



Sirpa Rasmus  
Leena Leppänen  
2.2.2022

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# Snow pits by citizens – ideas, plans and ways forward



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UNIVERSITY OF LAPLAND  
For the North – For the World



ARCTIC CENTRE  
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CHARTER Project on Prezi

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DRIVERS AND FEEDBACKS OF CHANGES IN ARCTIC TERRESTRIAL BIODIVERSITY Scientific Background

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## CHARTER Internal Page



For documents, calendars, downloads and more, visit the CHARTER project Internal page >

CHARTER Project

CHARTER on Twitter

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Knowledge on Arctic biodiversity change and social-ecological systems. Official account of CHARTER research project, funded by the EU Horizon 2020 prog #869471.



ARCTIC CENTRE  
University of Lapland



Char CHARTER Project 22h

Registration now available, program finalised - see link below

FMI Snow @FMI\_Snow

Confirmed PROGRAM now available!

Welcome to The 10th National #Snow Seminar: Part 1  
Organized remotely via Zoom on 2.2.2022

Register your participation here:  
<https://tinyurl.com/2p8mfhf7>

#Lumi2022 #snowscience  
@IlmaTiede  
@Arctic\_Centre  
@SYKEinfo  
@helsinkiuni  
@Ulkoministerio

1 1

Char CHARTER Project 25 Jan

# Why CHARTER project has a snow protocol?

- One aspect of the project is better understanding of the snow icing events, like rain-on-snow event occurrence and impacts.
- Data from snow pits (layer structure of the snow cover) needed for the development of snow monitoring using satellite data in CHARTER
- Also needed for snow model evaluation - and for better understanding the role of snow in local communities

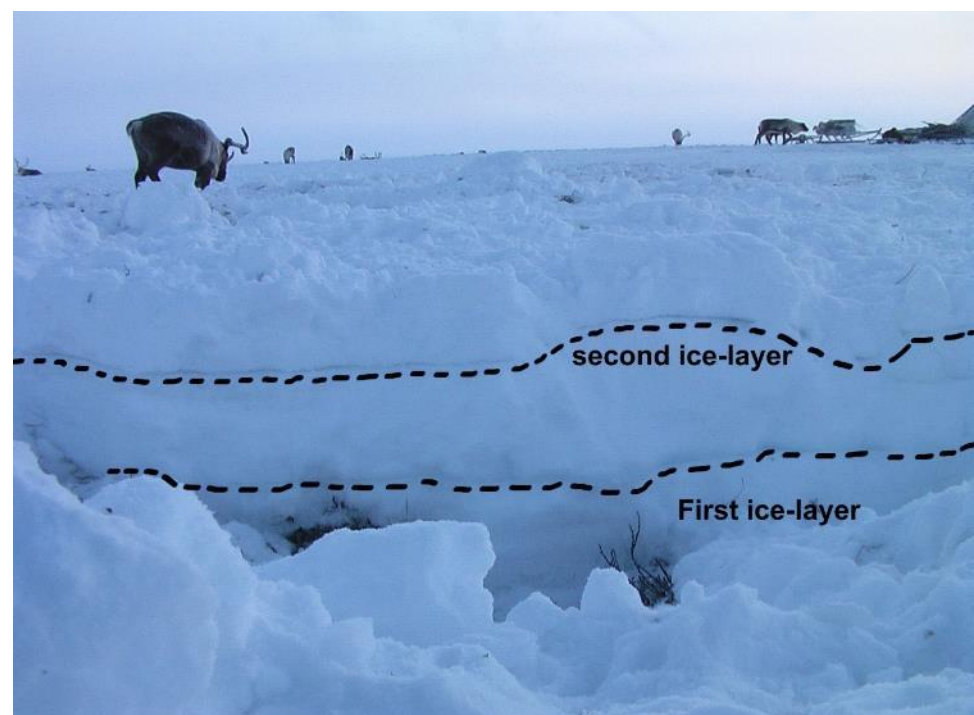


Photo: Florian Stammer

# Why CHARTER project has a snow protocol?

- Snow pit data was urgently needed in 2020-2021; field work was generally cancelled because of COVID-restrictions
- Ad hoc solution: CHARTER Snow Protocol, which follows the international standards but is simplified
- In 2021, small-scale communication to colleagues and long-term research partners in Yamal, certain herding districts in Finland, etc.



Photo: Jouko Kumpula



# What sort of protocol?

- Background information like location and ground type
- Snow depth (from 1 point, 2 points 20m apart or 5 point "envelope")
- **Ice layers**
- Optional: all layers in the snow cover
- Optional: snow water equivalent



Photos: FMI

# Definition of ice layers

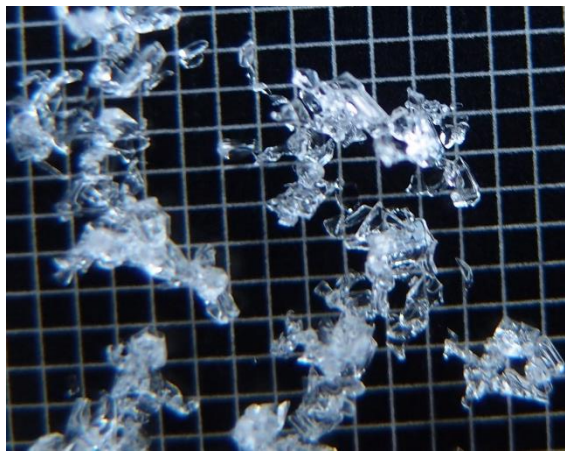
- Ice layers and crust layers are defined by hardness
- Tested by pushing snow with constant force until snow is too hard to be pierced.
- Location of ice layers is recorded

Hand hardness test	Definition
Fist	Very soft
4 fingers	Soft
1 finger	Medium
Pencil	Hard
Knife blade	Very hard
Ice	Ice



# Optional: Definition of all layers in snowpack

- Depth, grain type and hardness for every layer
- Simplified grain type descriptions from international classification
  - new snow, rounded grains, depth hoar, ice, crust, polycrystals, wet, slush







# Secrets of snow

<https://www.charter-arctic.org/secrets-of-snow/lumen-salaisuuksia-ratkomassa/>

**MUITA KANSALAISHAVAINTOJA JA JOUKKOISTAMISTA – MUKAAN MITTAMAAN!**

Lumipölyn jatkuvuudesta havainnointia Teliökuurasta -lomakkeen kautta

<https://www.gutenberg.org/files/54545/54545-h/54545-h.htm>

Hakintoja voi lähettää myös tämän verkkosivun kautta:

<https://www.yourparis.fr/616-7-Ville-et-mairie-avec-les-actes-de-la-mairie/5956/le-parisien/Tel-01-69-30-00-00-les-actes-de-la-mairie-616722>

Liikaa SVK:n kansainvälisessä verkkomarkkinassa

<https://www.jstor.org/stable/41667196>

Lisää konsultointien jaksamiseksi (Suomen laulukeuhkot, Luonnonvarakeskus, BirdLife Suomi, Ympäristöministeriö, Riihimäki)

<https://www.youtube.com/watch?v=5UW6m2aWwv0&list=PL8d3a211d13033a44> [https://youtu.be/3\\_dmr5hawi0cc](https://youtu.be/3_dmr5hawi0cc)

Emäksä kumivärvistä muodostuu tahkeaksi.

<http://www.jstor.org/stable/2613033>

Sääntökirjojen omat havainnot - osiosta voi löytää useita sääntökirjoista (lumihiutelmasta ajautuneen tikkailin särkein "lumen tyvyty", "hyökylumi", "hassako kottikallu jumi" ym.).

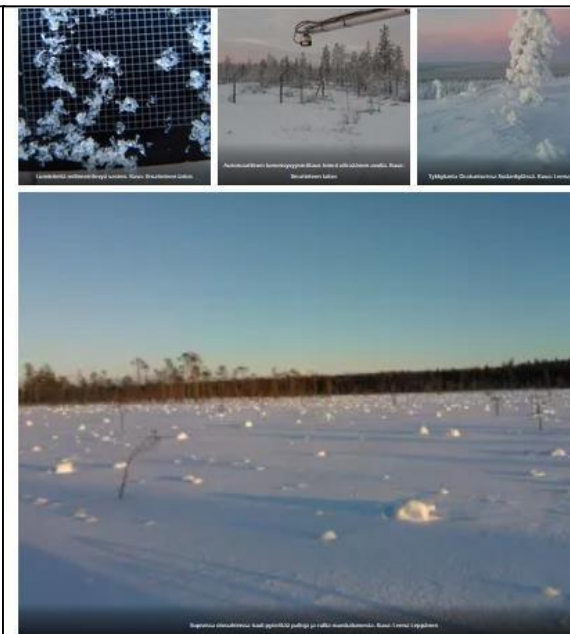
<http://www.jmstaterevision.com/tutor-how-to-run>

LaPresimma, Naturalist:

<http://www.nature.com>

<sup>2</sup> <http://www.wildlifeconservationtrust.org>

from the *Journal of Management Education*, 2006, 30(1), 10-12.



## MISTÄ LÖYTYY LUMIHAVAINTOJA:

Sää, lumikilanne (lumenleeseen loloaj)

<https://www.elsevier.com/locate/jbiotec>

Lumen nikkoo la kumissa (Vierisenen jalkoihin)

<http://www.libraryoftheology.org/ETC/etcdirect.htm>

Journal of Management Education 35(10)

Source: *Author's calculations* based on data from the 2000 Census of the United States.

10.1111/j.1365-3113.2011.04500.x

Lumen vesienä ja kirkkaana (laajeneminen jatkuvasti):

<https://www.youtube.com/watch?v=Vn8B1ar7aJA>

Lumen vesiatos ja luterilaisuus, myöskin luterilisuus Suomessa

<http://www2.ymparisto.fi/3d/laenne/Piv/Vuosi2010.html>

Kann den Familienname (Geburts- und Nennname)

© 2006 The Authors  
Journal compilation © 2006 Blackwell Publishing Ltd

<http://www2.jmp.rpi.edu/FV2/92/mkg2/tarzanr3.html>

Välillä lumilinja kietertyy syvyyksiin, eikä kukaan näe, osaatko pistää lauhavainnin (Helsingin

<https://www.potgene.com/yell>

Soderkyllän sää- ja ilmatietähuurolia ja ilmatieteen laitos, Soderkyllä; Arctic Spa

Editorial Board: The Editors

Soderbylin ium Privalovna: (Dimetwaa laissa, Soderbylin Arctic Space Centre)

Excerpt from *Journal of the American Academy of Religion*



# Experiences so far

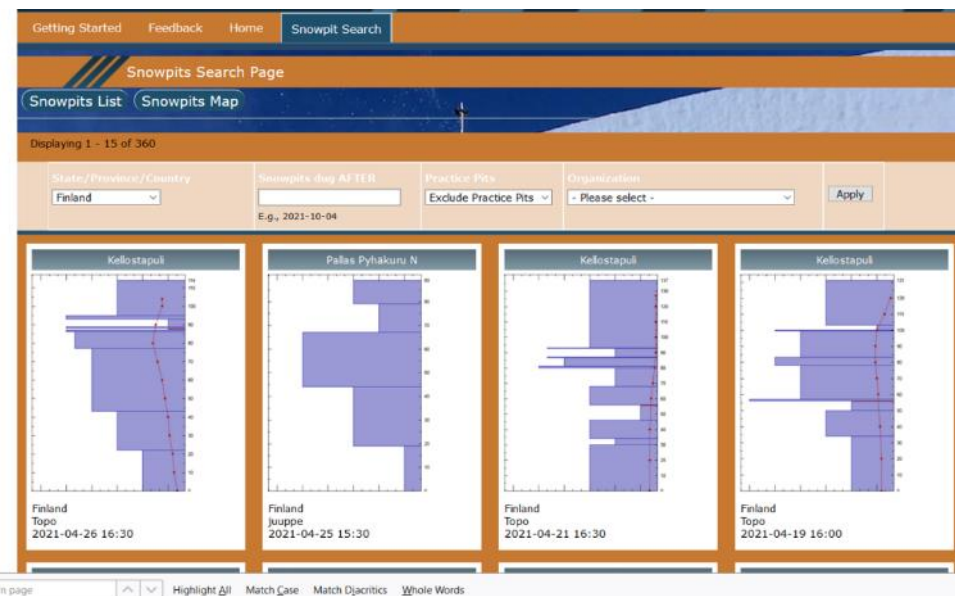
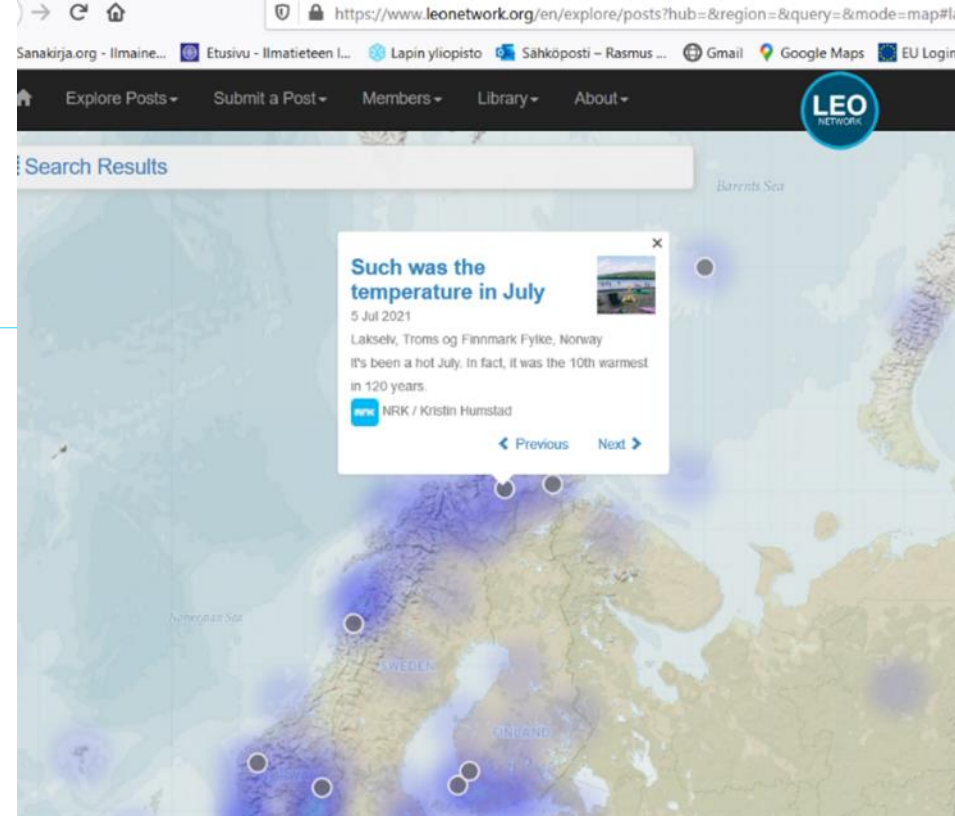
- Collaborators sent data from Yamal peninsula, Northern Finland and Norway, Alaska
- Simpler protocol needed (which still provide useful data)
- Interface to openly share the data – and easier-to-use tool to collect information (compared to the webropol-survey)
- Wider collaboration and communication needed



## Arctic Centre has now 5 snow kits

# Potential observers?

- Reindeer herders
- Border guards
- Backpackers, free-riders, ski patrols, skiing centres
- Research stations, research networks and individual projects
- SYKE snow survey observers, FMI Sodankylä, LUKE Pallas/Inari
- Kemijoki Oy and other businesses
- Schools and clubs



# Interesting new developments

- Many groups / institutes interested in collecting local snow observations: SYKE, FMI, Luontoliitto – “Citizen science coordination group”?
- Citizen science and crowdsourcing complementing the “official” meteorological and hydrological networks - **New ice layer observing tool!**





# Interesting new developments – LUMA Centre and schools

- LUMA Centres support schools and teacher education with the aim to “inspire and motivate ... to study topics in natural sciences, mathematics, and technology.”
- Schools are interested in snow observations and related material



**LUMA-KESKUS LAPPI**  
**OSA LUMA-KESKUS SUOMEA**

LUMA-keskus Lappi In English

Lapsille ja nuorille Opettajille ja kasvattajille Tiedetapahtumat Tiedeluokka Aurora Opetusmateriaalit Tutkimus

Yhdessä tehden, oppien ja innostuen!




## Virtuaalinen tiedeluokka

### Alakoulun töitä

Työt koostuvat kahdesta videosta ja tulostettavasta työohjeesta. Video A johdattelee oppilaita ilmiöön ja neuvoo kokeiden tekemisessä. Videolla B näytetään kokeiden tulokset ja selitetään ilmiö. Opettaja voi näyttää videon B oppilailleen tai katsoa sen itse opetuskeskustelun pohjaksi. Kokeet onnistuvat helposti saatavilla olevilla tarvikkeilla.

- **Veden kiertokulku** [Video A](#) [Video B](#) [Veden kiertokulku](#) [Kiertokulun kaaviokuva](#) Kokeillaan itse kuinka veden kiertokulku luonnossa toimii kolmen kokeen avulla.
- **Veden pintajännitys** [Video A](#) [Video B](#) [Veden pintajännitys.pdf](#) Mikä saa vesipisarat pysymään muodossaan? Tutkitaan veden pintajännitystä hyvin yksinkertaisilla välineillä.
- **Veden tiheys** [Video A](#) [Video B](#) [Vedentiheys.pdf](#) Missä olomuodossa ja missä lämpötilassa vesi on tiheintä, entä harvinta? Mitä merkitystä tälle on elämälle vesistöissä?

# Challenges

- Many needs and users, surprisingly amount and diversity of data (positive problem!)
- Quality and usefulness of observations?
- What do people get out of the work? (Glory and fame? Money? Equipment? Teaching material? Acceptance?)
- Languages used in communication?
- Local motivation to participate: getting their voice heard and observations “accepted”, more relevant phenomena observed and used in science



# Right place, right time?

Could these collaborations result in a citizen science element that outlives any individual project?

## Long-term goal?

Open, international, widely-used database of snow pit observations by researchers and citizens.

- Supporting snow and climate science - as well as ecological and social sciences
- Supporting local communities and livelihoods

“It is not necessary that every project builds their own interface and database; collection and sharing of data could be done together.”







# Thank you!

<https://www.charter-arctic.org/secrets-of-snow/>



CHARTER Snow Protocol as webropol survey:  
<https://link.webropolsurveys.com/S/40A073BB484C2434>

