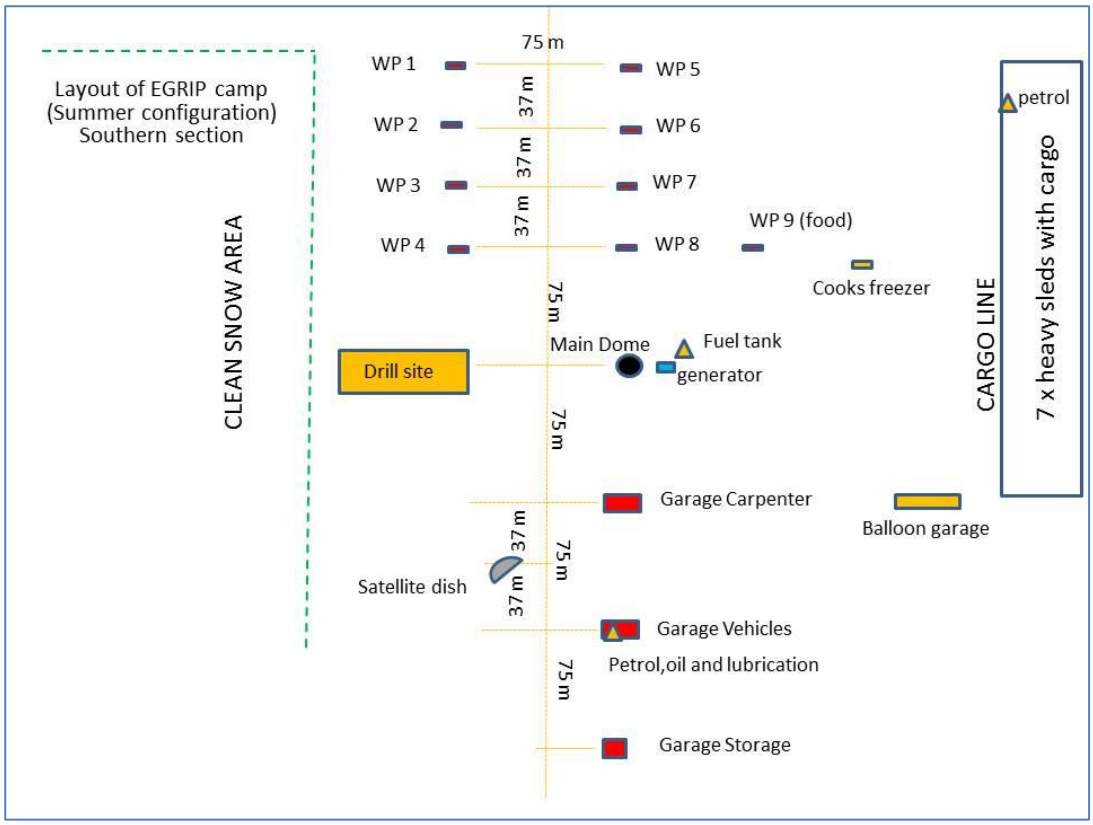
Maps of the EGRIP camp area.

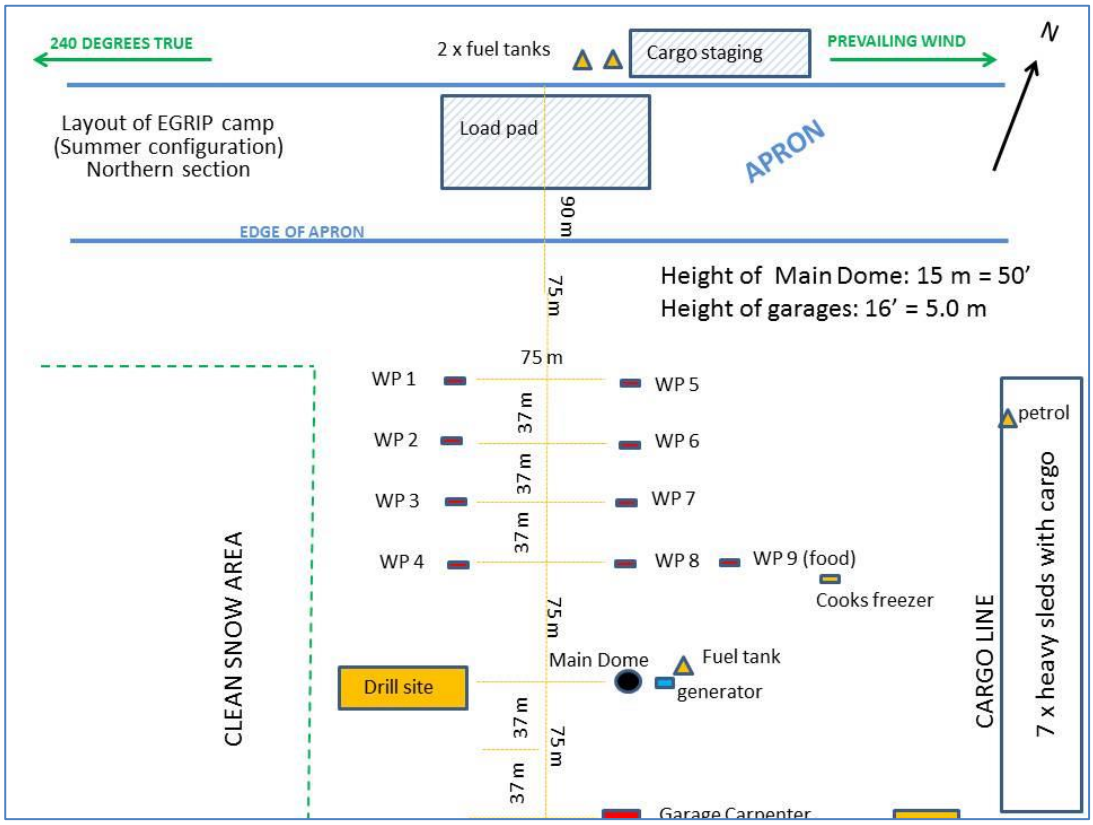
On the following three pages are maps of the EGRIP camp and Science areas in different scales.



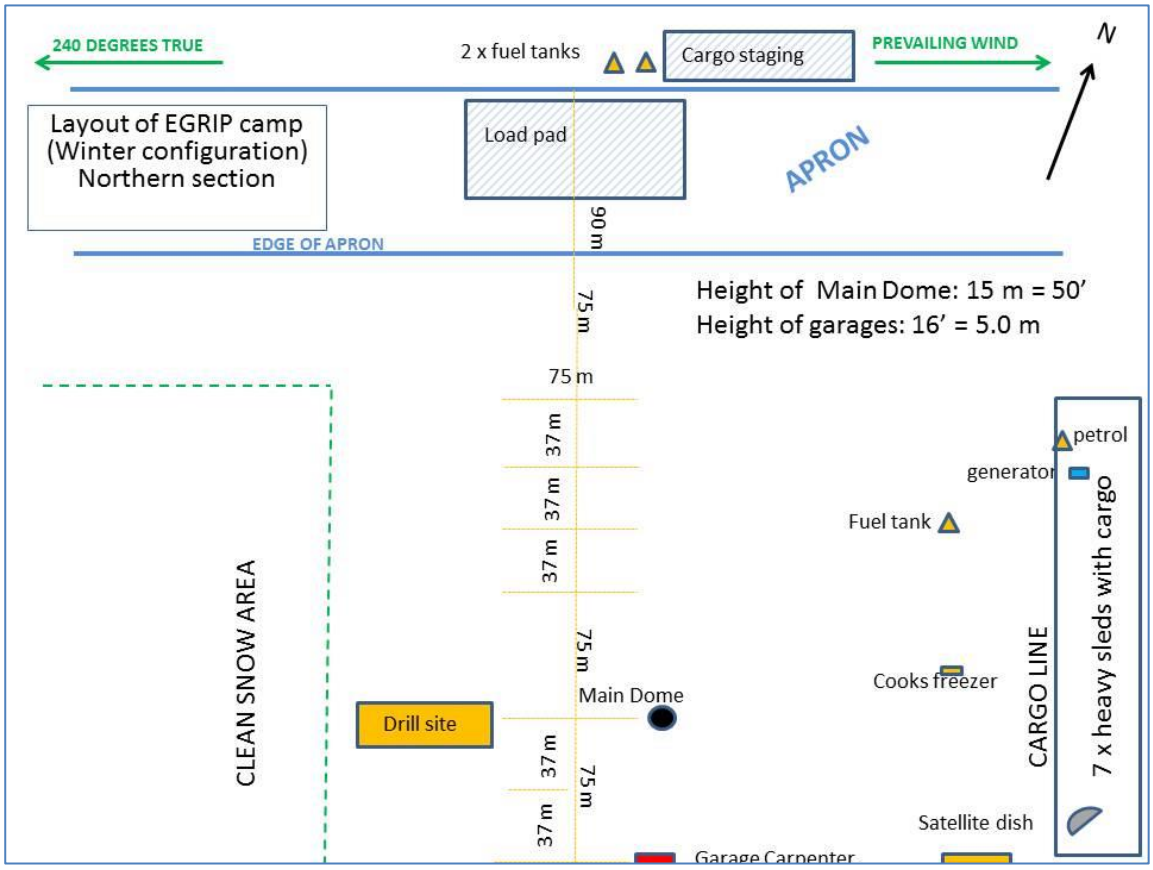


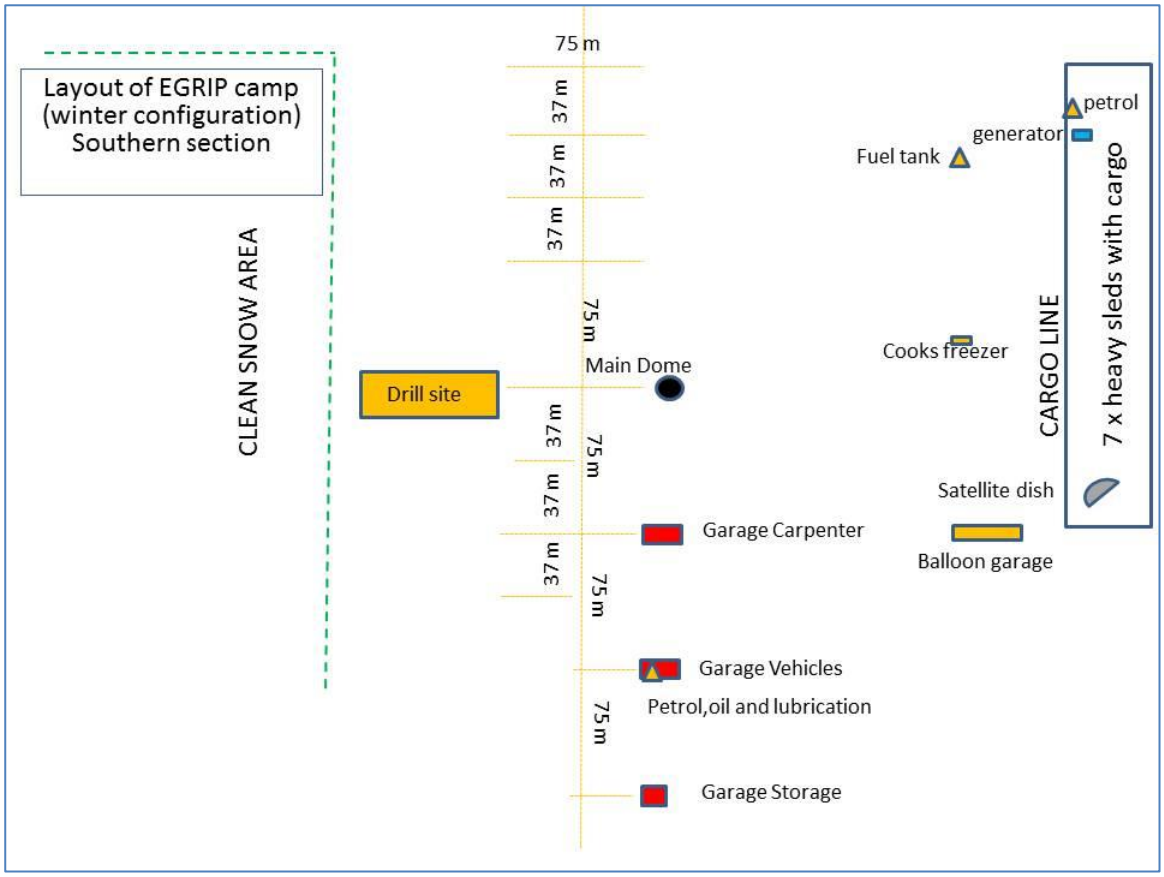
Camp, skiway and apron layout.





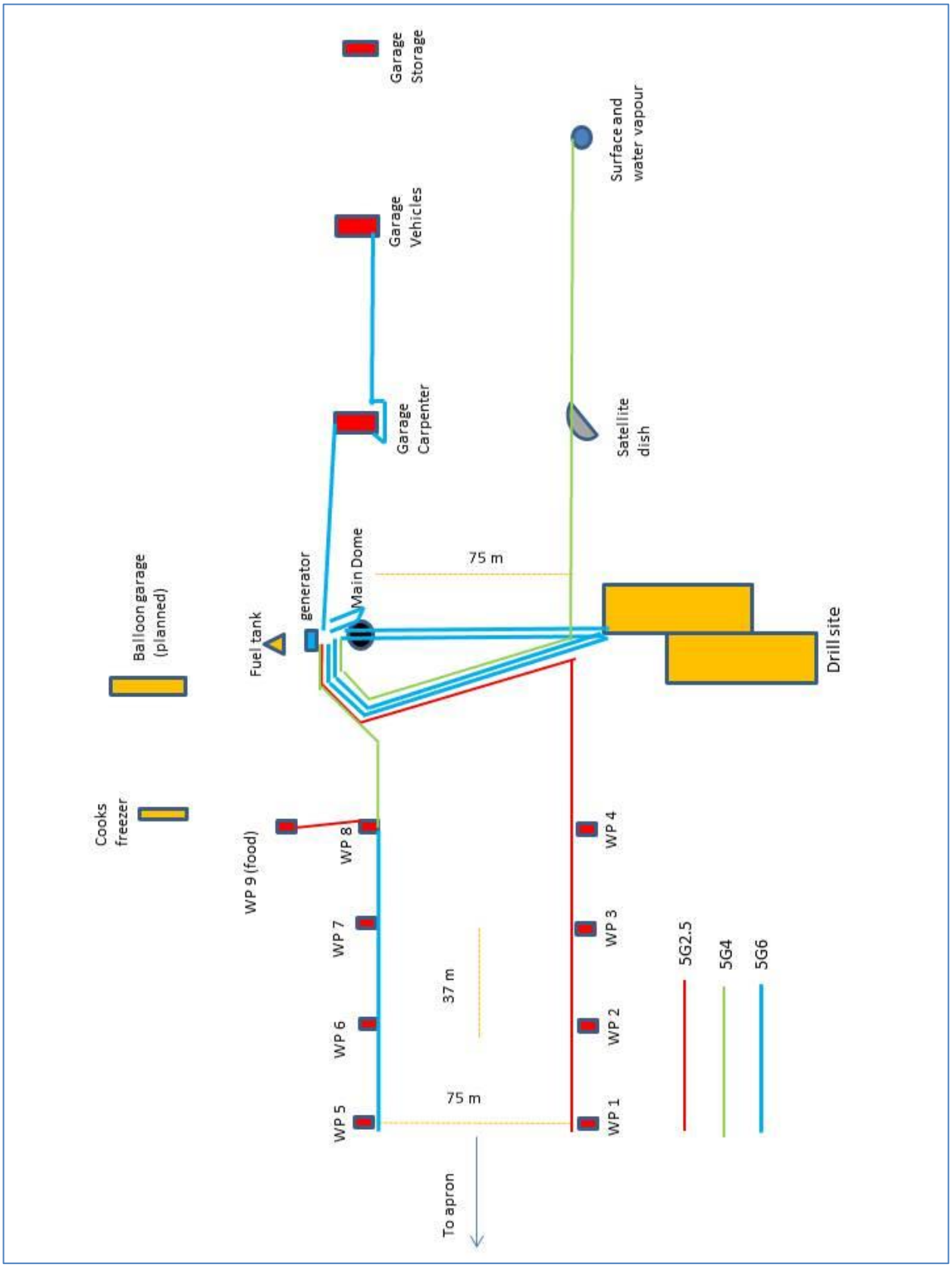
Map of EGRIP camp summer situation with all weatherports built.



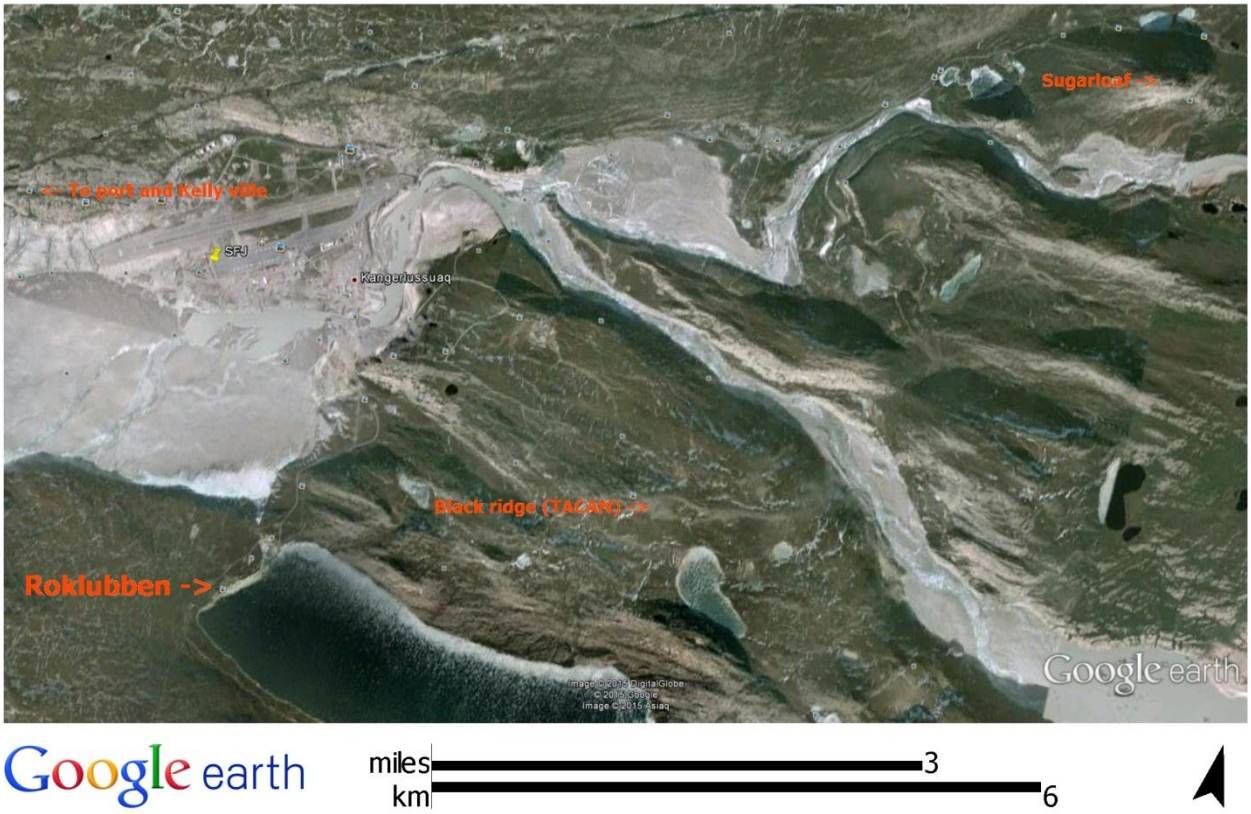


Map of EGRIP camp in winter situation. All weatherports are stowed on cargo line.

Electrical cabelling of EGRIP camp.



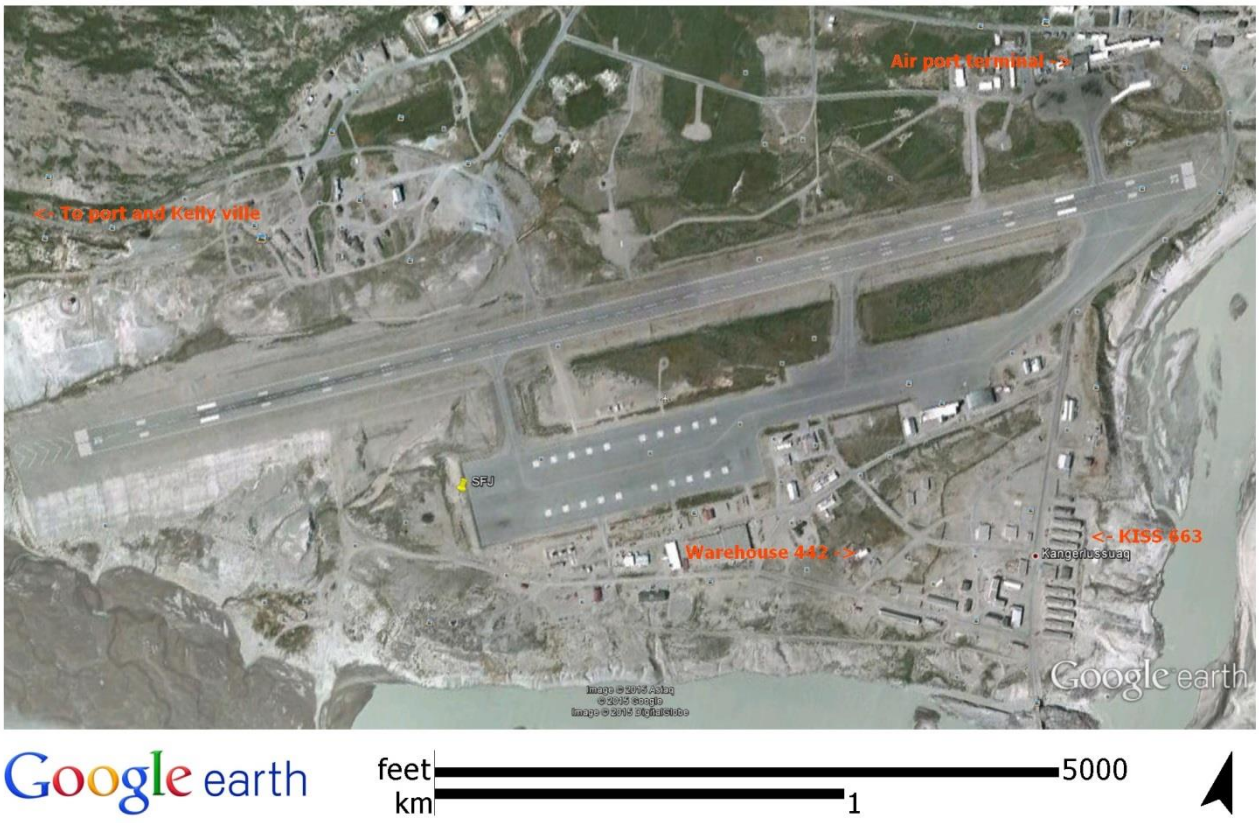
Description of Kangerlussuaq and Surrounding Area



In terms of complexity, Kangerlussuaq (Søndre Strømfjord or SFJ) is unique. Originally there was no native village. The first settlement was the US base Blue West Eight during World War II. The base was closed October 1, 1992, and all facilities handed over to the Greenland Airport Administration. Due to its US origin, the main electrical supply in Kangerlussuaq is 60 Hz, and you may encounter both 115V and 208V US type sockets, as well as 230V Danish sockets.

The population is approximately 650 including many kids. The terminal area is composed of several businesses: Met office, Air Greenland, local supermarket “Pilersuisoq”, some souvenir shops and Air Greenland cargo. The terminal side includes private housing, a combination of Air Greenland terminal and Hotel Kangerlussuaq, which also houses the Air Greenland offices and an ATM in DK Kroner. There are also buildings to the west of the terminal which house the Airport Administration and Air Cargo terminal (where outgoing and incoming cargo between Denmark and points in Greenland can be sent and received). The Greenlandic Post Office is located next to the local supermarket.

On the South side of the runway is the old U.S. Base. Here EGRIP office and quarters will be in KISS (Building 662). The project warehouse is building 442.



Weather: The climate is continental and dry with an annual precipitation averaging 120mm; winter temperatures reach down to -50°C and the summer temperature increases to above +20°C. In project planning for fieldwork in or around Kangerlussuaq, it is always best to prepare for the worst. The weather in Kangerlussuaq can be cold in May, and snow is always a possibility. June, July and August are normally fairly temperate with temperatures ranging from 5-21°C. Rain is rare in these months, but given the right conditions, it can still be quite cool.

Field clothing should include windbreaker, rain wear, work boots, warm hats and gloves, woollen shirts, sweaters and trousers. Given the wide range of temperatures during summer months, the use of layered clothing offers the greatest flexibility.

Be aware that cell phones cease to work 5 km from Kangerlussuaq. If you go on a walk, please tell the FOM where you are going and when you expect to be home. The FOM can lend you a satellite phone for emergencies.

Another important consideration is the insect season, normally from first week of June to late July. During this period, large, voracious Arctic mosquitoes are abundant.

In the past 5 years there have been 4 polar bear sightings in the Kangerlussuaq area.

Kangerlussuaq is the main hub for air traffic to and within Greenland with regular direct international connections to and from Copenhagen (Denmark) and occasionally Keflavik (Iceland).

In Kangerlussuaq you can buy regular, canned or freeze-dried foods, fuels (jet fuel/kerosene, gasoline, and field stove alcohol). There is also a post office, an airport hotel with cafeteria, a gym centre with

swimming pool, a tennis-, badminton-, racket ball- and soft ball court, a golf course - and also a small museum with exhibitions about the history of Kangerlussuaq. Check **www.greenland-guide.gl** for information.

There are a few alternative dining and drinking establishments in Kangerlussuaq. In the old base laundry, 100 m from KISS there is a small shop and fast food place. The is a pizzeria and Thai take-away and bar at "Nordlyset", some 150m from KISS towards the river at the rear of the building. Dining is available at the terminal. There is a cafeteria where the price of a typical meal is DK Kr.100, and a restaurant. In summertime restaurant "Roklubben" is mostly open for the public. This lakeside restaurant, some 5 km from Kangerlussuaq, offers a splendid view while dining on Greenland specialities.

BASE FOR SCIENCE

Kangerlussuaq has a long tradition as an important base for field geophysical and glaciological research projects, but so far the region has had only limited activities within the disciplines of life science. The area lies at the edge of the Polar Cap Zone and the Aurora Zone. It is therefore of particular interest to science studies related to the ionosphere and the magnetosphere as well as to the lower and upper atmosphere.

The Kangerlussuaq region is within the low Arctic eco zone with diverse habitats like salt lakes, dune systems, mountain tundra and steppes with caribou and musk ox populations etc. Reindeer are indigenous but muskoxen were introduced from Northeast Greenland forty years ago. Muskox and reindeer are hunted and in season meat can be purchased at authorized butchers.

The plant growing season is long, featuring 150 days without snow cover, 80 continuously frost-free days, and 150 consecutive days with maximum air temperature continuously above freezing; (the numbers given are average values). The climate is very stable and with low rate of rainy days. The monthly mean is 241 sun hours in May through August.

The Kangerlussuaq region is a well exposed high grade basement terrain forming the southern border zone of the Nagssugtoqidian orogen. The region has a glacial landscape dating back 8,000 years. The town is sitting on uplifted fjord sediments that popped up due to isostatic rebound after the last glacial. You may find proto-fossilized fish in the sediments west of town. Please note: It has become illegal to take large amount of fossils and rocks out of Greenland. As a rule of thumb, you are allowed to take out what you can have in a closed fist.

The proximity of the Inland Ice has a significant effect on the climatic regime for the living resources and further it presents unique logistic opportunities for studies on the Ice Sheet proper, the edge zone, and periglacial geomorphology.

The KISS (Kangerlussuaq International Science Support) facility

Scientists and students who plan to work in Greenland have facilities available in Kangerlussuaq. KISS offers an array of modern facilities and possibilities to rent equipment and goods for use in the field or at the labs of the KISS building.

KISS (bldg. 662 in the map) is owned by the Home Rule Government and operated by the Kangerlussuaq Airport Management. The use of KISS is reserved exclusively for researchers and research projects registered by the Greenland Authorities after submission of project plans.

It is important to realise that KISS is a year-round facility and that the Kangerlussuaq region offers obvious research opportunities and potentials during the 8 winter months. This applies both to projects in biology and geophysics and the presence of KISS now greatly improves the logistics for performing field operations during winter time

The KISS facility, and the other facilities in Kangerlussuaq offer unique possibilities for performing science based at Kangerlussuaq. Please contact the NEEM FOM office for more information.

EGRIP 2022 Responsibles

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EGRIP 2022 Participant Address List (20 March 2022)

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Zeppenfeld, Chantal	CH	chantal.zeppenfeld@climate.unibe.ch
Zhang, Nan ?	CHN	znan@jlu.edu.cn

Address of the 109th:

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New York Air National Guard
Stratton Air National Guard Base,
1 Air National Guard Rd.
Scotia, New York 12302-9752

Phone numbers

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Marie Kirk	+45 35 33 13 20
e-mail:	m.kirk@nbi.ku.dk
EGRIP FOM (Field Operations Manager) telephone	+299 84 11 51
FOM mobile	+299 52 41 25
FOM satellite phone	(will appear on EGRIP home page)
e-mail	fom@egrip.camp

Iridium Satellite handheld telephones to EGRIP camp.

Only some of the telephones will be available at any given time. Please ask the Field Operations Manager (FOM) which number are current.

Iridium OpenPort system (EGRIP only)

Please ask the Field Operations Manager (FOM) which number is current.

Kangerlussuaq

While participants are in Kangerlussuaq they can be reached by:

Fixed line:	+299 84 11 51
EGRIP FOM Cell :	+299 52 41 25

CPS POLAR FIELD SERVICES, Kangerlussuaq

Office:	+299 84 15 98
Fax	+299 84 15 99
Mobile:	+299 52 42 18 (primary)
	299 52 42 81 (secondary)
E-mail:	cpskangerops@polarfield.com
	sheeley@polarfield.com (Tracy Sheeley)
	kyli@polarfield.com (Kyli Cosper)
Air Greenland Cargo	+299 52 43 98
Tickets	+299 70 12 12

NYANG	+299 84 13 89
Met Office tel.:	+299 84 10 22
e-mail:	139ravenops@gmail.com
FIC: telephone:	+299 36 33 53 (sector north)
FIC e-mail	fic@naviair.dk
Notam & com centre	+299 36 33 04
Rescue and Coordination Centre (RCC)	+299 36 33 18
e-mail:	rcc@naviair.dk
KISS:	+299 84 13 00
	+299 84 14 87
	+299 84 11 07
fax:	+299 84 14 72
email	sciencesupport@mit.gl

MEDICAL ADVISORY GROUP

Rigshospitalet (Phone +45 3545 3545)

EGRIP medical team in Tasiilaq medicals@egrip.camp

Cargo shipments to Greenland

EGRIP will have a Field Operations Manager in Kangerlussuaq all the time this season. It is essential that all shipments are labelled correctly, and that EGRIP is informed about every shipment. In addition, we can expect delays in the Air Greenland transport from Copenhagen to Kangerlussuaq although Air Greenland has increased the number of flights in summer.

Cargo to Kangerlussuaq should be labelled:

EGRIP Operations 2022
Box 12
DK-3910 Kangerlussuaq
Phone +299 84 11 51. Mobile +299 52 41 25
Greenland

The international designation of Kangerlussuaq is **SFJ** (Søndre Strømfjord)

We would like following information about each collo:

Weight
Dimensions
Volume

Additional information and labeling
Non Freeze
Hold in Kangerlussuaq
Hazardous Material, including UN number and Proper shipping name.

Information on shipments and **Air Way Bill # (AWB)** should be emailed to:
fom@egrip.camp and **logistics@egrip.camp**

We urge people to ship cargo as early as possible. Based on our experience and this year available air cargo space to Greenland we as a minimum recommend following:

SHIPPING DEADLINES:

Shipping Deadlines 2022:

If you cannot have your cargo ready by these dates, please contact Marie/Iben. Note: It is expensive to hand carry boxes and we may have a faster shipping solution. Please also note that items longer than 318cm are subject to extra charge.			
AIR Greenland			
Flight Period:	**ETA EastGRIP:**	**ETA (SFJ) Kangerlussuaq:**	**ETD Cargo/Hazmat UCPH:**
1 Put-In	25 April 2022	18 April 2022	31 March 2022
2	20 May 2022	12 May 2022	05 May 2022
3	06 June 2022	30 May 2022	19 May 2022
4	19 July 2022	08 July 2022	30 June 2022
5	15 August 2022	08 August 2022	28 July 2022

Boat (RAL) *(check dates)*	**ETA EastGRIP:**	**ETA (SFJ) Kangerlussuaq:**	**ETD Cargo/Hazmat UCPH:**	**ETD Aalborg/Aarhus:**
			BWS ETD Tuesdays	
1	19 July 2022	18 June 2022	(16) 19 May 2022	25 May 2022
2	15 August 2022	30 July 2022	TBD/Aarhus	TBD/Aarhus
3	Spring 2023	13 August 2022	TBD/ Aarhus	TBD/Aarhus

Shipping to EGRIP from the United States

CPS POLAR FIELD SERVICES and the EGRIP FOM must be notified of all cargo shipments, including commercial air in order to arrange for the receipt and transportation of cargo to the appropriate location in Greenland.

PLEASE NOTE: Be sure to mark your cargo with “EGRIP 2022” to avoid your cargo ending up at Summit!
CPS POLAR FIELD SERVICES contacts: Tracy Sheeley (sheeley@polarfield.com) and Kyli Cosper (kyli@polarfield.com)

It is necessary for you to enter your shipment into the CPS cargo tracking system (CTS). Tracy and Kyli will provide you with a password and login. You will receive an email from us when we have received your cargo in good order in Kangerlussuaq.

Useful tables
for planners, field leaders, Field Operation Managers, drillers and other interested parties.

Positions of NEEM and EGRIP camps and 2015 traverse route.

EGRIP position: 75.63N, 36.00W (decimal degrees), 2708 m a.s.l. (8885 feet)

Start of route is approx. 2 km N of NGRIP camp.

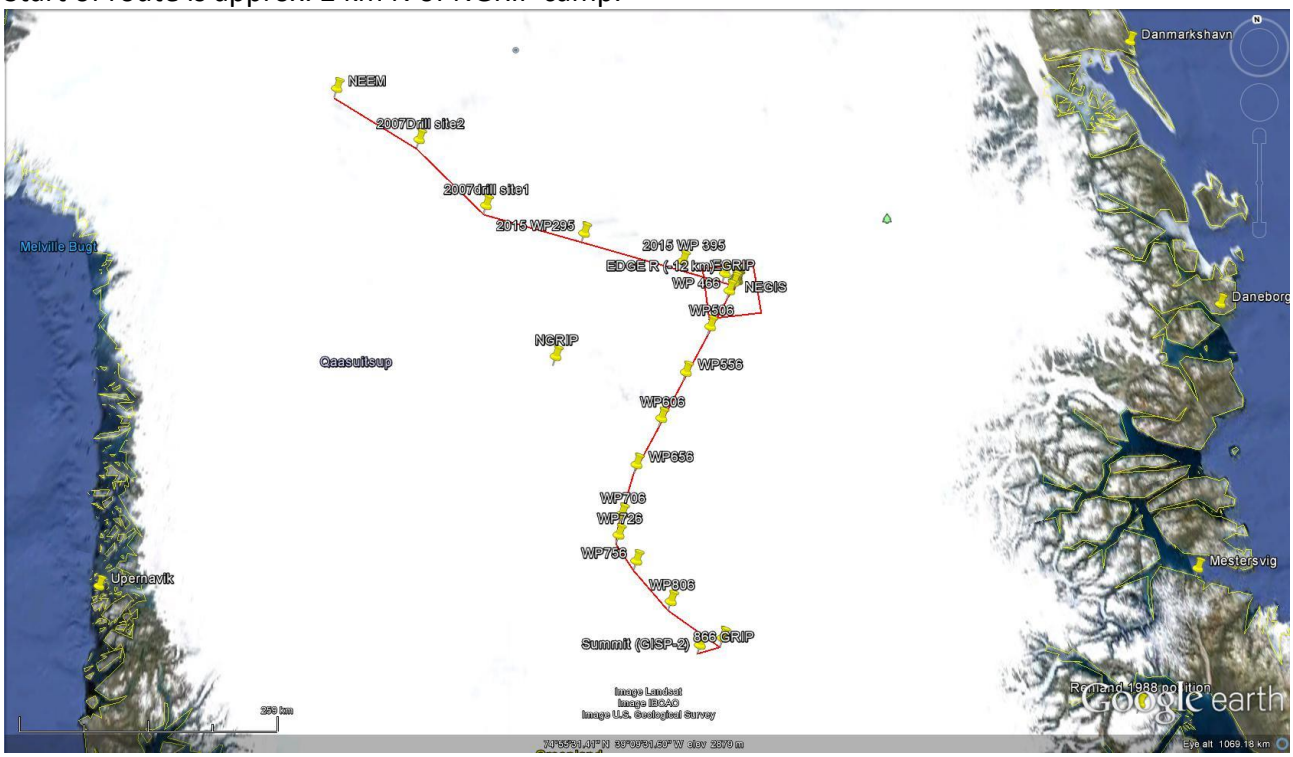


Fig. 5 1 The red line shows the 2015 route from NEEM to EGRIP and on to Summit.

Positions of EGRIP skiway (official-May 2019):

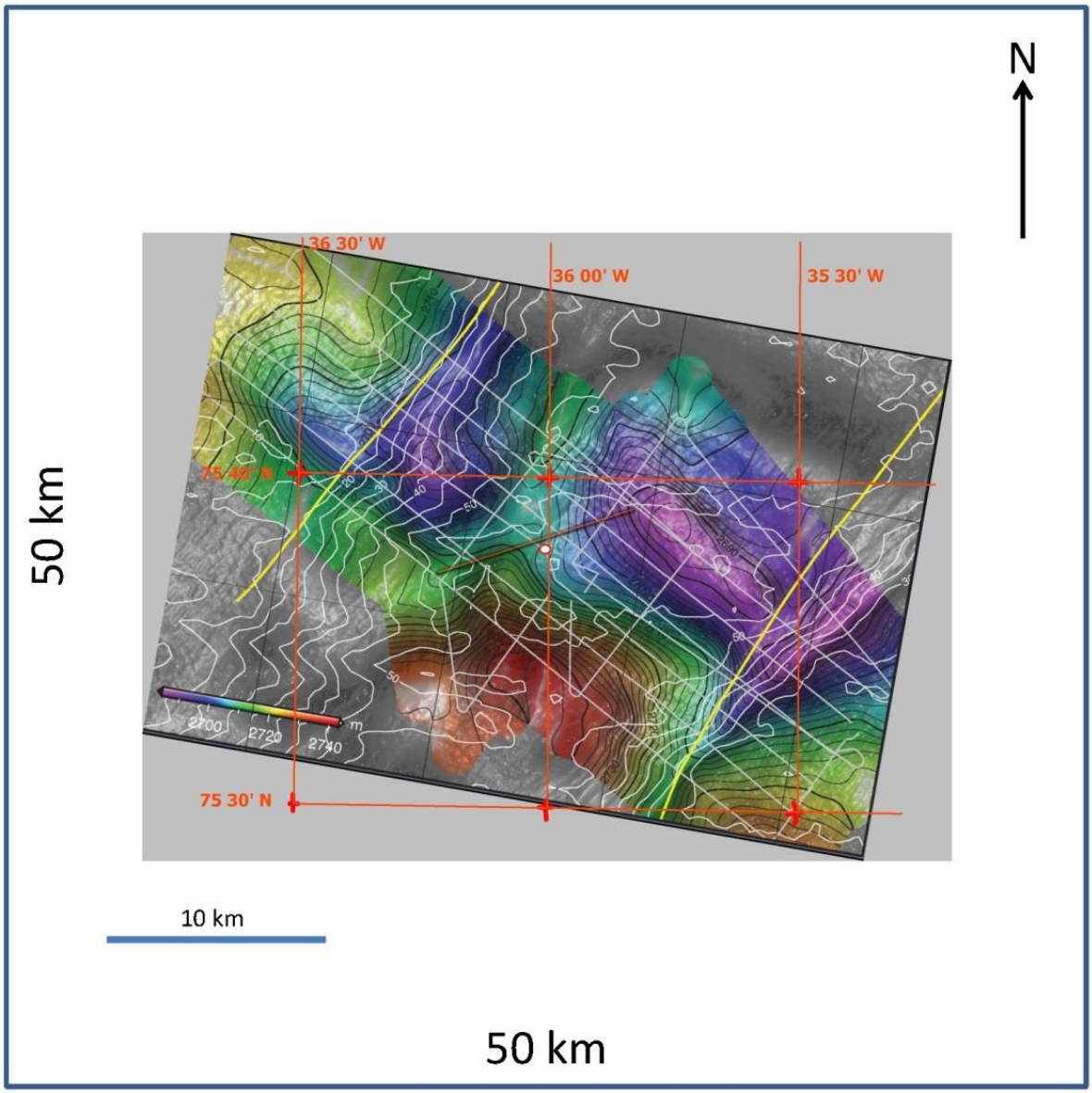
NorthEast end: 75 38’ 38.65’’N; 35 56’ 29.47’’W ELEVATION: 8871 feet (2704 m)

SouthWest end: 75 37’ 39.43’’N; 36 03’ 23.47’’W ELEVATION: 8898 feet (2712m)

Skiways runs 240 and 060 degrees true.

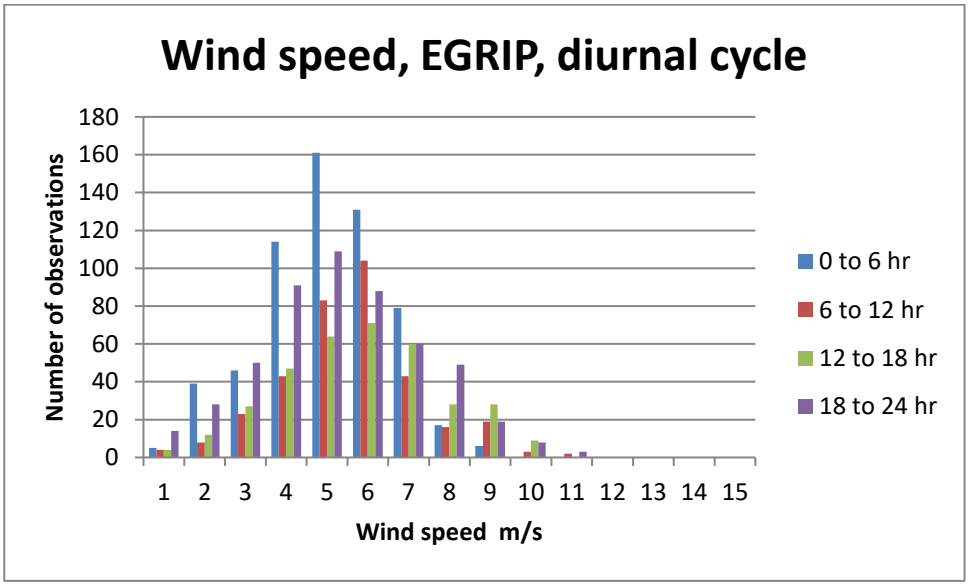
Official (109th) altitude: 8,885 ft, Slope 0.22 degrees, down vs 060.

Note: The entire camp moves 51m towards NNE each year.

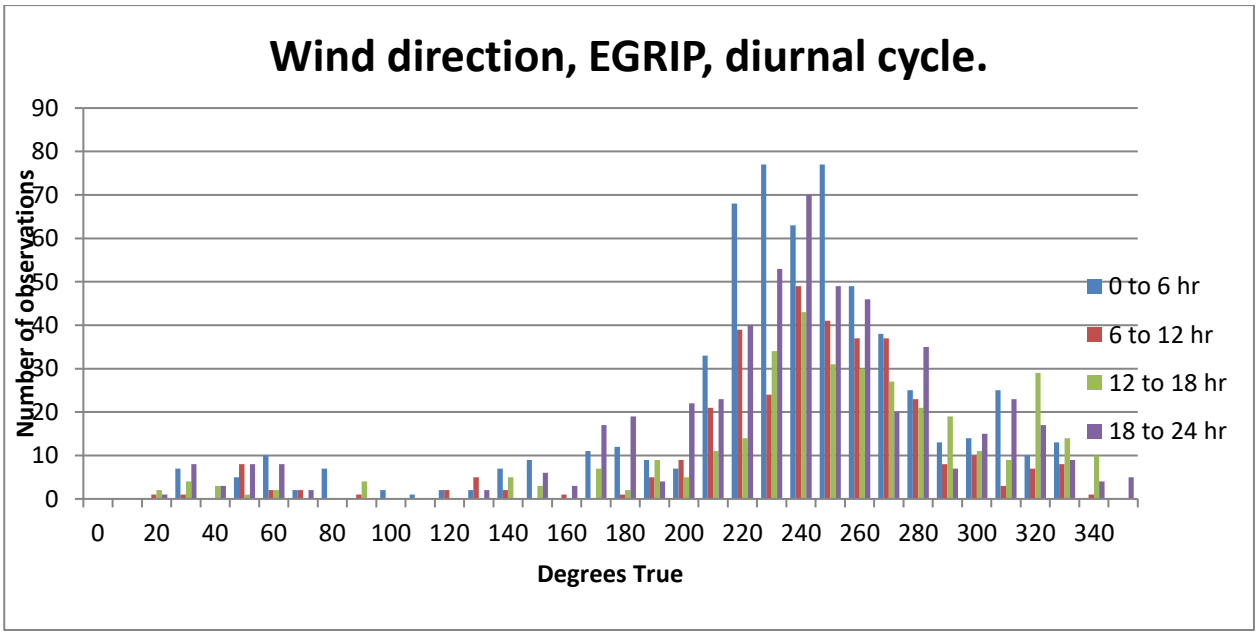


Map on the vicinity of EGRIP camp with camp and skiway (240 degrees true). Data has been compiled by Knut Christiansson, Penn. State. The entire frame is 50 km by 50 km and represents the area allotment requested for EGRIP at Greenland authorities.

EGRIP weather 2014 from PARCA AWS



Wind speeds are in m/s. The ordinate is number of observations



When compared, it becomes clear that the wind is much more localized at EGRIP than at NEEM. Therefore a EGRIP skiway of 240 degrees true is within 20 degrees of the wind more than 60 % of the time. EGRIP is slightly colder than NEEM, but there are fewer cases with high winds. Finally, the annual accumulation of 11 cm ice eq. (30 cm snow) is less than half of NEEM.

Shipping boxes

The type of shipping box is very critical for both the protection of the cargo, and for efficient air transport. In Kangerlussuaq, the boxes will be stored on the cargo line which is exposed to snow, rain, sand and wind. On the ice, drifting snow will creep through any openings. The off loading from the aircraft at Summit is in the form of drifting cargo: The pallets are slid down the rear ramp of the aircraft while the aircraft is taxiing. In order to obtain the full payload and prevent the aircraft from cubing out before reaching maximum weight, the boxes should be stackable on an Air Force pallet. Also, wooden boxes with nails sticking out are dangerous to handle. By experience, we have found the following series of boxes to satisfy all the requirements:

Zarges aluminium box, type K-470. The following sizes are preferred:

order no	Internal dimens (L*W*H)	Outside dimens	Weight
40678	550*350*310	600*400*340	5,0
40564	550*350*380	600*400*410	5,3
40565	750*550*380	800*600*410	10,0
40566	750*550*580	800*600*610	12,0
40580	1150*750*480	1200*800*510	20,0

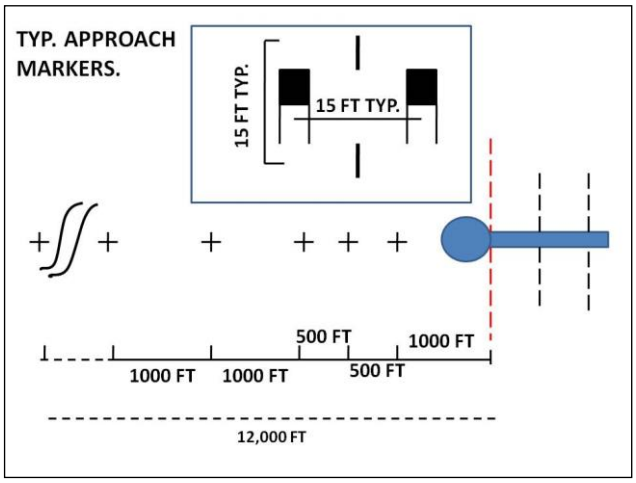
The boxes should be lined with a shock absorbing layer. We have found a 27mm layer of Dow Chemical EDPM foam, 35kg/m^3, to provide the needed protection for even fragile material. Finally, in order to seal the box, all seams (bottom inside and outside, two vertical seams) should be sealed with Loctite 290 penetrating sealing compound.

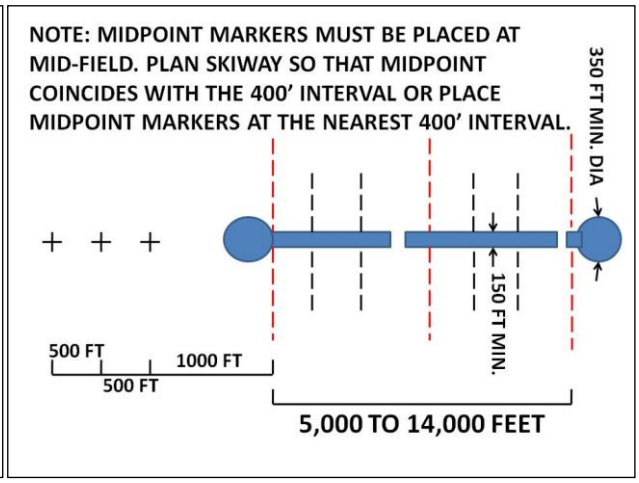
We propose that, whenever possible, all participants use these or compatible boxes for their cargo. In order to be compatible, a box should have the same outside dimensions, and the same type of inter-box locking mechanism. The boxes should be equipped with handles.

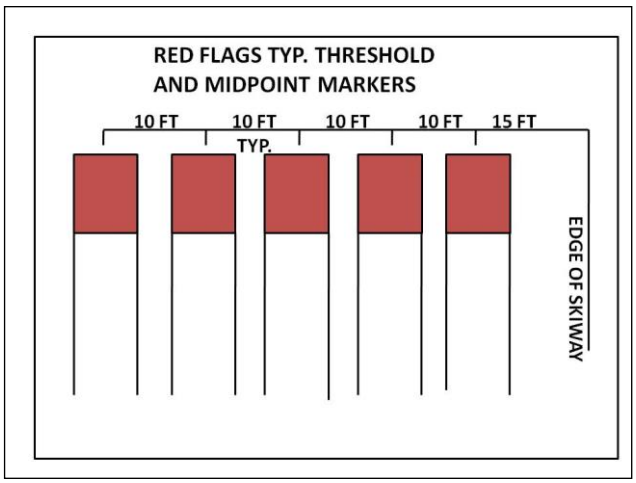
The costs of transporting boxes are considered to be part of the field expenses.

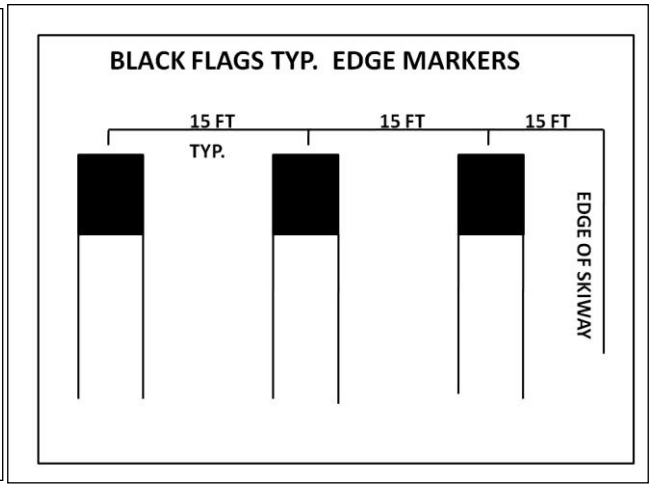
Skiway Marking:

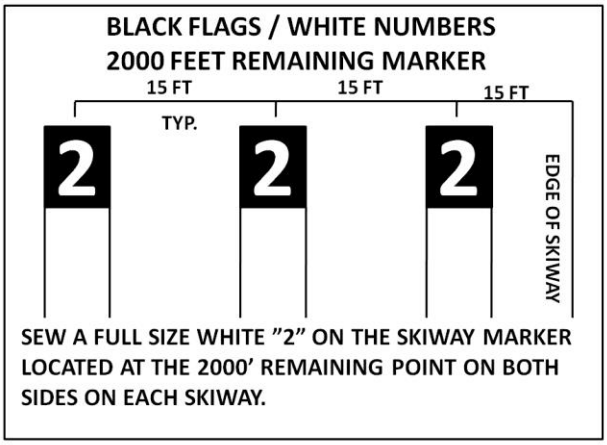
EGRIP ski way is 200’ x 12.000’ (Feet) – (choice of length 5,000’ – 16,000’, width 150’ – 400’)
Skiway design from AFI 13 – 217, 10.MAY 2007





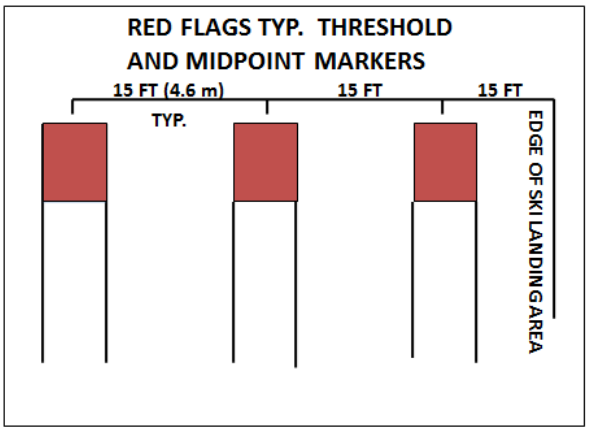


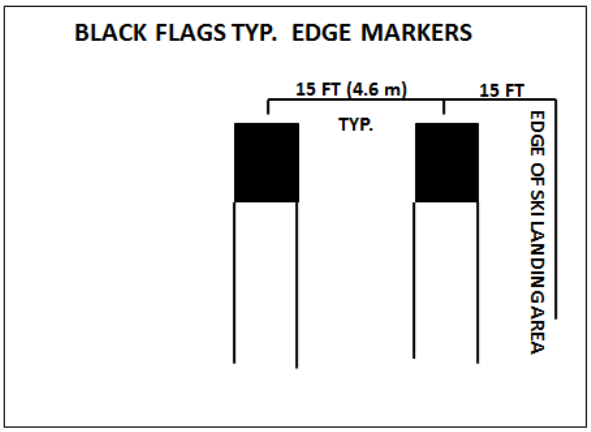


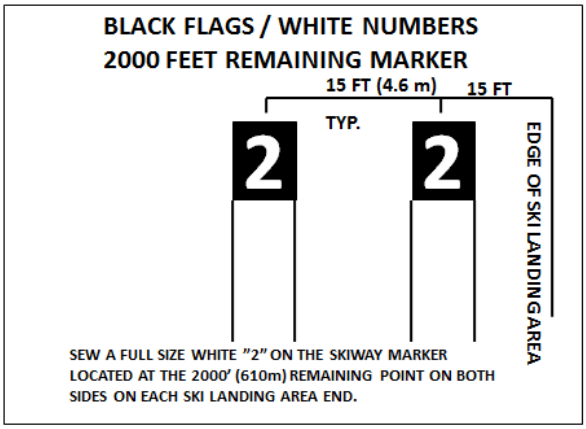


Ski Landing Area Marking (temporary skiway, last used at NEEM*):*

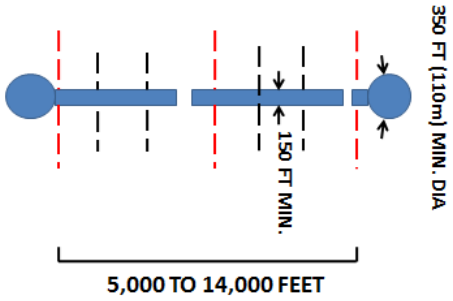
EGRIP ski landing area will be 200' x 12.000' (Feet) – (choice of length 5,000' – 16,000', width 150' – 400'). Landing Area design from AFI 13 – 217, 10.MAY 2007







NOTE: MIDPOINT MARKERS MUST BE PLACED AT MID-FIELD. PLAN SKI LANDING AREA SO THAT MIDPOINT COINCIDES WITH THE 500' (152.4m) INTERVAL OR PLACE MIDPOINT MARKERS AT THE NEAREST 500' INTERVAL. NO APPROACH MARKERS NEEDED

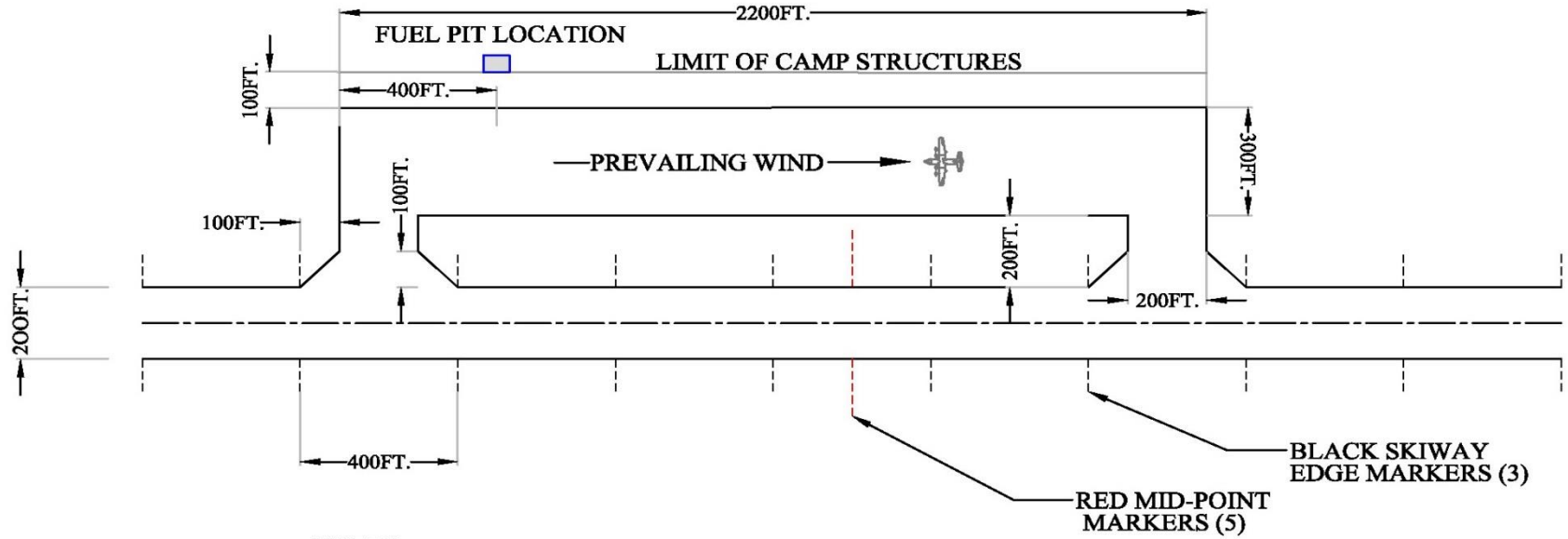


TYPICAL DIMENSIONS FOR MARKER BAMBOO:
2.4 m (94") x 2.5 cm (1 ")DIAMETER

SKIWAY:
NO OF MARKERS NEEDED (12,000 FEET X 200 FEET) (3660 m X 61 m):
30 RED AND 12 BLACK WITH "2" AND 268 BLACK (INCLUDING APPROACHES).
APRON AND TAXIWAYS: 30 GREEN.

SKI LANDING AREA :
NO OF MARKERS NEEDED (12,000 FEET X 200 FEET):
18 RED AND 8 BLACK WITH "2" AND 80 BLACK
APRON AND TAXIWAYS: 30 GREEN.

SKIWAY APRON LAYOUT
(CARGO OFFLOAD / ONLOAD AREA)



NOTES:
1. DIMENSIONS AS NOTED.
2. ACTUAL LOCATION OF SKIWAY APRON IN RELATIONSHIP TO SKIWAY MAY CHANGE DEPENDING ON CAMP LOCATION.
3. MARK APRON CORNERS WITH DOUBLE GREEN FLAGS, APRON LIMITS WITH SINGLE GREEN FLAGS.
4. MARKERS ENLARGED FOR CLARITY.

LC-130 AIRPLANE DESCRIPTION
WINGSPAN...132' 7"
LENGTH...97' 9"
HEIGHT...38' 6"

JCS 2011

Skiway official survey document:

May 29, 2015 survey in black
May 1 2018 re-survey in brown. May 11 2019 survey in blue.

SURVEYOR: Jorgen Peder Steffensen (Document updated May 2019).

NOTE:
1. ALL ELEVATIONS REFERENCE MEAN SEA LEVEL IN FEET (METRIC)
2. LATITUDES/LONGITUDES AND AZIMUTHS EXPRESSED IN DEGRESS-MINUTES-SECONDS FORMAT
3. ALL DISTANCES IN FEET (METRIC)
4. DUE TO ICE FLOW, EGRIP SKIWAY IS MOVING 150 FEET PER YEAR, BEARING 030

EGRIP CAMP (BGEG)

AIRFIELD REFERENCE POINT (ARP): CENTERLINE STATION 1640 (500 meter)
LATITUDE: 75-38-02.82 N LONGITUDE: 36-00-12.96 W
LATITUDE: **75-38-07.48N** LONGITUDE: **36-00-00.90 W**
LATITUDE: **75-38-09.02N** LONGITUDE: **35-59-56.83 W**

ELEVATION: 8885 (2708 meter)
DISTANCE SKIWAY CENTERLINE POINT TO THRESHOLD:
APPROACH: 6000
DEPARTURE: 6000

MAIN SKIWAY (200 ft. x 12000 ft.)
APPROACH (24)
LATITUDE: 75-38-32.52 N LONGITUDE: 35-56-46.80 W
LATITUDE: **75-38-37.07N** LONGITUDE: **35-56-34.12 W**
LATITUDE: **75-38-38.65N** LONGITUDE: **35-56-29.47 W**

ELEVATION: 8871 (2704 meter)
DEPARTURE (06)
LATITUDE: 75-37-33.36 N LONGITUDE: 36-03-38.82 W
LATITUDE: **75-37-37.85N** LONGITUDE: **36-03-27.54 W**
LATITUDE: **75-37-39.43N** LONGITUDE: **36-03-23.47 W**

ELEVATION: 8898 (2712 meter)
MAIN SKIWAY GRADIENT: 0.22%

SKIWAY AZIMUTHS from Approach True 24
True: 237 24'
Grid: unknown (mag. Declination Jan 2019: 27 00')

MAIN DOME (HIGHEST STRUCTURE)
LATITUDE: 75-37-54.41 N LONGITUDE: 35-59-16.15 W (May 2019)
ELEVATION: 8925 (top of structure) (2720 meter)
AGL:
DISTANCE TO SKIWAY CENTERLINE: 1640 (500 m)
DISTANCE SKIWAY CENTERLINE POINT TO THRESHOLD:
APPROACH 24 : 6000 (1829 meter)
DEPARTURE 06 : 6000 (1829 meter)

Typical specifications for Twin Otter and Basler:

Actual specs depend on the aircraft used, its equipment, fuel type etc.

	De Havilland DHC-6, Twin Otter:	**Basler (modern DC-3), Polar 6:**
Weight empty [kg]	3456	8900
Max take off weight [kg]	5682	13068
Weight of ski	250	544
Empty weight with ski	3706	9444
Max load [kg]	1976	4008
Fuel consumption [kg/hr]	270(330l/hr)	470 (570l/hour)
Speed without ski [km/hr]	250(135 kn)	380 (205 kn)
Speed with ski) [km/hr]	230 (125 kn)	300 (160kn)
Max range [km]	556	3225
Max altitude [ft]	30,000	25,000
With pax	10,000	25,000
Fuel load [kg]	1100	4008
Loading data:		
Cargo hatch [m*m]	2.0*1.9	2.15 *(1.9 front – 1.6 rear)
Cargo compartment		
Length, incl rear cabin etc [m]	8.1	12.85
Width 1,1m, max	1.2	2.34
Height 1,3m, max	1.4	2.0
Pay load		
Normal with full fuel load [kg]	990	2500 (with fuel for 3 hours)
Maximum	1260	1500 (with fuel for 5 hours)

Twin Otter:
In order for the cargo to fit through the cargo door, if the cargo is:

5.5m long, it must not be more than 0.2m thick
4.0m long, it must not be more than 0.35m thick
2.5m long, it must not be more than 0.65m thick
1.3m long, it must not be more than 1.2m thick

Basler:
In order for the cargo to fit through the cargo door, if the cargo is:

6.0m long, it must not be more than 0.6 m thick

Typical LC-130 specifications:

(all specs for info only, depends on aircraft etc)

An empty LC-130 is [lbs]	91000
Tank capacity [lbs]	61000
Max touch down weight open snow [lbs]	125000
Max take off weight [lbs]	155000
Max landing weight [lbs]	155000
Max landing weight on prepared skiway [lbs]	135000
Fuel capacity [lbs]	62000
Fuel consumption [lbs/hr]	5000
Nominal speed [kn]	290
Flight time SFJ-NGRIP-SFJ (1020 nm)	4.4 hours
Flight time SFJ-NEEM-SFJ (1260 nm)	5.4 hours
Range with max payload [miles]	2364
Max air hours [h]	10
Cargo room max 41*10.3*9’ [m]	12.50*3.14*2.74
Physical door width 116" [m]	2.94
Cargo deck to ceiling 9' 1" [m]	2.76
Max weight for one pallet, pos 1-4 [lbs]	10000
Max weight of one pallet, pos 5 [lbs]	8500
Max weight of ramp pallet [lbs]	4664
Nominal empty weight of pallet and nets [lbs]	355
Max weight multplie pallet for combat offload [lbs]	12000
Pallet outside dimensions 88"*108" [m]	2.23*2.75
Pallet inside dimensions 84"*104"*2.25" [m]	2.13*2.64
Max height normal pallet, 96" [m]	2.44
Normal height of pallet, snow and combat [m]	2.28
Max height ramp pallet for combat offload [m]	1.75
Max height dual or tripple pallet [m]	1.75
Max vol per pallet [m^3]	13.7
Max vol ramp pallet [m^3]	8.75
Width wheel well area 123" [m]	3.12
Width ramp without rails 114" [m]	2.89
Width outboard rails 105 5/8" [m]	2.68
Ramp height 44" to 49" [m]	1.12 to 1.25
Ramp length 10' [m]	3.05
No of pax without using pallet space	4
1 pallet equals [pax]	8
2 pallet equals [pax]	14

Note: Pallet heights are measured from top of pallet.
Max weight for pallet on 931B forks is 2200 lbs

Small table of values and conversions:

1 foot =	0.3048 m
1 lbs =	0.4536 kg
1 US gallon =	3.7854 l
1 knot =	0.514 m/s

Max dimension of cabin luggage:	55*40*23 cm, 8 kg
Density of Jet A1	805 kg/m^3
Density of mogas	720 kg/m^3
200 l drum of JET A1 or D60	178 kg
Empty standard drum	15 kg
Jet A-1 weight vs. volume	0.52 liter per lbs.
Firn density for stop of water flow:	720 kg/m^3

CINA equation for the relation between pressure and altitude:

$$p[hPa] = p_0 \left(\frac{288 - 6.5 \cdot 10^{-3} \cdot h\,[m]}{288} \right)^{5.256}$$

where p_o=1013.25 hPa, 288K standard air temperature at sea level (15 °C) and 6.5*10^{-3} the standard lapse rate in the troposphere [°C/m]. Use this equation to obtain the sea level pressure when the altitude is known, i.e. for aviation weather reports.

Chill temperature:
This is the formula used for calculating wind-chill-temperatures:

$$\boldsymbol{t_{Chill}[\,^oC] = \left(\frac{10.45 + 10\sqrt{v} - v}{22.034} \right) \cdot (t - 33) + 33\ [\,^oC; m/s]}$$

Current capability of electrical cables:

Area [mm^2]	Resistance [Ohm,/100m]	Nom load [A]	Max load [A]
0,7	2.3	6	10
1,5	1.16	15	25
2,5	0.69	20	35
4,0	0.43	25	45
6,0	0.29	40	60
10	0.175	60	80
16	0.11	80	110
25	0.07	100	135

Connections to 5-conductor cable:

Old system		**New system**
Yellow/green:	Protective ground	yellow/green
Blue	Neutral (0)	blue
Black	L1	brown
Brown	L2	black
Black	L3	grey

Attenuation of coaxial cables:

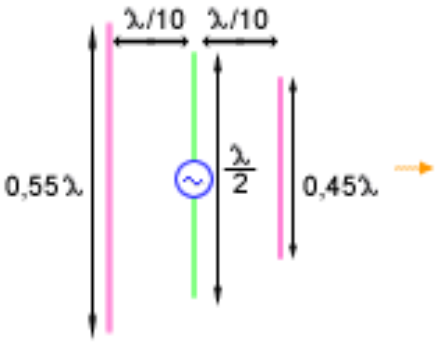
RG58/U attenuation per 30m:

10 MHz	1.5 dB at SWR 1.0.	+0.5 dB at SWR = 3
200 MHz	8.0 dB at SWR 1.0.	+1.2 dB at SWR = 3
1500 MHz	30 dB at SWR 1.0	+1.2 dB at SWR = 3

RG213/U attenuation per 30m:

10 MHz	0.7 dB at SWR 1.0	+0.4 dB at SWR = 3
200 Mhz	3.5 dB at SWR 1.0	+1.0 dB at SWR = 3
1500MHz	12 dB at SWR 1.0	+1.2 dB at SWR = 3

HF Radio Yagi-Uda Antenna:



From left to right, the elements mounted on the boom are called,

Reflector element, Driver element, Director element

The reflector is 5% longer than the driver element, and the director 5% shorter.

Typical dimensions for 3 element wide spaced 8093 kHz Yagi-Uda antenna:

Reflector length:	0.5*l	18.53m
Dipole length	0.475*l	17.60m
Director length	0.45*l	16.68m
Distance Reflector-Dipole	0.23*l	8.53m
Distance Dipole-Director	0.25*l	9.27m

With this length of the antenna the gain is expected to 7 dB, SWR<2

Coordination of LC-130 in Kangerlussuaq

Note regarding the coordination of Polarfield/EGRIP
and 109'th TAG activities in Kangerlussuaq.

This note is written to make the field coordination between Polarfield/Batelle ARO, EGRIP and 109'th TAG as smooth and easy as possible by ensuring efficient ways of exchanging firsthand information between the responsible Field Operations Managers (FOM's) for CPS and EGRIP and 109'th TAG personnel during periods with flights for the GISP and EGRIP programs.

The outline of this paper should be presented to each Deployment Commander(DC) in a briefing and each mission crew should be briefed on the contents before scheduling a flight to/from EGRIP. This will ensure that the FOM's and the 109'th personnel will operate along the same outlines throughout each period of deployment.

In the following it is assumed that prior to the field activities of Polarfield and EGRIP in Greenland, plans and agreements have already been made between Polarfield/EGRIP and 109'th TAG regarding times of deployment in Kangerlussuaq, expected number of missions throughout the season, total cargo estimates, estimates on cargo straps, nets and pallets needed, ski-way marking, ski-way preparation, off load areas, radio frequencies etc.

Flight period:

After arrival of 109'th to Kangerlussuaq a meeting should be held between 109'th DC, 109'th cargo responsibles (Load masters and Aerial port) and the FOM's of Polarfield and EGRIP. Both FOM's need to be there since U.S. NSF activities and EGRIP project are independent and each FOM carries the financial responsibility regarding 109'th operations. At this meeting the FOM's will provide information on:

- Planned flights,
- Amount of cargo,
- Hazardous cargo,
- Number of PAX to be transported,
- Ski-way conditions in camp.
- Ski-way, taxiway and off-load area outlines relative to the camps,
- Updates on radio frequencies,
- Current weather and
- Communication radio frequencies & phone numbers.

The DC will provide information on the exact duration of the deployment, ground crew availability, aircraft availability and options in case of bad weather. The meeting will result in an operation schedule for the flight period in question. Both FOM's and the DC should consult each other in case of changes in this schedule.

Day to day operations:

The FOM's will normally organize that all cargo is palletized, strapped down and weighed. In cases of doubt the FOM's will consult the Aerial Port regarding palletizing. The FOM's will always consult the Aerial Port when married pallets are being built and when load vehicle (k-loader) is needed. The FOM's will list the weight and height of the pallets. The FOM's will indicate to Aerial Port which pallets are going on each flight and will indicate the position of any hazardous cargo on the pallets. Normally, transportation of pallets from the staging area to the planes and vice versa will be handled by Aerial Port using the Articulated front loaders(ATs) or other load vehicles. However, the FOM's will assist in the on- and off-loading of aircraft whenever needed using the EGRIP forklifts and trucks.

Cargo manifests, passenger manifests and shippers declarations of hazardous material will be prepared by each FOM office and delivered to Skier operations on the day before departure. In case of last minute changes (e.g. changes in passengers) the changes to the manifests will be passed on to Skier operations no later than two hours before departure. The FOM's will get aviation weather observations from the field camps on a one hour basis, starting at least 3 hours prior to scheduled departure. The FOM will ensure that the Field Leader also sends three consecutive Aviation weather reports to the DMI office, so DMI may work out an aviation weather report for the 109th pilots.

Since each FOM is economical responsible to his/her program, the FOM and DC either in person or by telephone will agree on whether a flight will depart or not. The FOM should be present at the AC at departure to provide last minute briefing with the departing crew.

During missions Telephone, Iridium phones, OpenPort phones and e-mail will be monitored for updates on weather and mission progress from plane crews and field camps. NOTE: Both EGRIP camp and FOM office will have phone lines open 24 hours a day. The FOM office will relay information on mission progress to Skier OPS. The FOM keeps a record of departure times and reported arrival times.

End of flight period:

At the end of deployment, before departure of the 109'th to the U.S. or, when there is a change of DC, a meeting should be held between the 109'th and the CPS and EGRIP FOM's in order for the FOMs and DC to sign the mission sheet, which includes the number of flight hours assigned to the different programs.

Updated, February 25, 2022 by J.P.Steffensen

AVIATION WEATHER REPORTS

The aviation weather reports should report the following in the sequence shown:

1. Time [local, here SFJ hours], use 24 hour format.
2. Ceiling Height to cloud base[100 feet, estimated or observed]. Type [SKC, FEW, SCT, BRK, OVC]
3. Visibility [nautical miles or fractions there off]
4. Temperature (Celsius). State centigrade.
5. Wind, Direction[10 deg resolution], State “true” or “magnetic” . And speed in knots
6. Pressure [hPa], reduced to zero elevation using 10700' for GRIP, 10600' for GISP, 9700' for NGRIP, 8140’ for NEEM and 8924’ for EGRIP. This is called the **QNH** value.
7. Horizontal definition [good, fair, poor, nil]
8. Surface definition [good, fair, poor, nil]
9. Comments.

Example: 0630 local, Scattered, 2500 feet estimated, vis. 2 miles, temp: -15 degC, Wind 290 mag at 12 knots, QNH 1013 hPa, horizon: good, surface: fair, “skiway clear, fogbank SE of ski-way.”.

Visibility: Nautical miles or fractions of miles. Any visibility problems less than 6 miles state obscuring phenomenon. Choices: Haze, snow, ice fog, ground fog, blowing snow, white out. Max visibility stated “unrestricted”.

Pressure: Local pressure converted to sea level according to international aviation CINA standard atmosphere. State hPa. Note, that the elevation used is the agreed upon, canonized elevation in feet, not the actual elevation. hPa (or millibar; 1 hPa = 1 mb)

Ceiling type: **SKY CLEAR** (SKC, no cloud al all), **FEW** (a small cloud here and there <25 %), **SCATTERED** (SCT. Even coverage of clearly separated small clouds. 25% -60%), **BROKEN** (BRK, Even coverage of clear blue patches of sky between clouds. 60 % – 85 %). **OVERCAST** (OVC, even cloud cover, 100%). With OVC always state cloud base height.

Horizon definition: **Good:** Sharp horizon **Fair:** Identifiable
Poor: Barely discernable **Nil:** No horizon

Surface definition

GOOD: Snow surface features are easily identified by shadow. (Sun in obscured)
FAIR: Snow surface can be identified by contrast. No definite shadow exist. (Sun obscured).
POOR: Snow surface cannot be identified except close up. (Sun totally obscured).
NIL: Snow surface features cannot be identified. No shadow or contrast. Dark coloured objects seem to "float" in the air. Glare is equally bright from all directions.

Whiteout NIL surface, NIL horizon

Comments: Plain language comments, trends, changes : «Fog bank north”, “Visibility decreasing.” “Winds variable”. “Barometer rising”.

Conversion:	1mB	= 1 hPa =	0.0295300 in.Hg.
	1 foot	= 0.3048 meter,	
	1 nau.miles	= 1853 meter.	
	1 m/s	= 1.943 knots	

Communication plan

Typical radio communication plan.

The major part of the communication is performed using VSAT satellite link, Iridium OpenPort and Iridium satellite communication. However, flight related communication close to camp is performed on VHF radio.

Call signs (Site Names): CPS Sonde, Summit Radio, East GRIP , GOC Sonde.

VHF radio.
Camp communication with air craft is performed on Air band **122.8MHz** FM, In camp radios will operate on Maritime Channel 8 (156.400 MHz). Maritime VHF is also used to support SAR operations.

If aircrafts are expected, weather reporting from camp starts 3 hours prior to estimated take off time on a one hour basis unless otherwise arranged. Reporting primarily on e-mail with telephone and radio as backup unless agreed otherwise. Weather observations should be reported to the FOM office, weather office in Kangerlussuaq (DMI) and the 109th. DMI needs at least three observations from camp to issue a local area forecast to the flight crews.

Summary of frequencies used in Greenland

VHF radio air band.	118.1	CNP AFIS
	118.3	SFJ Approach
	121.3	NUUK FIC
	121.5	**Call, Emergency**
	122.8	Air to ground, EGRIP or Summit
	126.2	SFJ Tower
VHF marine band:	Ch 8	EGRIP talk channel
	Ch 12	EGRIP talk channel
	Ch 16	International call and distress channel (156.8 mHz)

Phonetic alphabet

A special way of saying letters and numbers that makes them less likely to be misunderstood when they are transmitted over radios.

A	Alpha	N	November	1	Wun
B	Bravo	O	Oscar	2	Too
C	Charley	P	Papa	3	Tree
D	Delta	Q	Quebec	4	Fower
E	Echo	R	Romeo	5	Fiwer
F	Foxtrot	S	Sierra	6	Six
G	Golf	T	Tango	7	Seven
H	Hotel	U	Uniform	8	Aight
I	India	V	Victor	9	Niner
J	Juliet	W	Whiskey	0	Zeeroh
K	Kilo	X	Xray		
L	Lima	Y	Yankee		
M	Mike	Z	Zulu		

In addition, numbers are usually spoken as individual digits. For example, 123 would be read as “wun too tree”.

Useful abbreviations for de-cyphering pilot talk on flight plans.

AC: Air craft.	
ACL: Air Craft Load	= Total weight of aircraft (in kg or pounds)
GC: Centre of gravity	For balancing the Air Craft
FL: Flight Level	level of flight in nearest 100 feet
POB: Persons on board	= total number of souls (PAX and crew)
Endurance or FOB	= Total time of flight with current fuel load.
1000z	= 10.00 GMT (0800 AM West Greenland summer time)

Flightplan:

IDENT: C-GHGF TYPE: DC3T VFR M SHG/S
DEPART BGNM@1200 FL125 N0205
ROUTE: BGSF
EET 0330 FOB 0600 POB 5
For PIC E BENGTSSON
J.P.Steffensen, FL EGRIP Camp
+8816 777 15686

Identity: Charlie-Golf Hotel Golf Foxtrot. Type: Turbo DC3 (Basler), Flying Visual Flight Rules. Safety equipment “M SHG/S” Departs EGRIP at 1200z , flying at flight level 12500 feet, , route to Sondrestrom, Estimated flight time 03.30 hours, Fuel on board 06.00 hours. 5 Souls on board. Pilot in Charge: E Bengtsson.

METAR and TAF:

METAR	bgsf 111320z auto 08007kt 9999ndv ncd m30/m34 q0995=

METAR	METAR
Bgsf	Valid for Kangerlussuaq/Sdr Strømfjord
111320z	Issued the 11th day of the month at kl. 13:20UTC
auto	
08007kt	Wind from 80° at 7 knots
9999ndv	Visibility > 10 km
ncd	
m30/m34	Temperature -30 degrees C, dewpoint temperature -34 degrees C
q0995	Pressure 995 hektopascal (hPa)

TAF-FT	bgsf 111058z 1112/1123 06006kt 9999 bkn150 tempo 1113/1123 4500 -shsn bkn024=

TAF-FT	Long TAF
Bgsf	Valid for Kangerlussuaq/Sdr Strømfjord
111058z	Issued the 11th day of month at 10:58 UTC
1112/1123	Valid from 09:00 and the next 11 hours
06006kt	Wind from 60° at 6 knob
9999	Visibility > 10 km
Bkn150	Broken at 15000 feet
Tempo	Periods with change
1113/1123	Between kl 13:00z and 23:00z
4500	Visibility 4500 meter (4,5 km)
-shsn	Light snowshowers
bkn024	Broken at 2400 feet

Positions in Greenland

Positions in Greenland				
Site	N, deg	W, deg	N, deg, min	W, deg,min
Aasiaat, BGAA	68,7219	52,7847	68 43 19	52 47 05
Akureyri, AEY	65,65	18		
AWI 1995 depot	76,63	46,37	76 38	46 22
Camp Century, tower	77,1797	61,10975	77 10 46	61 06 35
Camp Century,upstream	77,22122	60,80012	77 13 16	60 48 00
Constable Point, BGCO	70,7417	22,6583	70 44 30	22 39 30
Danmarkshavn, DMH	76,79	18,65		
Dye-2	66,485	46,298	66 29 06	46 17 54
Dye-3	65,15139	43,81722	65 09.05	43 49.02
EGRIP	75,63541	36,00025	75 38 07	36 00 01
GISP 2 (Summit)	72,58833	38,4575	72 34.78	38 27.27
GRIP	72,58722	37,64222	72 34.74	37 37.92
Hans Tausen, 95 Drill site	82,50556	37,47222	82 29.8	37 28.2
Jakobshavn, BGJN	69,2444	51,0622	69 14 40	51 03 44
Kangerlussuaq, BGSF	67,0111	50,725	67 00 40	50 43 30
Kulusuk, BGKK	65,5736	37,1236	65 34 25	37 07 25
Longyearbyen	78,25	15,5		
Narsarsuaq,BGBW	61,1611	45,42780	61 09 40	45 25 40
NEEM	77.4486	51.0556	77 26 54.93	51 03 19.89
NGRIP	75,1	42,30000	75 06	42 20
NGT23, B20	78,83333	36,50000	78 50 00.0	36 30 00.0
NGT27, B21	79,99925	41,13744	79 59 57.3	41 08 14.8
NGT30, B22	79,34142	45,91156	79 20 29.1	45 54 41.6
NGT33, B23	78,00000	44,00000	78 00 00.0	44 00 00.0
NGT37	77,25000	49,21667	77 15	49 13
NGT39	76,65000	46,48333	76 39	46 29
NGT42	76,00000	43,50000	76 00	43 30
NGT45	75,00000	42,00000	75 00	42 00
Nuuk, BGGH	64,1944	51,6806	64 11 40	51 40 50
Saddle North	66,43333	43,33333	66 26	43 20
Station Nord (STANOR)	81,6	16,650	81 36	16 39
Storstroemmen			77	22
T53. JJ			71 21.24	33 27.34
T61	72,2	32,3	72 12	32 18
Thule AB	76,53	68,7	76 32 00	68 42 00
Uummannaq, BGUQ	70,7342	52,6961	70 44 03	52 41 46

Relevant distances

From	To	km
AEY	NOR	1780
AEY	CNP	600
CNP	THU	1532
CNP	DMH	686
CNP	RENLAND	161
DMH	NGT33	627
DMH	NOR	539
EGRIP	DMH	480
EGRIP	CNP	695
EGRIP	SUMMIT	350
EGRIP	NEEM	440
EGRIP	NGRIP	190
MST	CNP	170
MST	RENLAND	141
NEEM	SFJ	1180
NEEM	THU	480
NEEM	UPERNAVIK	600
NEEM	NGRIP	365
NGRIP	CNP	799
NGRIP	GRIP	315
NOR	Longyearb	717
NOR	HT	335
SFJ	THU	1224
SFJ	JAV	245
SFJ	EGRIP	1088
SFJ	GRIP	796
THU	CC	205
THU	HT	887
THU	NGT33	625
THU	GRIP	1005
THU	NOR	1182

EGRIP Drilling Liquid Properties

A drilling liquid was developed for NEEM and used at EGRIP based on ESTISOL 240 (coconut oil extract) mixed with COASOL. This liquid is non-polar, non-hazardous, no explosive risk, 'healthy', has a low environmental impact, and is available. BUT is twice the price of D-40/HCFC-141b and has 5 times the viscosity at -30'C. We have also included a new cold temperature version ESTISOL 140, which was tested and found suitable for Antarctic operations at Aurora basin in 2014, also as a one components fluid (see densities below). It has higher vapour pressure so it can be smelled and it dries out from clothing much faster.

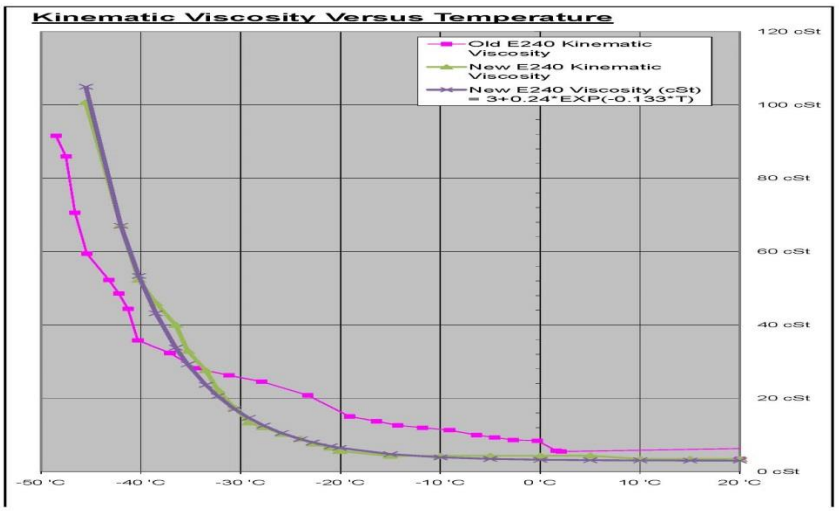
EGRIP is using COASOL/ESTOSOL 240 in combination with ESTISOL 140 in the coming years.

TABLE .	**COASOL**	**ESTISOL 240**	**ESTISOL 140**
Manufacturer	DOW	DOW	DOW
Melting point	< - 60 °C	< -50 °C	<-89 °C
Boiling point	274 - 289 °C	255 - 290 °C	199 °C
Flash point	131 °C	136 °C	75 °C
Explosive limit	0.6 – 4.7 % (vol)	None	None
Vapour pressure (20°C)	0.004 kPa		0.03 kPa
Density (20°C)	960 kg/m^3	863 kg/m^3	865 kg/m3
Density (-30°C)	995 kg/m^3	898 kg/m^3	915 kg/m3
Viscosity (20°C)	5.3 cSt	3 cSt	1.0 cSt
Viscosity (-30°C)	25 cSt	13 cSt	2.2 cSt
Auto ignition temperature	400 °C	None	270 °C
Bio-degradable	Yes	Yes	Yes
Fire fighting equipment	Water spray, foam, CO_2	Water spray, CO_2 foam, dry chemical	Water spray, CO_2, foam, dry chemical
Special protection	No	No	No
Hazardous material	No	No	No
Explosive risk	None	None	None
Max. Workplace air levels	None	None	None
Price US$ equiv. in Kg	5.50 $/Kg	4.60 $/Kg	4.5 $/kg
Data on ESTISOL 240, 256, EGDA, & COASOL are from safety tests according to EU Safety 91/155/EU, article 204020, 203989, 205698 & 204872 respectively			

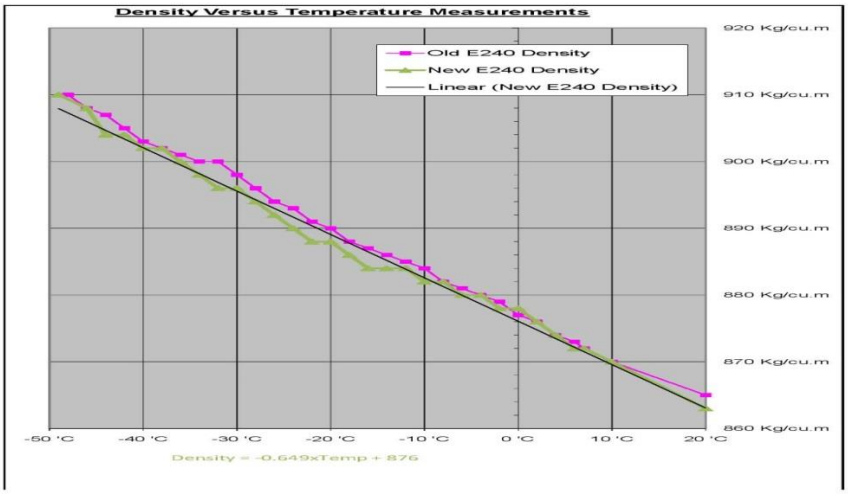
ESTISOL 240 was field tested as a drilling liquid at Flade Isblink, Greenland 2006 with a 4" diameter ice core drilled using the Hans Tausen electro-mechanical drill to a depth of 423.30m (260m of this core using the new liquid). The ice core quality was 'good', no problems encountered cleaning and processing the ice core, the mixture has a slippery feel with no discernable odour, and the liquid is very slippery when spilt on the smooth wooden flooring. The Hans Tausen drill descents at speeds of 0.95m/s at drill liquid temperatures of -16 deg. C.

By increasing the borehole diameter by 4mm (to 134mm) a 36% descent speed increase was achieved (1.28m/s). Further improvements can be achieved by adding a dead weight, reducing the pressure chamber diameter, or reducing the pressure chamber length.

The mix proportions for EGRIP fluid , 2-3 litre ESTISOL 1 litre COASOL

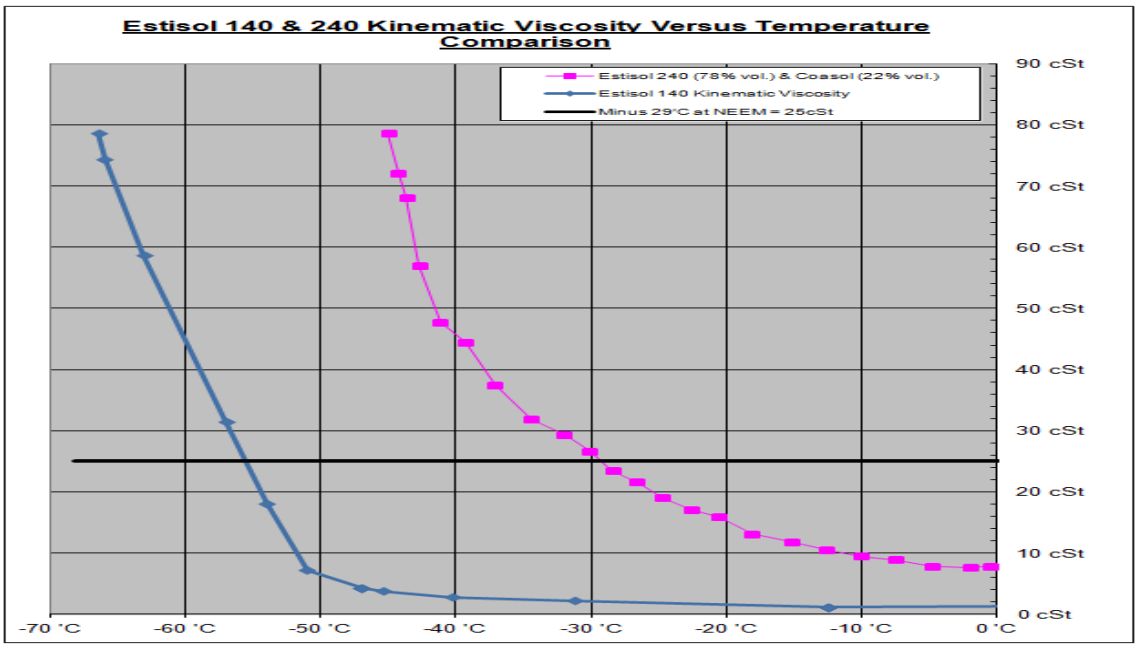


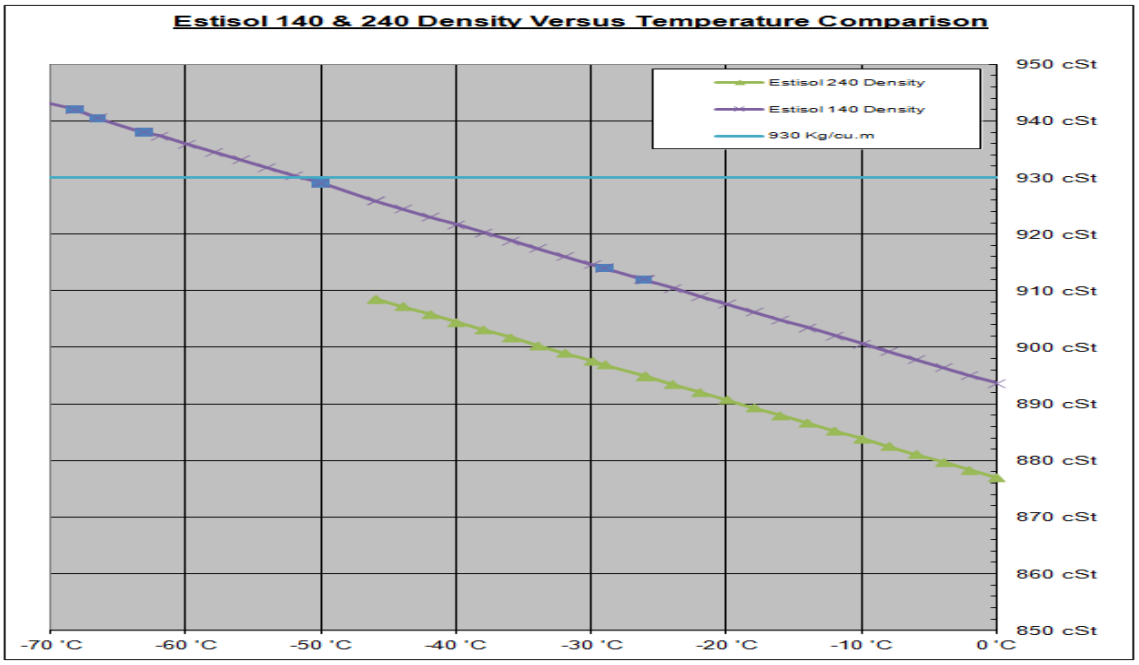
In February 2008, the supplier of Estisol 240 announced a change in specifications of the fluid due to a change in raw materials for the production (coconut oil has become too expensive) We therefore conducted a new set of measurements. As seen above, by cheer luck, this change has improved the fluid for our use. Purple: old Estisol 240; Green: New Estosol 240. Blue: simple model of kinematic viscosity vs. temperature.

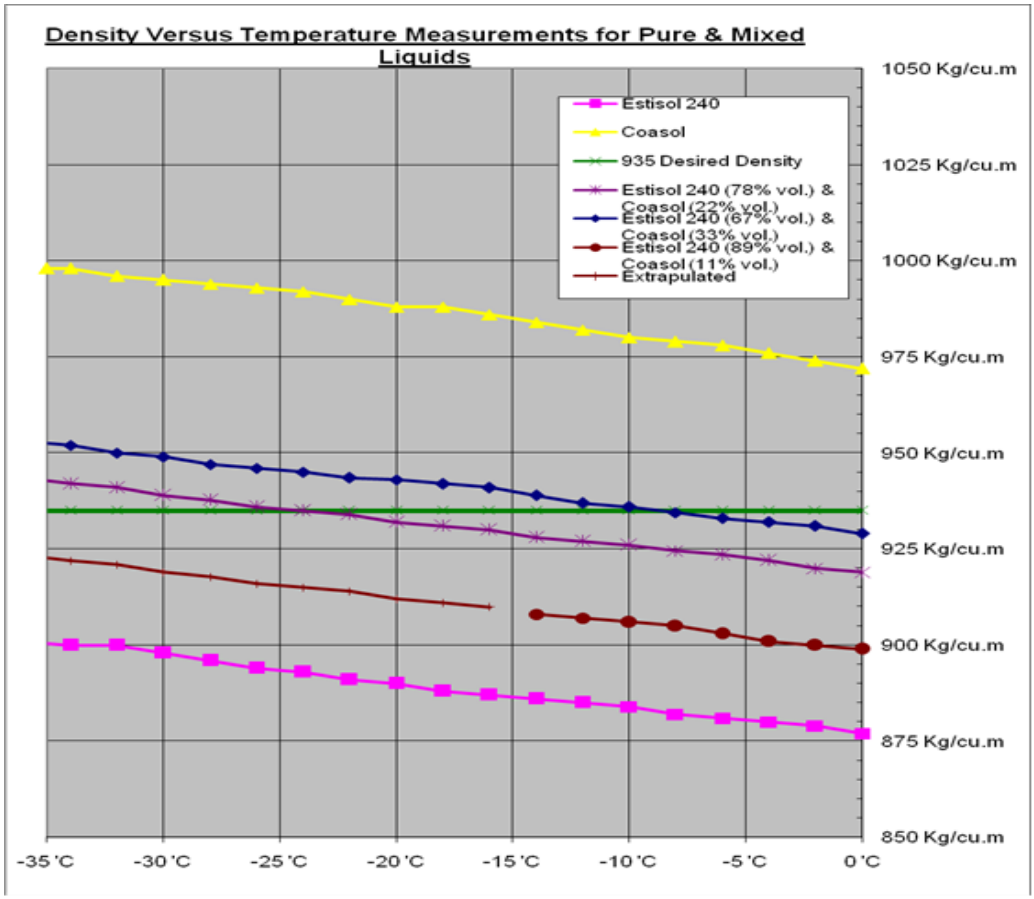


As seen above, the densities of new and old Estisol 240 are comparable.

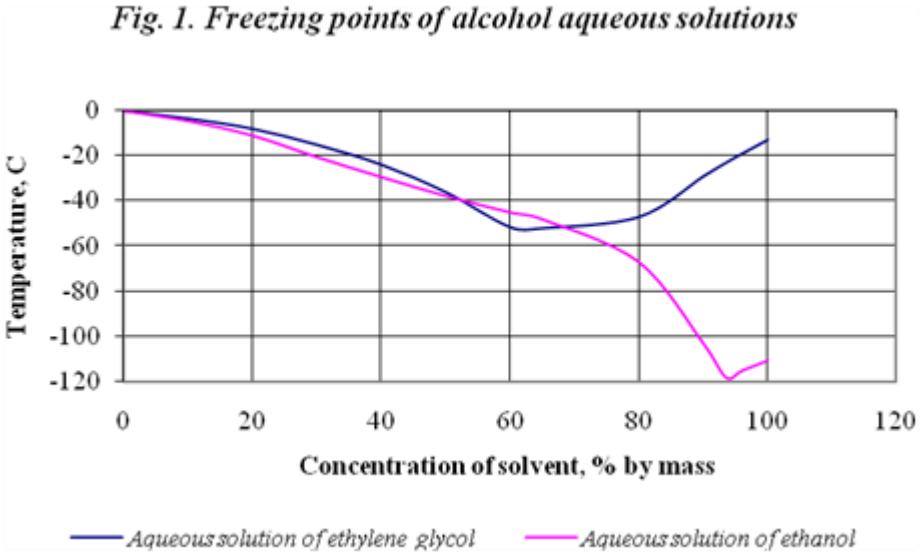
Properties of ESTISOL 140.



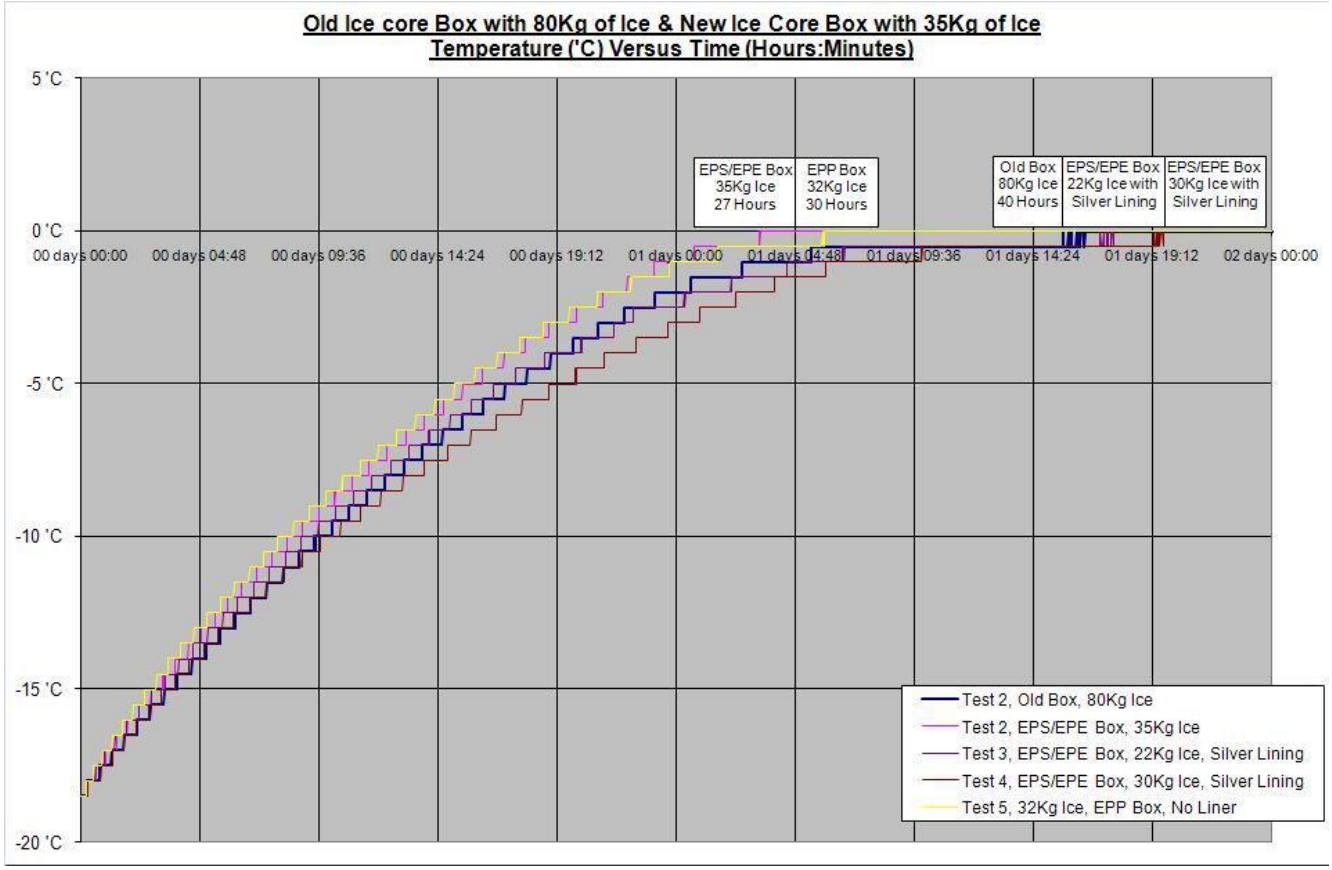




Above - density versus temperature of the drilling liquids in pure & in different mixes.



Ice core boxes, temperature measurements:



Sun glasses

It is recommended to use sunglasses with UV-protection (Polaroid) to protect eyes from excessive ultraviolet radiation, primarily to avoid snow-blindness, but also to reduce long-term ocular damage such as cataracts. Be careful to wear glasses that also block the sunrays around the edges of the lenses.

Standards for sunglasses – see labelling on inside of the frame

Europe CE (EN 1836:2005)

0	insufficient UV protection
1	sufficient UV protection
2	good UV protection
3	full UV protection

US (ANSI Z80.3-1972)
A compliable lens should have a UVB (280 to 315nm) transmittance of no more than one per cent and a UVA (315 to 380nm) transmittance of no more than 0.5 times of the visual light transmittance.

Australia (AS 1067)

0	some UV protection
1	.
2	.
3	.
4	high level of UV protection

Acute mountain sickness - AMS

Symptoms/signs of acute mountain sickness:

- Headache
- Fatigue/nausea
- Difficulty in breathing
- Sleep disturbances (insomnia)

Symptoms of AMS usually start 6 to 8 hours after a rapid ascent and reach their greatest severity within 24 hours, subsiding over 72 hours. Rapid ascent, exercise, and continuing to ascent to higher altitudes greatly increases the chances of suffering from AMS and its symptoms.

Best way to reduce risk of AMS is to **avoid excessive alcohol consumption the night before flying into camp** and to keep well hydrated on water.

AMS is rarely serious and is usually self-limiting, but may lead to more serious high altitude cerebral edema or high altitude pulmonary edema.

How to operate the Gamow bag

The purpose of the Gamow bag is to provide temporary first aid treatment to victims suffering from varying degrees of acute mountain sickness (AMS) on location and on an emergency basis.

1. Place victim inside bag.
2. Pull the zipper close.
3. Pump the foot operated air pump to begin inflation.
4. Check to make sure that the nylon web retaining straps are not twisted and that they are in their proper locations
5. Inflate the Gamow bag to the desired pressure – see below.
6. A pump per minute rate of 10 to 20 must be maintained at all times to ensure adequate victim protection from excessive carbon dioxide concentrations. An electric oil free air-compressor with an output of at least 1 cubic foot per minute (cfm) may be used to presurize the Gamow bag (use chrome inlet).
7. Do not connect the bag to oxygen.

Ambient conditions			**Inside Gamow bag when pressurized to 2 psi (103 mmHg)**		
Meters	Feet	mmHg	Meters	Feet	mmHg
2400	7874	562	1054	3458	665
2700	8859	541	1310	4298	645
3000	9843	522	1555	5102	626
3300	10827	503	1805	5922	607
3600	11812	484	2053	6736	588

The Gamow bag should only be used on a temporary or emergency basis. The bag is not intended as a cure for AMS.

Treatment with oxygen greatly outweights the use of the Gamow bag, but must be maintained at a flow of 6-8 liters per minutes.

How to monitor blood pressure using the Omron electronic monitor

1. The subject sits down and rests their arm on a table so the brachial artery is level with the heart. Alternatively lie on your back and rest the arm across your stomac. This is important when monitoring blood pressure, as pressure is proportional to height. For example, if one measures the blood pressure at head height, the systolic/diastolic pressure readings will be approximately 35mmHg less compared to readings taken at heart level, whereas at ground height the pressure readings will be 100mmHg greater.
2. Wrap the sphygmomanometer cuff around the upper arm, just above the elbow. Place the tubings on the hollow of your elbow.
3. Press the **ON** button.
4. Press **START**.
5. The blood pressure monitor will automatically measure the blood pressure.
6. **NOTE:** Do not move the arm during monitoring.
7. Monitor displays the systolic blood pressure (the high value) and diastolic blood pressure (the low value) and heart rate.

Blood pressure	**Interpretation**	**Action**
SBT>180 mmHg or DBT>110 mmHG	Severe hypertension	Repeat the test; Contact physician
SBT>160 mmHg or DBT>100 mmHG	Moderate hypertension	Repeat the test; Contact physician
SBT>140 mmHg or DBT>90 mmHG	Mild/borderline	

SBT≈120 mmHg and DBT≈80 mmHG	Optimal
SBT<90 mmHg and DBT<60 mmHG	Hypotension

SBP= Systolic blood pressure

DBP= Diastolic blood pressure

How to monitor blood glucose

1. Wash your hands.
2. Prepare your lancing device.
3. Remove the test strip from its foil packet.
4. Insert the three black lines at the end of the test strip into the strip port.
5. Push the test strip in until it stops. The monitor turns on automatically.
6. Wait until the monitor displays the "Apply Blood message", which tells you that the monitor is ready for you to apply blood to the blood glucose test strip.
7. Use your lancing device to obtain a blood drop either from a finger or an ear lobe.
8. Before you obtain a blood sample from the fingertip or ear lobe, make sure the sample site is clean, dry, and warm. Avoid squeezing the puncture site.
9. Apply the blood sample to the test strip immediately.
10. Touch the blood drop to the white area at the end of the test strip. The blood is drawn into the test strip.
11. If the monitor shuts off before you apply blood to the test strip, remove the test strip from the monitor and try again.
12. Continue to touch the blood drop to the end of the test strip until the monitor begins the test. The monitor begins the test when you hear the beeper and/or the display window shows the status bar.
13. Then the display window shows the countdown. **Note: Do not** remove the test strip from the monitor or disturb the test strip during the countdown.

Result of blood glucose monitoring

Blood glucose	**Interpretation**	**Action**
LO = low (<1.1 mmol/L or 20 mg/dL)	Extremely low	Repeat the test; Contact physician
<2.8 mmol/L (50 mg/dL)	Moderately low	Repeat the test; Contact physician
4.1-5.9 mmol/L (74-106 mg/dL)	Normal	
>11 mmol/L (200 mg/dL)	Moderately high	Repeat the test; Contact physician
HI = High (>27.8 mmol/L or 500 mf/dL)	Extremely high	Repeat the test; Contact physician

Error messages:
Error no 105 or 705: take out batteries, wait five seconds, insert batteries, and try again.

Calibration of new test strip lot:
Insert calibration strip into strip port. Wait until the monitor displays the lot number. Check number against packet.