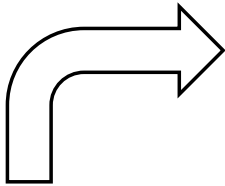
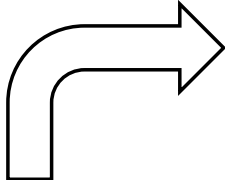


# Performing Fieldwork Safely on Sea Ice: A Guide for Station Managers



# Why is this relevant?



# Content

- Identifying the field activities & common hazards
- Sea Ice Hazards
- Travel on Sea Ice
- Working on Sea Ice
- Relevant equipment, safety training and practical training before going in the field



# Common Field Activities Related to Sea Ice



# How do we prepare our field groups?

## Step 1 – hazard awareness

- Pre-information from the group on their fieldplan <https://www.unis.no/resources/logistical-services/>
- Identify relevant hazards and necessary training

## Step 2 – hazard education

- Choose relevant safety course
- Groups all need some general information, focus on relevant hazards to go into further detail
- Do not overwhelm the group with information on hazards not relevant to them
- The safety course should focus on: How to identify hazards, how to operate safely in the field and what to do in case of an accident or emergency

## Step 3 – equipment for fieldwork, equipment for rescue, training

- Provide group with equipment needed for fieldwork
- If group should provide their own equipment, ensure they have adequate time to prepare
- Hands-on training and practice with the equipment if practical, especially to test that everything works as it should

## Step 4 – final planning and briefing before fieldwork

- At UNIS this is called the 'HSE Brief'. A final meeting before the fieldwork to address the fieldplan, hazards, weather, etc. <https://www.unis.no/resources/hse/>

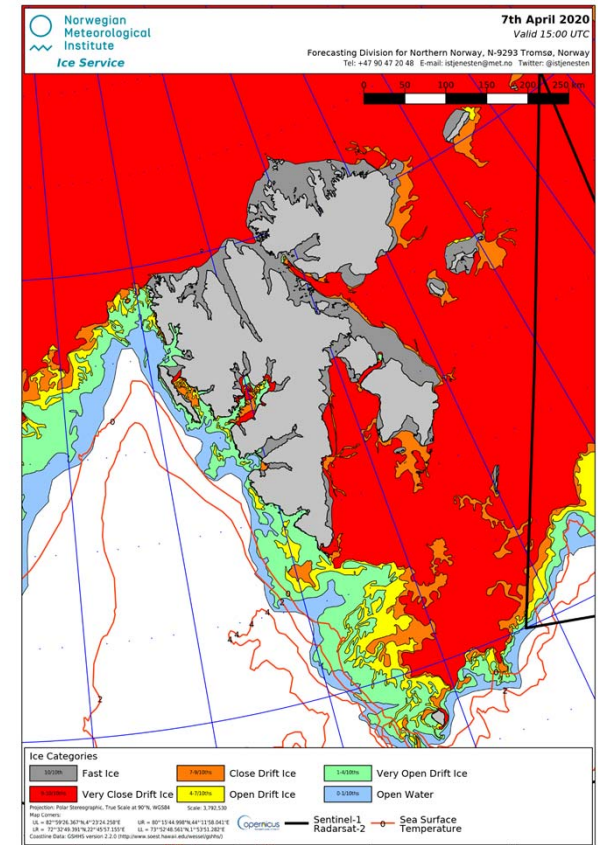
## Step 5 – follow up of routines and activities while in the field

- Established communication/tracking while in the field and debrief afterwards (often will send a technician with a group working on sea ice)

# Before you consider sending a group on ice

Sea ice is an important resource for us; both for research and for travel routes, but the consequences of being on sea ice can be devastating and preparation must be thorough

- Identify the area the group will be working/travelling
- Track ice growth throughout the season
- Check the ice beforehand
- Brief the group
- Familiarization with safety equipment and routines
- Group is prepared for a potential rescue scenario



# Summary of Hazards – a complete supplemental safety course will be available

- Ice Thickness- Minimum 30cm for UNIS groups to safety travel/work on sea ice
- Weather- Good visibility is a must! When traveling over ice one can encounter leads/cracks, pressure ridges, holes and need visibility in order to safety navigate
- Surface Water/Over Water- Snowmelt can cause overwater, easy to get stuck. Take time to navigate around or use speed when crossing
- Cracks/Leads- Produced by the stresses of wind, wave, tidal action, and thermal forces. Typically cracks will form close to coastlines, islands or other objects. Some are too wide to cross and skis from the snowmobile can get caught in narrow cracks. Must consider if it is safe to cross over
- Tides- tides can lead to large chunks, uneven surface close to the shoreline. This leads to difficulties driving on and off the ice, take time to find a good route
- Sea Floor Vents- Can cause weak spots and holes in sea ice, important to enquire locally or constantly check ice depth while moving on sea ice and pay attention to differences in the ice surface
- Color of Ice- can give clue to ice thickness. White ice indicates thick, black or clear indicates thin, important to pay attention to changes in ice color
- Pressure Ridges- form due to pressure and cracks up ice, can be found close to coastlines or in the middle of sea ice. Resulting ice chunks can be several meters high.
- Seal Holes- very hard to see, especially when driving snow mobiles
- Proximity to Glaciers- glaciers can calve even in winter, unpredictable and can break up the ice, stay far away from glacier front and always park snow mobiles facing away from the front!
- Polar Bears- this is their primary habitat!

# Hazards

Sea ice is a complex surface that varies dramatically across even short distances:

- strong currents
  - warm water intrusion
  - active or newly formed cracks
  - land formations like long, low-angle ridges or peninsulas that descend into the sea
  - type of weather when the ice is formed
- 
- With a salinity at app 3% saltwater freezes at minus 1,8 degrees
  - When conditions are good sea ice grows 3 – 5 cm the first 24 hrs, after that growth speed is reduced as a function of increased insulation (snow)





# Relevant equipment, safety training and practical training before going in the field

- Group should receive a thorough safety course on the procedures and hazards for working and travelling on sea ice
- Group should be familiar with resources available to them
  - Weather forecasts for Norway: [www.yr.no](http://www.yr.no) and [www.windy.com](http://www.windy.com)
  - Sea Ice Charts for Svalbard: <https://cryo.met.no/en/latest-ice-charts>
  - Daily Satellite Images from NASA: <https://worldview.earthdata.nasa.gov/>
- Every individual working on sea ice needs a pair of ice spikes and needs to wear them at all times on the ice
- Each group needs to have at least one (depends on group size):
  - Throw Rope
  - Drill to check ice thickness
  - Rescue Suit
  - Safety box in case of emergency including items to make 'Hibler's Wrap'

# Relevant equipment, safety training and practical training before going in the field

- Group should have training in how equipment works before going on sea ice
- If there is access to water, have the group practice going in water and doing a self rescue and buddy rescue
  - If there isn't ice available, have individuals practice climbing onto other buoyant material such as wood planks



# Sea Ice Rescue Exercises



# Equipment



Throw Rope



Rescue Suit



Ice Spikes



Battery Powered Hand Drill with Drill Bit 30cm or longer



Emergency box contains enough equipment to build an emergency overnight camp for up to eight people, or help someone who is injured or get someone warm who has fallen through the ice

# WRAP – Hibler's method



vapor barrier – insulation – windproof barrier

# Before crossing

## 1. Stop and make an overview

- Look for signs of poor ice.
- Plan the route.

## 2. Make a plan and brief the group.

- Distance between scooters
- Signals
- Communications (VHF etc)
- Behaviour if stop
- What to do in an accident

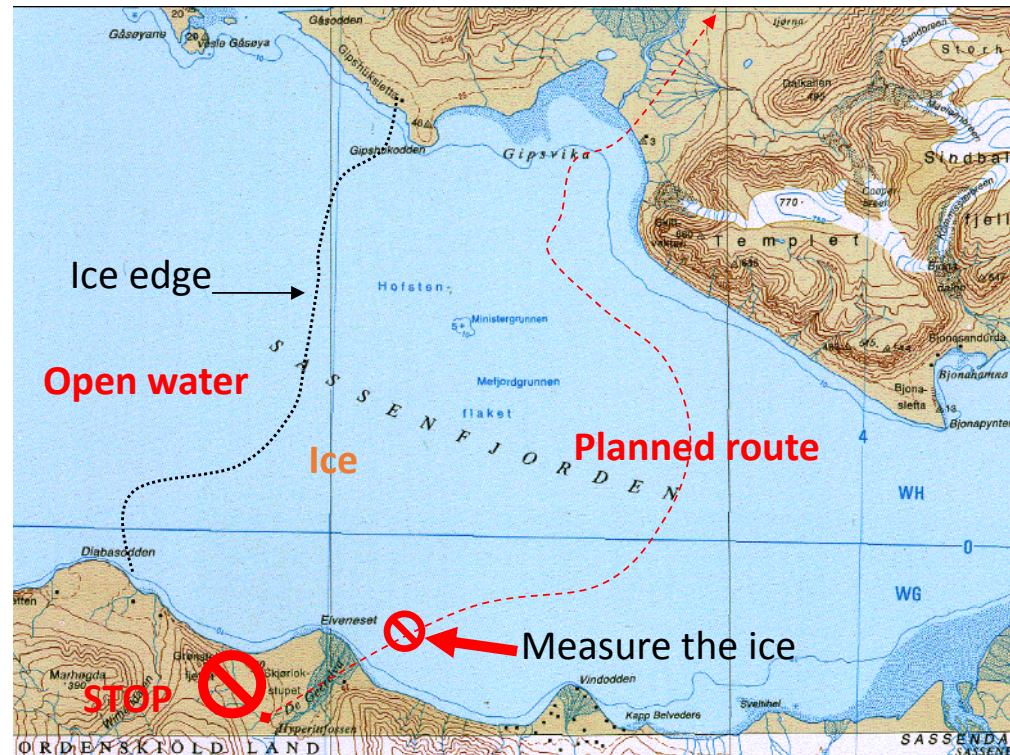
## 3. Make preparations

- Ice spikes ready
- Rescue equipment available (rescue rope, rope etc)

## 4. Measure the ice thickness and quality.

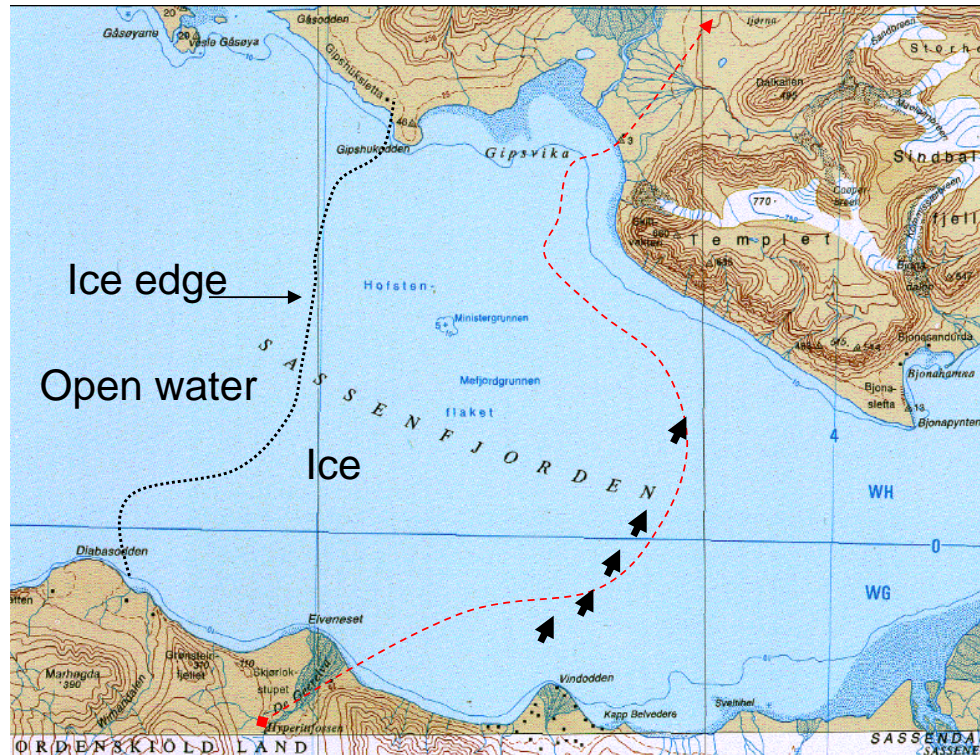
- Min 30 cm. UNIS regulations

## 5. Make a decision - whether to go or not.



# When you start driving

1. **Single scooter** (no sledge) at the front with good distance to the rest, or recon the route with a pair of scooters first.
2. **Keep the speed up**  
Only stop if necessary
3. **Observe the track**  
Look for water or slush.
4. **Observe** what is happening behind you.
  - Is everyone following?
  - Water behind the sledge?







# What do you do if you fall through the ice and into water?

You have very little time!

After a few minutes the suit and boots will be full of water and it will be impossible to get up



Do not waste time on trying to save the snow scooter or your equipment (rifle etc.)

The snow scooter will float for a few seconds, use this time to jump on to the ice. Try to lie down on the ice to spread your weight. Wriggle back to safety, using your ice spikes to pull you forward.

If you fall in the water, make one big push on to the ice, using your ice spikes to get a grip and pull you away from the ice edge.

# Working on Sea Ice

- When working on sea ice it is important to establish a safe zone and good routines
- Measure ice width around the working area and mark off a safe travel path back to land or the ship
- Everyone should be wearing ice spikes at all time and be aware of where the safety/rescue equipment is stored
- Pay attention to weather (both visibility and wind)
- If working from a ship, have a plan for communication using vhf radios
- Remember sea ice is a common place to see polar bears!



# Base Information Center

