SF3

geo park Rokua finland

United Nations Educational, Scientific and Cultural Organization

Rokua UNESCO Global Geopark

European Geoparks

Hand manual

Field day for wintry nature in Manamansalo

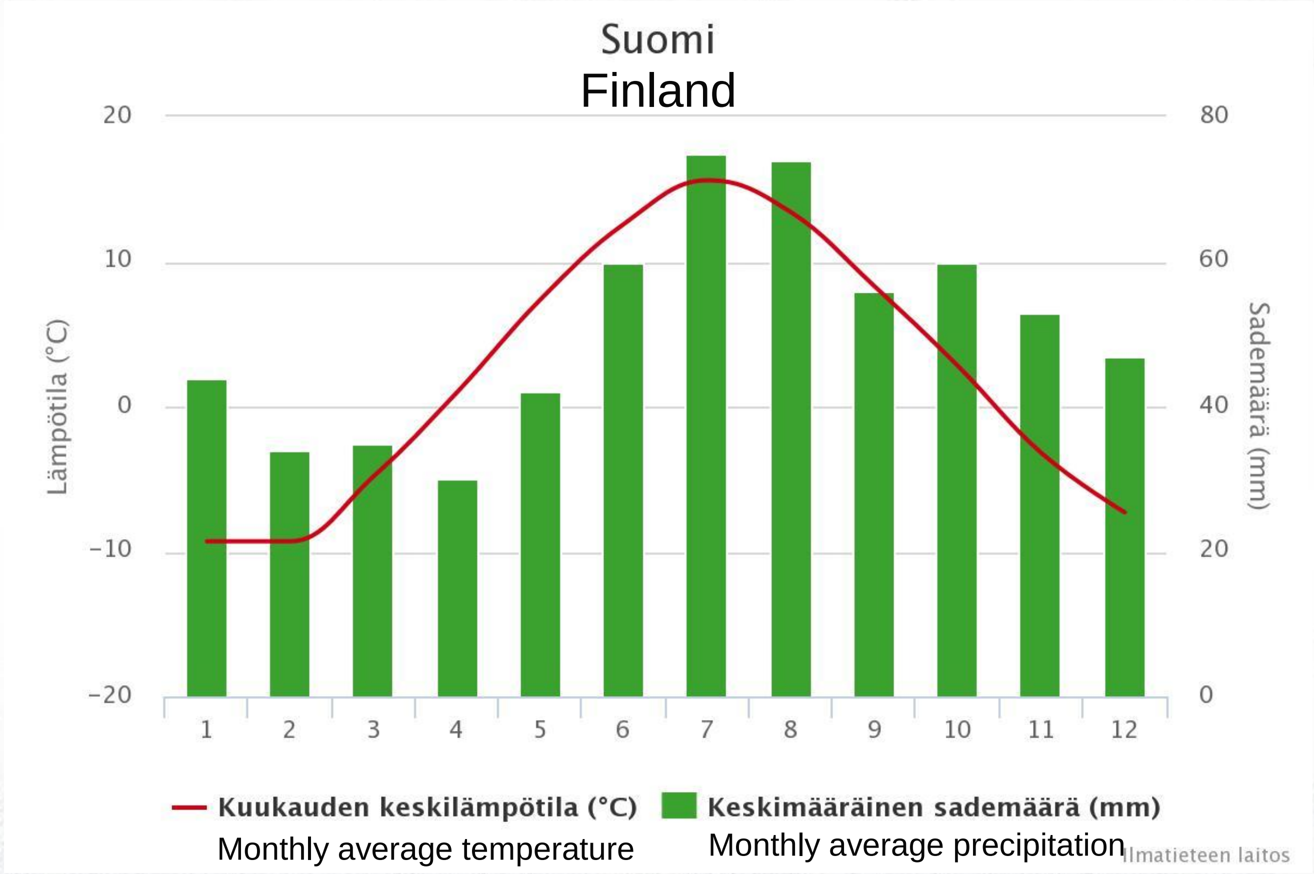
Environmental Educator Mikko Kiuttu

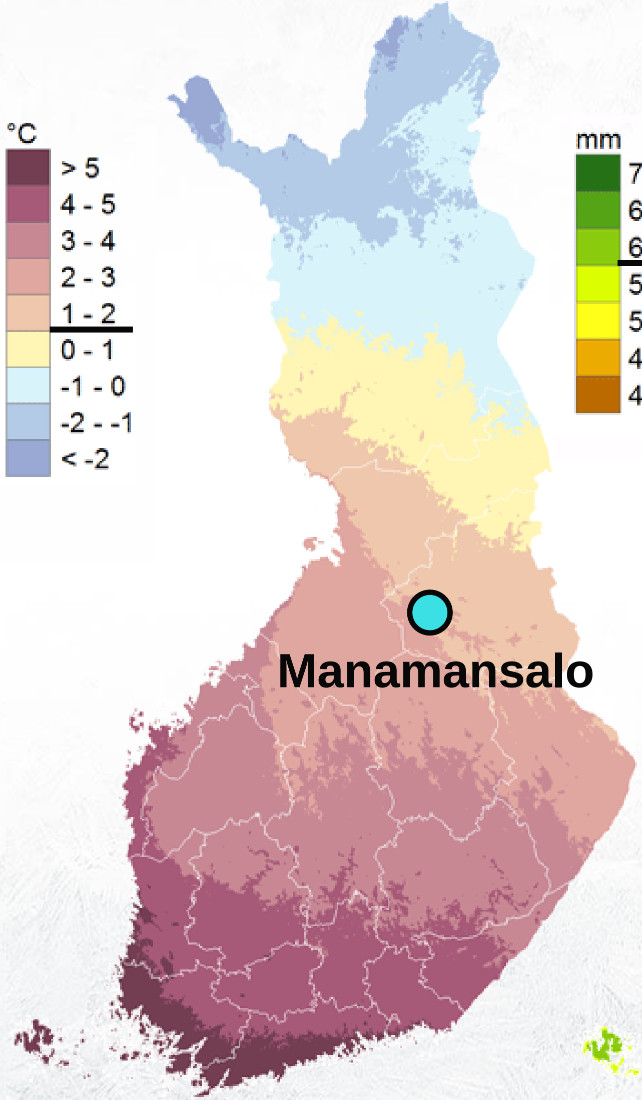
Erasmus+

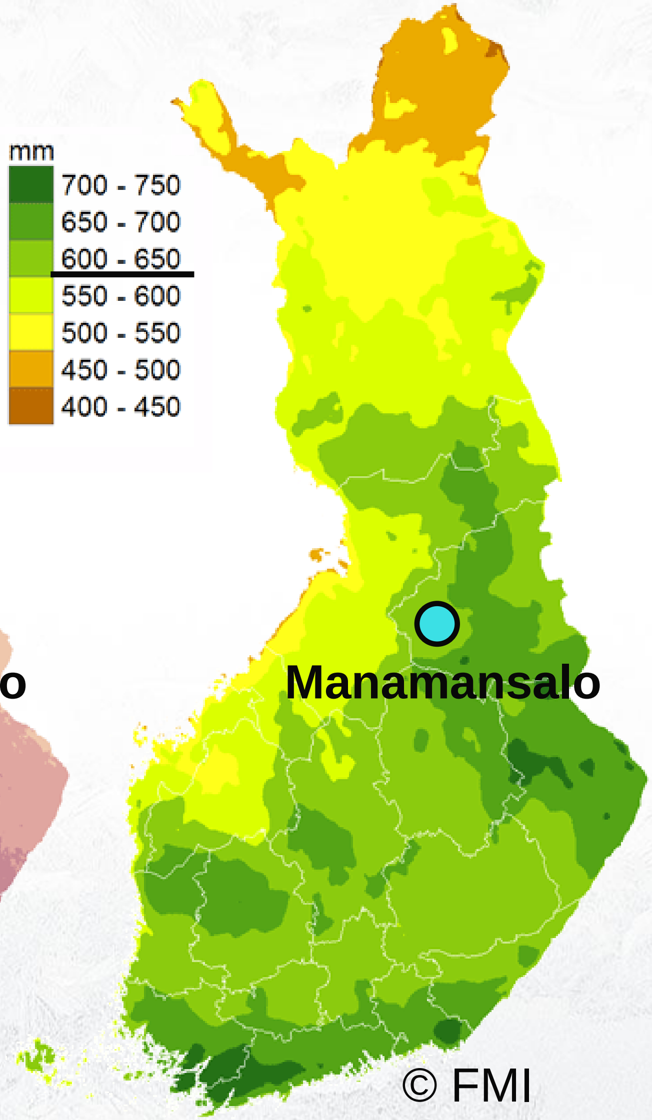
The Finnish Outdoor Destination of the Year 2018

Theory

Average climate in Finland 1981-2010







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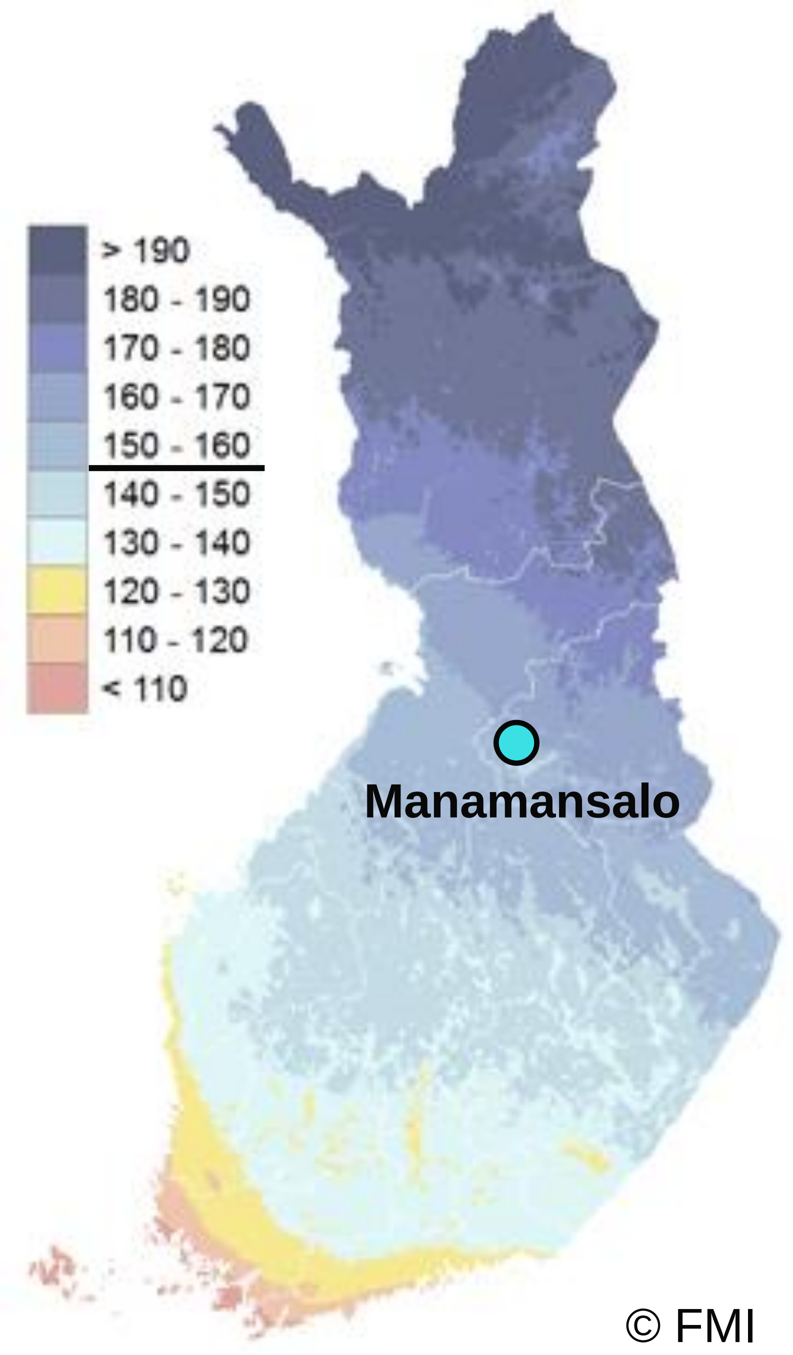
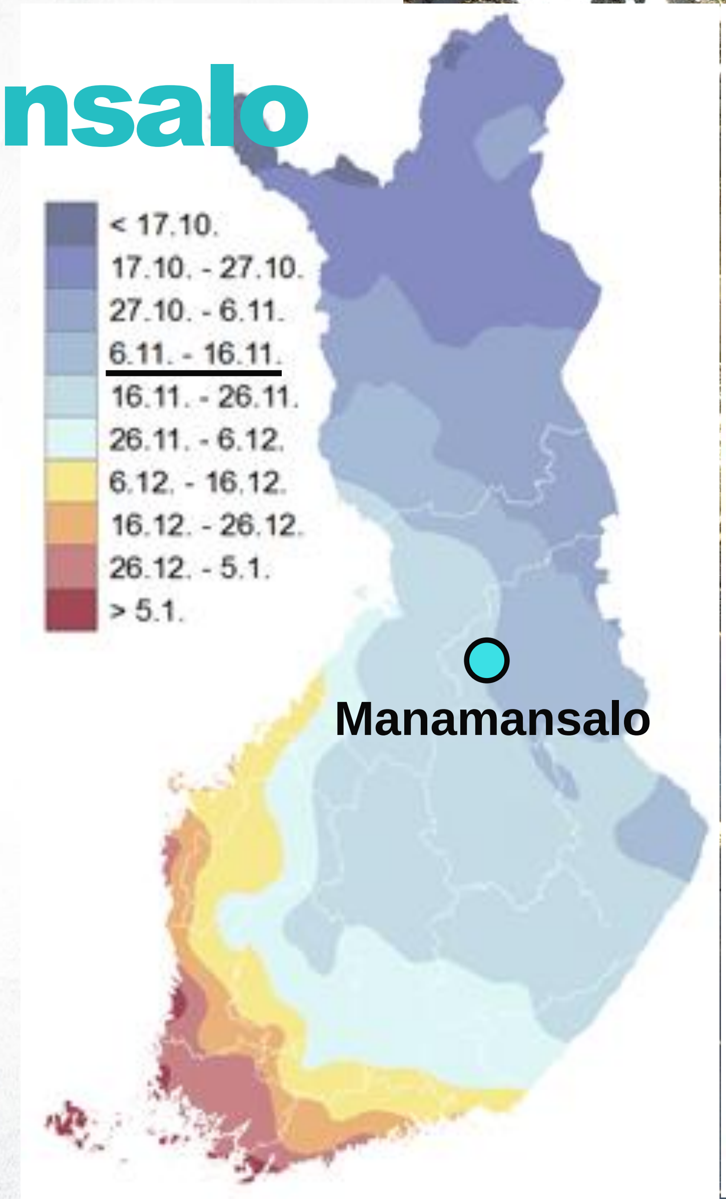
Winter in Manamansalo

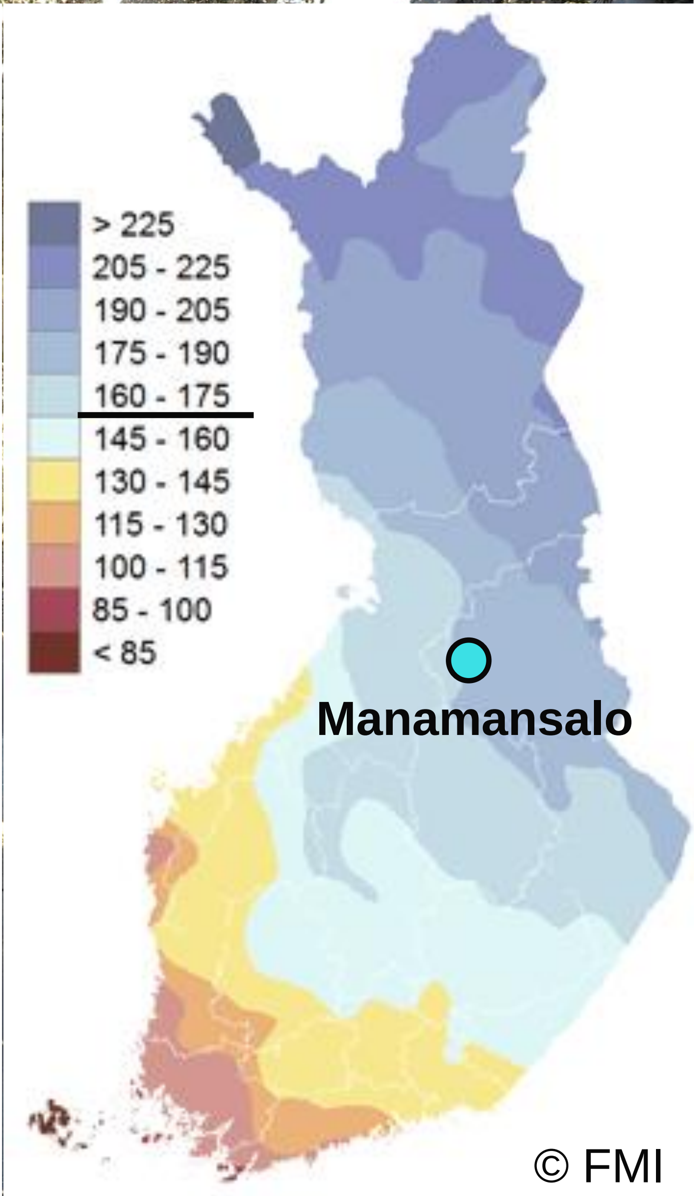
- Meteorologically winter is determined by average temperature values.
    - Thermic winter = average temperature stays below 0 degree Celsius.
- The length of thermic winter in Manamansalo is ca. 160 days.
    - Locally, Lake Oulujärvi decreases the lenght of thermic winter couple of weeks.



Winter in Manamansalo

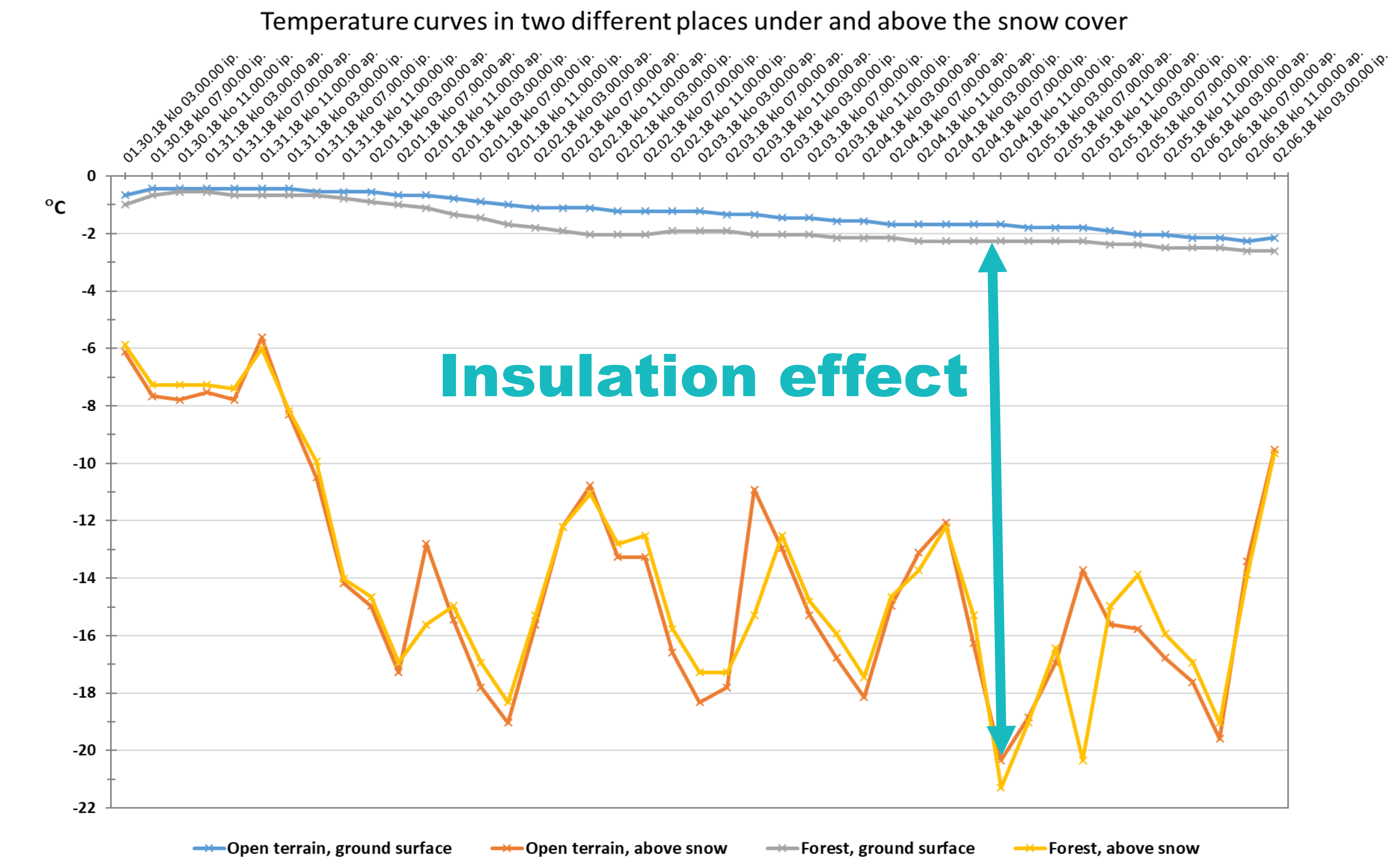
- Stable snow cover usually falls in mid-November.
  - Length of stable snow = the longest period of time when ground is covered by at least 1 cm snow cover.
- Snow cover time in Manamansalo is in average ca. 170 days.





Snow

- Two main elements:
  - Water (ice crystals, liquid water).
  - Air (pores).
- Density = Weight per volume (kg/m$^{3)}$.
  - Fresh snow ca. 100 kg/m^3, or 0,1 kg/l.
  - Compacted snow ca. 500-600 kg/m^3.
  - In windy places even 800 kg/m^3.
  - Strong wind, warm temperature (>0 degrees) and gravity increase density.
  - Density affect to rate of insulation.
    - ➢ Insulate = not conducting heat
    - ➢ Compare: winter clothes


Temperature curves in two different places under and above the snow cover
01.30.18 klo 03.00.00 ip.
01.30.18 klo 07.00.00 ip.
01.30.18 klo 11.00.00 ip.
01.31.18 klo 03.00.00 ap.
01.31.18 klo 07.00.00 ap.
01.31.18 klo 11.00.00 ap.
01.31.18 klo 03.00.00 ip.
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02.04.18 klo 07.00.00 ip.
02.04.18 klo 11.00.00 ip.
02.05.18 klo 03.00.00 ap.
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02.05.18 klo 03.00.00 ip.
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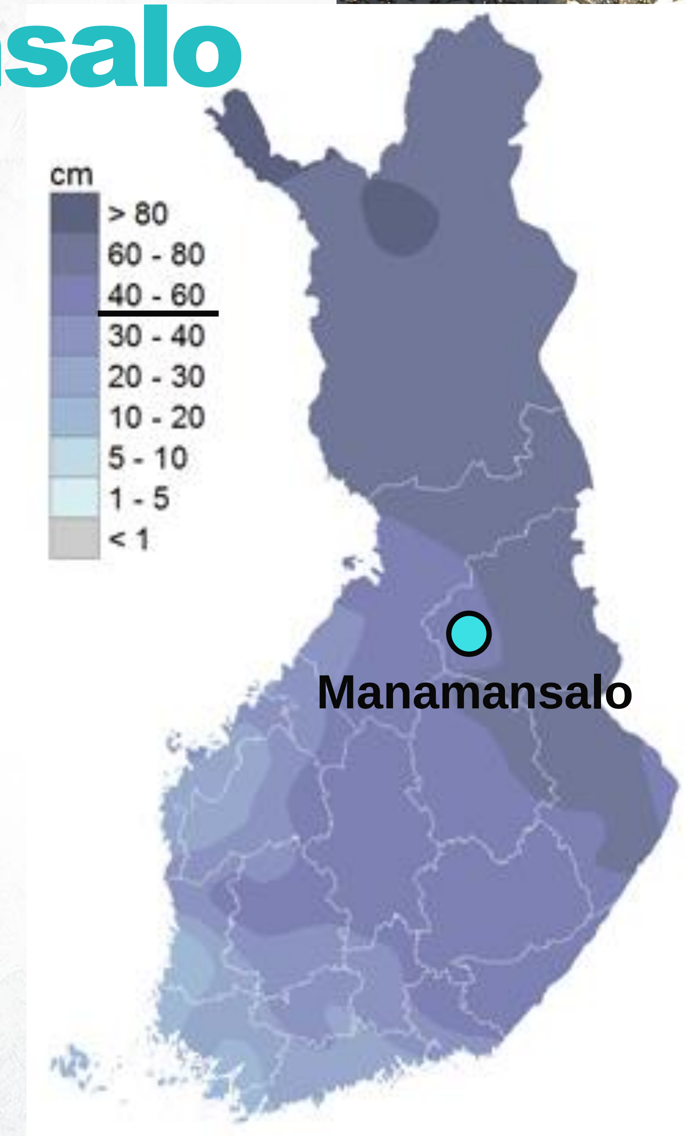
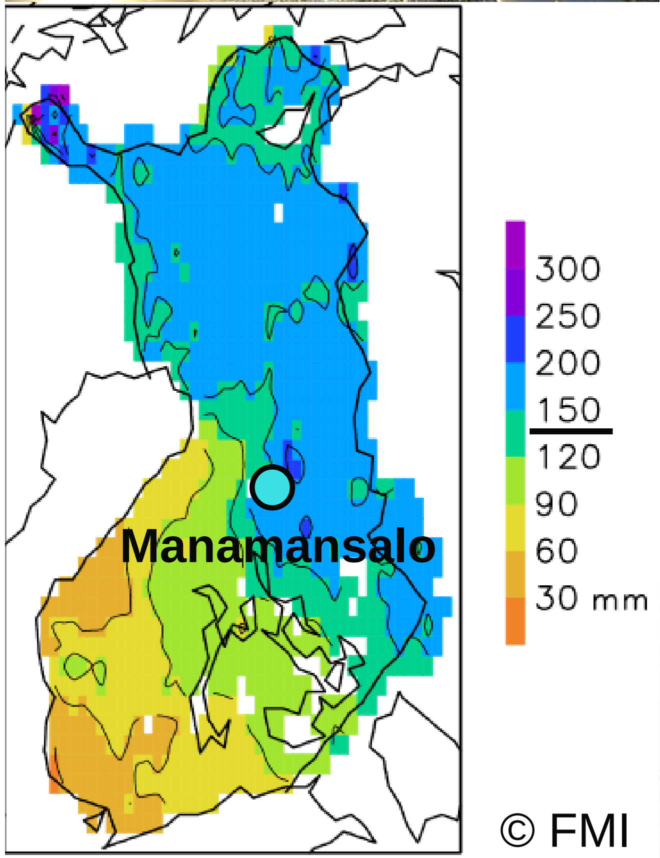
02.05.18 klo 11.00.00 ip.
02.06.18 klo 03.00.00 ap.
02.06.18 klo 07.00.00 ap.
02.06.18 klo 11.00.00 ap.
02.06.18 klo 03.00.00 ip.
°C
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
Insulation effect
Open terrain, ground surface
Open terrain, above snow
Forest, ground surface
Forest, above snow

Winter in Manamansalo

- The average maximum snow depth is ca. 60 cm.

- The average maximum SWE is ca. 150-200 kg/m^3.
  - SWE = Snow Water Equivalent
  - **SWE = water content in snow** (in millimetres or in kilograms).
  - Usually: kg/m^3





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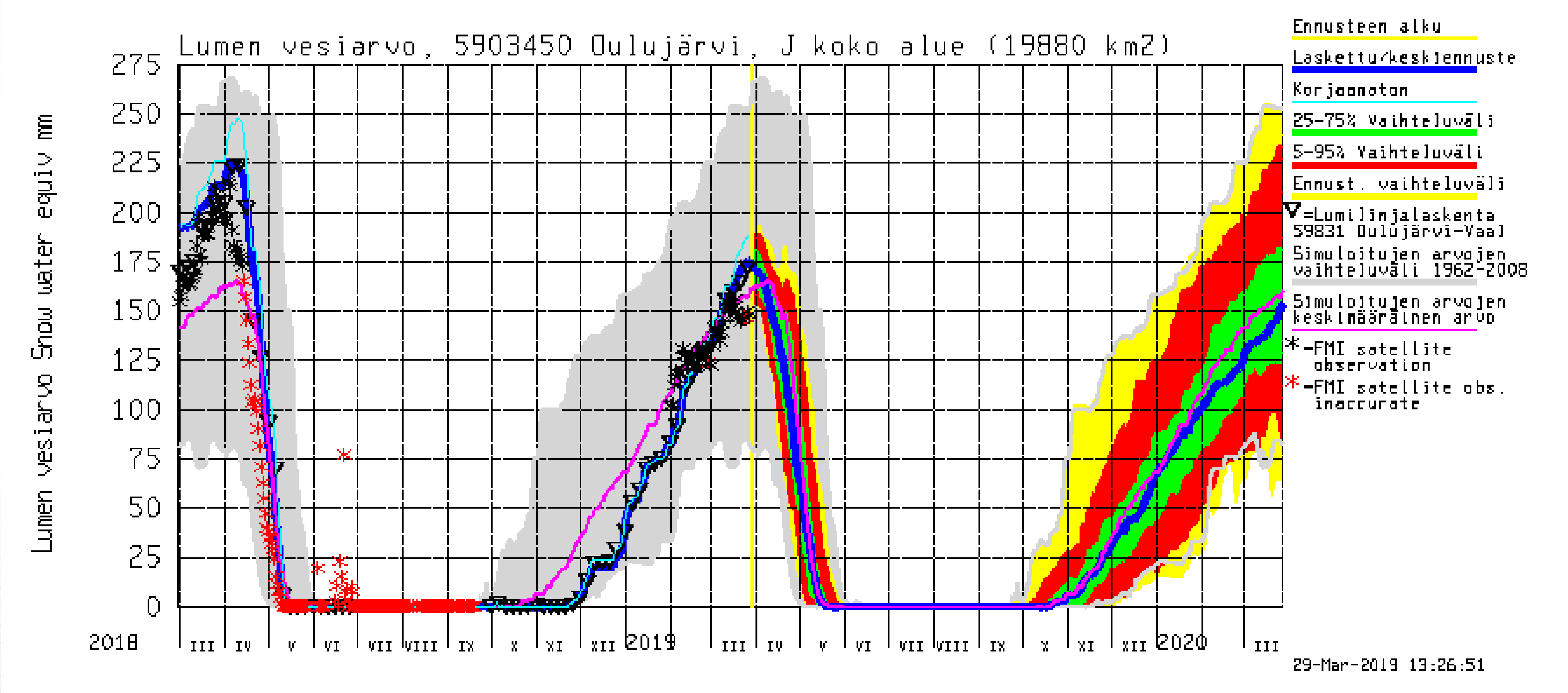
https://ilmatieteenlaitos.fi/c/document_library/get_file?uuid=4268309b-38cc-4046-af31-77917628316e&groupId=30106

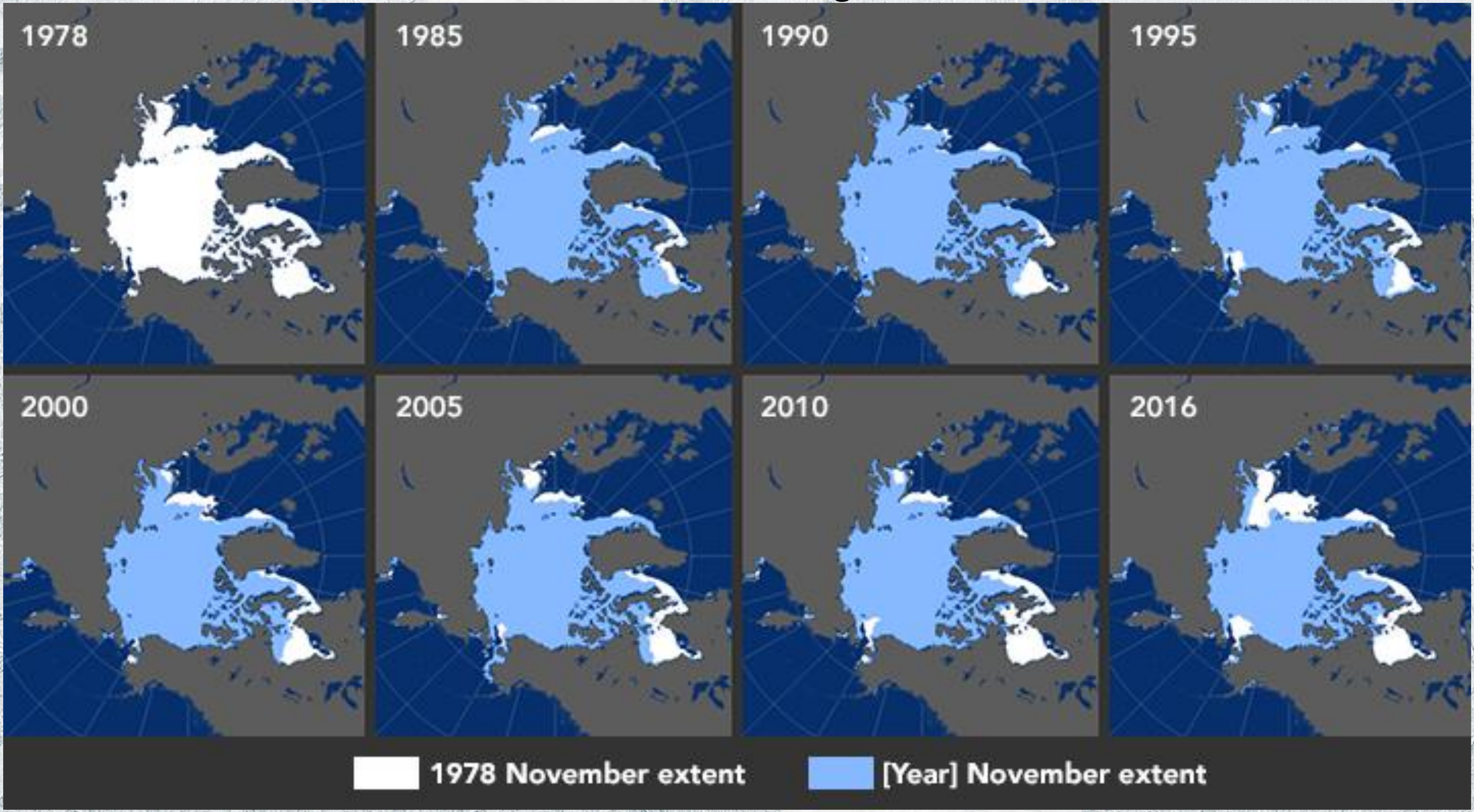
Variation in snow water equivalent



Ice cap

- ***No ice*** = No visible ice on water.
- ***Partially frozen*** = The visible part of lake, river or sea is partially frozen.
- ***Continuous icecap*** = The whole visible part of the waterbody is frozen.
- **Thickness of ice** (unit: centimetres):
  - ***Ice*** = Thickness of the whole icecap.
  - ***Water*** = Depth of free water below the icecap.
  - ***Porous ice*** = Thickness of porous ice layer (weak ice layer with lots of air pupples).
  - ***Bright ice*** = Thickness of hard, transparent ice layer.
  - ***Snow*** = Depth of snow above the porous ice.
- ***Constant icecap*** = Exact date, when waterbody got continuous ice cap.
- ***Ice run*** = Exact date, when the icecap cracks and began to move.
- ***Iceless period*** - Exact dates, when there is no ice visible anymore.

Arctic ice sheet extent; change from 1978-2016.



https://earthsky.org/earth/arctic-sea-ice-extent-record-low-november-2016

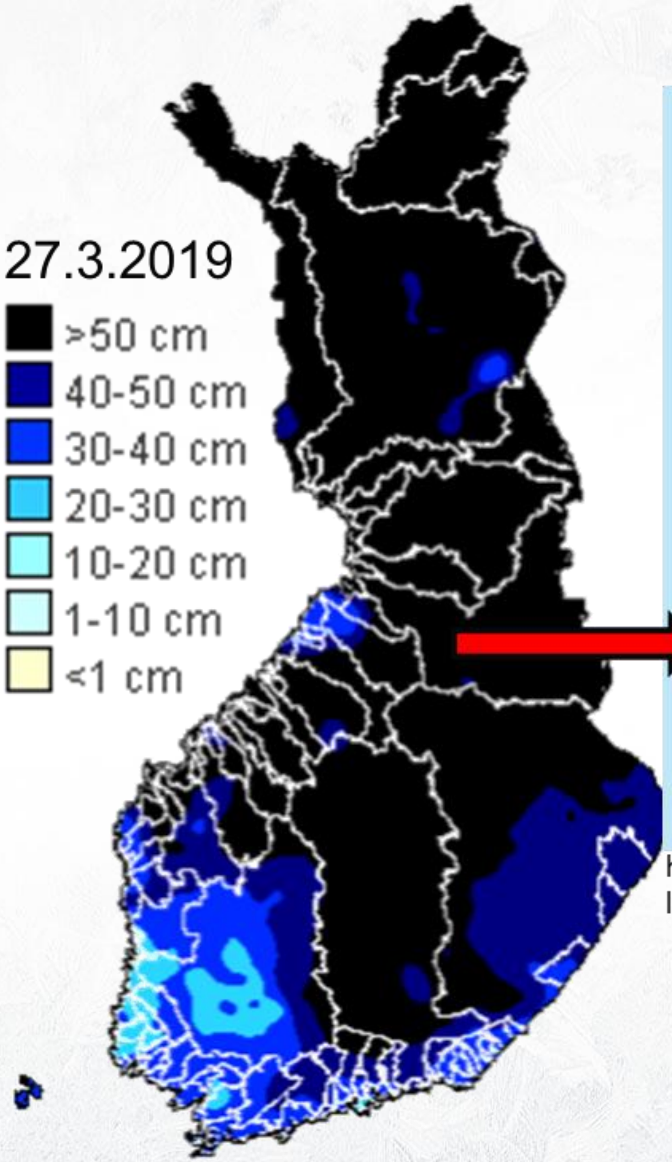
–1.07 million km²

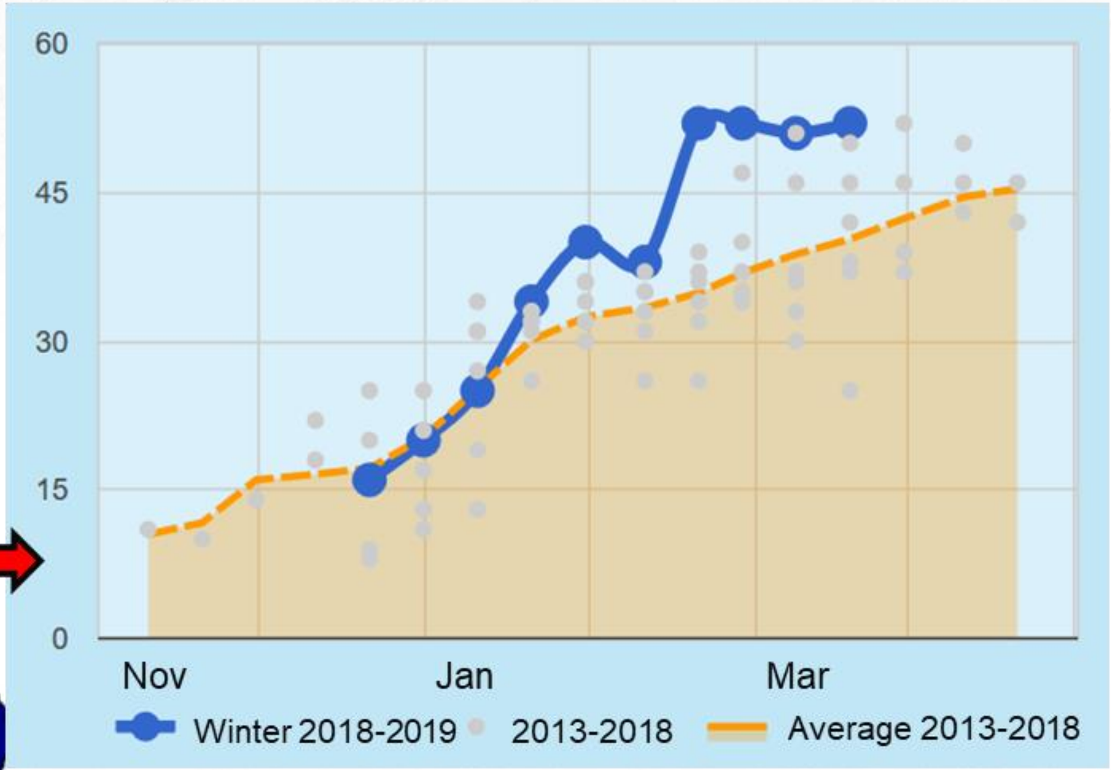
The Arctic's sea ice extent has shrunk in every decade since 1979, with 1.07 million km^2 of ice loss every decade.

- United Nations Development Program

1 feet ~ 0,33 m

Ice thickness in Lake Oulujärvi in winter 2018-2019 compared to longer term average.

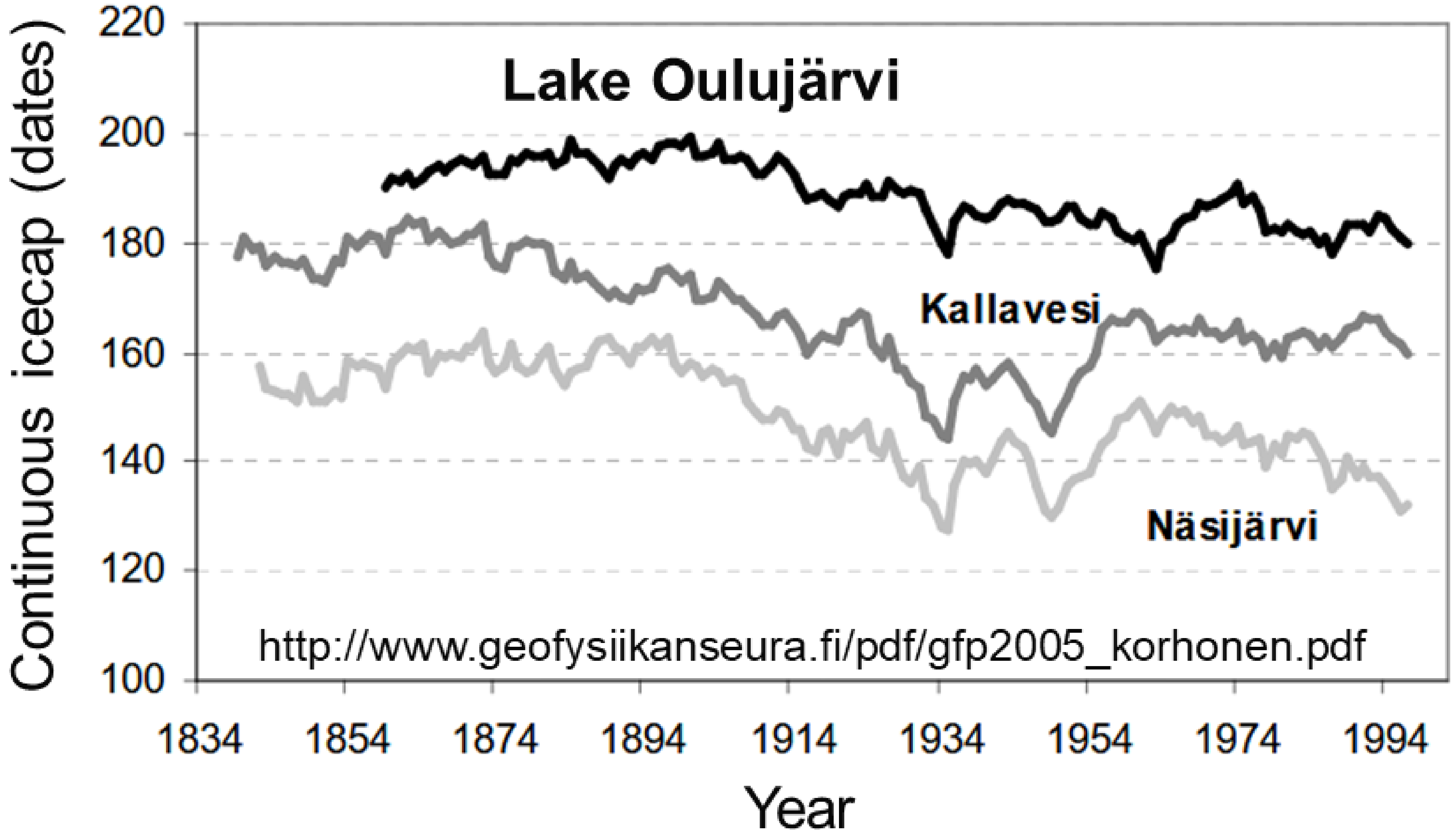




https://www.jarviwiki.fi/wiki/Ouluj%C3%A4rvi_(yhd.)/Ymp%C3%A4rist%C3%B6hal linnon_havaintopaikka_(Manamansalo,_j%C3%A4%C3%A4tilanne)

http://wwwi2.ymparisto.fi/i2/90/hice2/vesitilanne.html

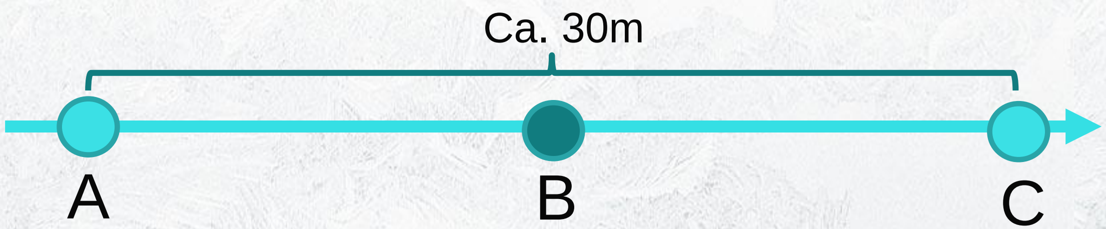
Average duration of continuous icecap in some Finnish lakes.




Working instructions

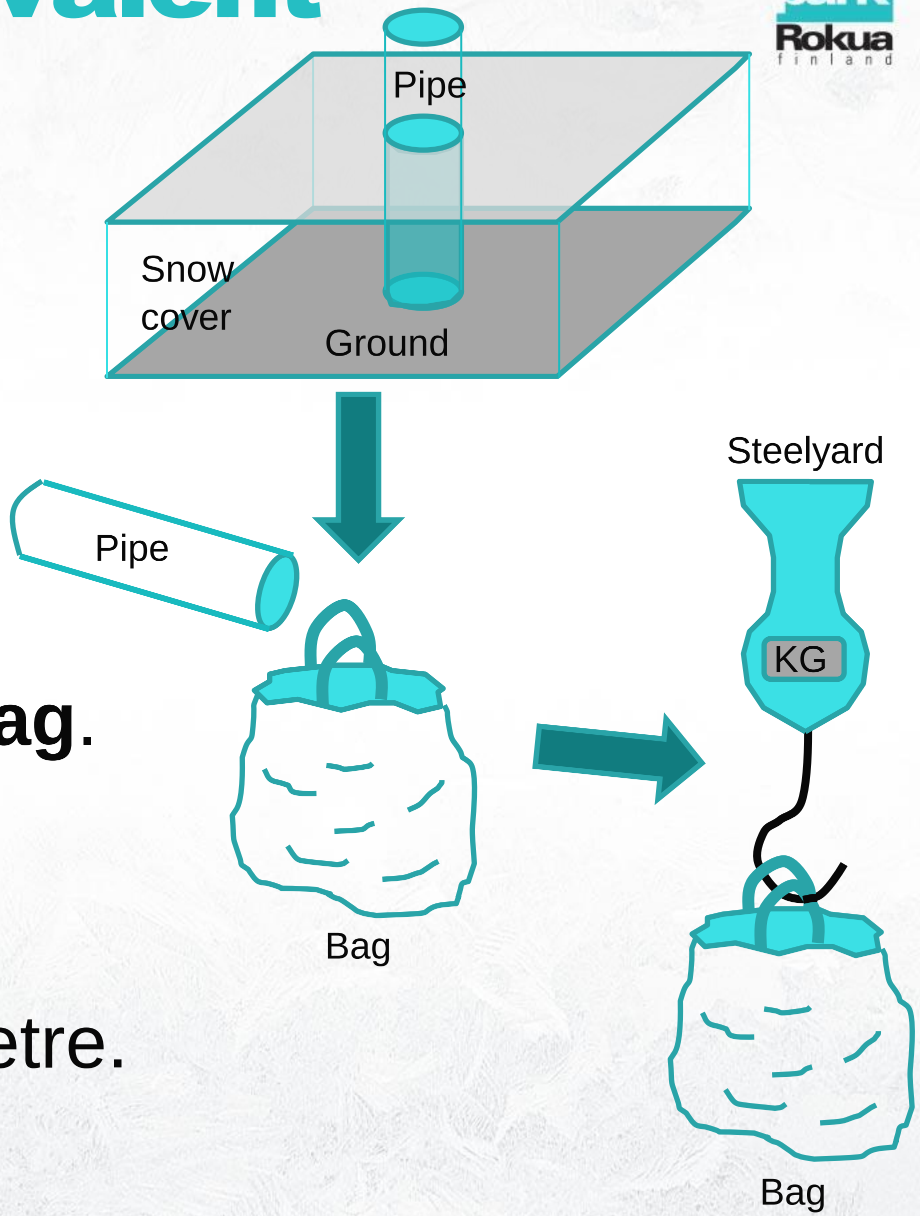
Measuring snow depth

1. **Select ca. 30 metres line**.
   - Snow cover should be untouched.
2. **Measure the depth in 3 points (A-C).**
   - In the beginning, in the middle and in the end of the line.
3. **Push the wooden liner until it hits ground**.
4. **Read value** in the stick.
5. **Write the value in the worksheet**.



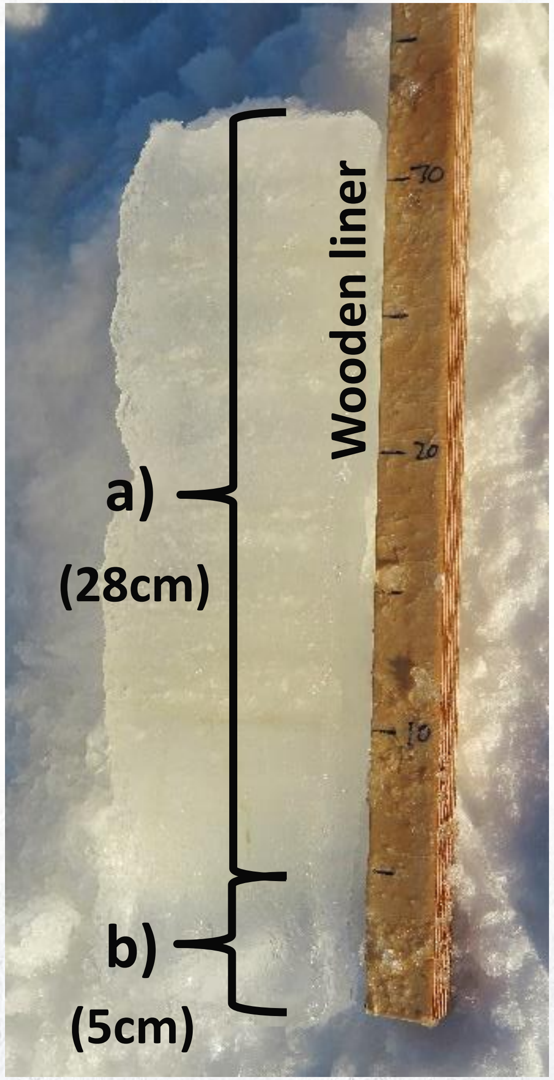
Measuring snow water equivalent

1. **Use the same line** as for snow depth.
   - **Measure SWE in the middle of the line.**
2. **Push the pipe until it hits ground.**
3. **Polish one side off snow** with shovel.
4. **Push a shovel under the pipe.**
5. **Rise and empty the pipe to a plastic bag.**
6. **Weight the bag** with a steelyard.
7. **Write the value in the worksheet.**
8. **Calculate snow load** per one square metre.



Measuring ice cap

1. **Select two measurement points.**
   - ➢ Near shore and long distance from the shore.
   - ➢ **NOTICE: Make sure it is safety to go on ice!!!**
2. **Drill a hole** through ice cap. If possible, take a sample of ice using an ice saw.
3. **Measure total thickness** of ice cap. Mark the value in your worksheet.
4. **Measure** the thicknesses of (look the picture):
   a) ***Porous ice*** *(in picture: 28 cm),*
   b) ***Bright ice*** *(in the picture: 5 cm).*
5. **Mark the values** in your worksheet.



Observing animals´ foot prints

Squirrel

Fox

Willow grouse and hare

Pictures: Mikko Kiuttu, Rokua Geopark

Observing animals´ foot prints

Wulf

Lynx

Ermine and Marten

Pictures: Mikko Kiuttu, Rokua Geopark

Notes

SF_4

ICE AND SNOW MEASUREMENTS

Anni Karppinen, Sanni Kurkinen, Juho Virkkunen, Topi Honkonen

APPARENT TRENDS IN ICE CAP TIME

As a result of climate change:

- ice melts earlier than before

- water freezes later

- ice thickness thinner than before

- Minimum ice thickness: 23 cm
- Maximum ice thickness: 66 cm
- Average ice thickness: 42 cm
- The largest measured ice thickness: 76 cm (10.4.1985)

	freezing	breaking up of ice	duration of ice cover
1854-2020	18.11	23.5	186
1961-2000	20.11	22.5	183
2000-2020	1.12	12.5	162

WHY IS IT IMPORTANT TO HAVE LONG TERM DATA SERIES ON NATURAL PROCESSES?

- Some winters are colder than others, that's why the measured values change every year.

- Reliable data is obtained if findings are collected for several years → average

WHAT KIND OF CONSEQUENCES MIGHT THE CHANGES IN SNOW COVER AND LAKE ICE HAVE IN OUR HOME REGION IN THE FUTURE?

- Snow protects plants from frost damage in the winter
- Some animals need snow during winters

Without snow:

- animals' camouflage will disappear

- Saimaa ringed seal will become extinct

- the birds don't get into the snow nest

Without lake ice:

- winter sports wouldn't be possible, for example skating on lake ice

- harm for certain animal species

SNOW AND ICE MEASUREMENTS IN KAIVANTO, MANAMANSALO

All measurements (cm)	Minimum	Maximum	Average
Snow depth	17	20	18
Snow water equivalent			
Bright ice	6	13	9
Porous ice	18	20	19
Total thickness	26	31	28

SNOW MEASUREMENTS IN MARTINLAHTI, MANAMANSALO

Point 2, land	Minimum	Maximum	Average
Snow depth (cm)	32	35	33
Snow water equivalent (g)	475	575	520

Point 4, lake	Minimum	Maximum	Average
Snow depth (cm)	15	20	17
Snow water equivalent (g)	205	275	240

ICE MEASUREMENTS IN MARTINLAHTI, MANAMANSALO

Measurements (cm)	Point 2 average	Point 3 average
Snow depth	20	21
Bright ice	20	20
Porous ice	25	17
Total thickness	45	37