BLUE ACTION

ARCTIC CENTRE
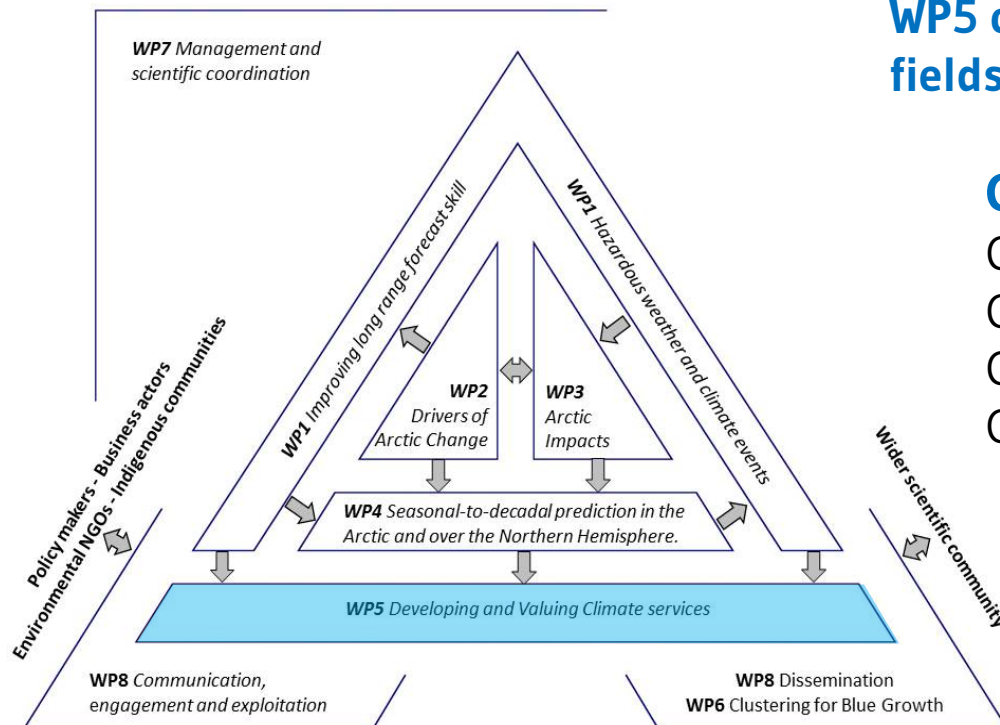University of Lapland

RUKA! KUUSAMO

# SnowApp - Climate service prototype co-designed for ski resorts in Northern Finland (H2020 Blue-Action project)

PROSNOW webinar Climate Services Relevant to Ski Tourism
28th September 2020

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# Five case studies on climate services in the Blue-Action: Arctic Impact on Weather and Climate project (EU Horizon2020; 2016-2021)



WP7 Management and scientific coordination

WP1 Improving long range forecast skill

WP1 Hazardous weather and climate events

Policy makers - Business actors
Environmental NGOs - Indigenous communities

Wider scientific community

WP2 Drivers of Arctic Change

WP3 Arctic Impacts

WP4 Seasonal-to-decadal prediction in the Arctic and over the Northern Hemisphere.

WP5 Developing and Valuing Climate services

WP8 Communication, engagement and exploitation

WP8 Dissemination
WP6 Clustering for Blue Growth

**WP5 case studies have co-designed climate services for different fields:**

**CS1 Winter tourism centers in Northern Finland**
CS2 Temperature-related human mortality in European regions
CS3 Extreme weather risks to maritime activities
CS4 Climate services for marine fisheries
CS5 Yamal 2040: Scenarios for the Russian Arctic

More information: www.blue-action.eu

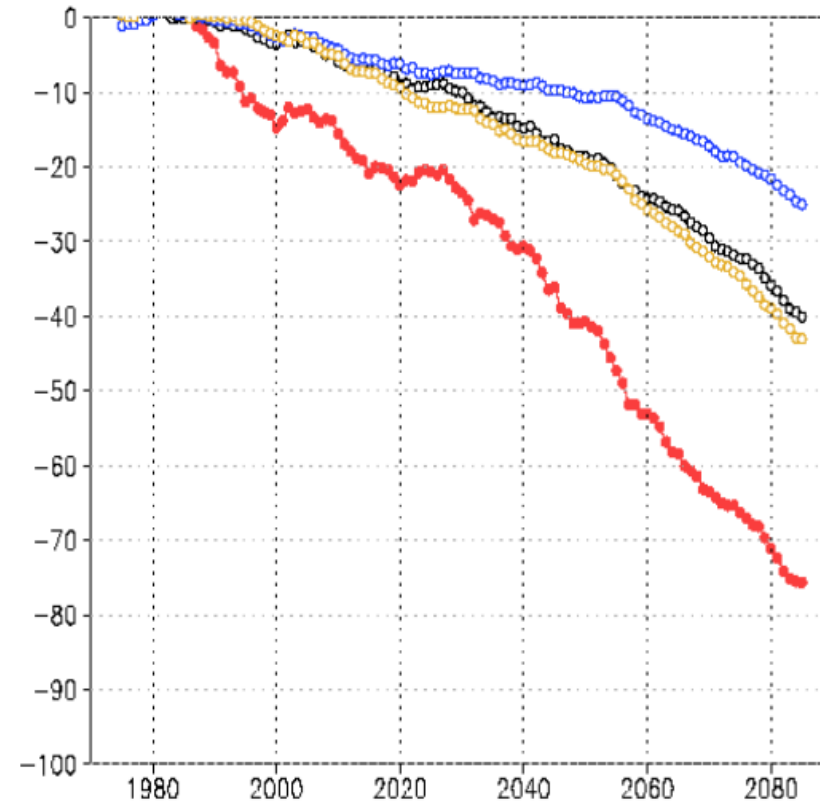# Some expected impacts of climate change in Northern Finland

**Thinner snow cover and decrease of snow cover days expected**

**The decrease of snow cover days (%) in Northern Finland (appr. 67°N), according to the A2 scenario**
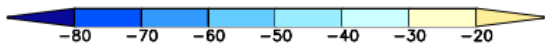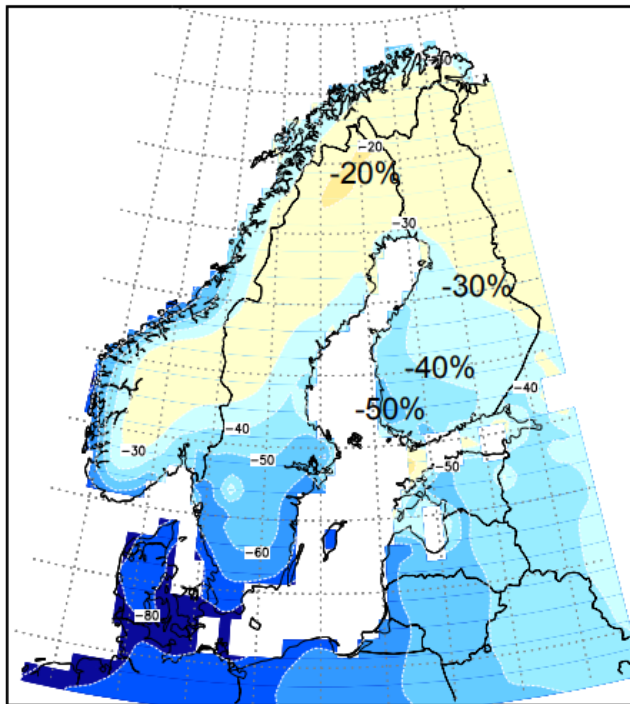


*Decrease in snow cover days (%)*
*1961-1990 → 2071-2100, according to the A2 scenario*

*Ilmasto-opas.fi:*
*If nothing is done on climate change, by the end of the century snow depth will decrease by 48 % in Sodankylä and by 78% at the Helsinki-Vantaa airport*

- Red: October
- Black: December
- Blue: February
- Yellow: April

Source: Lapin ilmastostrategia 2030; FMI (2010) Lapin ilmastoennuste

ILMATIETEEN LAITOS
METEOROLOGISKA INSTITUTET
FINNISH METEOROLOGICAL INSTITUTE

# Snowmaking and storing of snow are increasingly used for adapting to the delay of wintry conditions in the early season

Potential problems

- Energy consumption -> GHG emissions and costs -> sustainability (ecol. and econ.)?
- Negative impact on image unless ecologically sustainable?
- Availability of water in some resorts
- Uncertainty on snowmaking conditions in the early season, **need for better prediction**

Photo: Jussi Väätäinen / Rukakeskus Oy

# Climate service for winter tourism industry

- Co-designed by a multidisciplinary team at the Arctic Centre of the University of Lapland, and Rukakeskus Ltd.

- Timeline of the winter tourism case study: 12/2016-10/2020

- Climate data: 6-month forecasts from GCFS2.0 (DWD, UniHamburg)

- Co-design with end-user for ensuring relevance

- Piloting with Ruka with replicability in other resorts in mind after the project phase

# RUKA Ski Resort in Northern Finland

- Family-owned company with two ski resorts in Northern Finland: Ruka and Pyhä
- 200 ski days per year, 400 000 skiers per year
- 34 slopes; longest slope 1300 m
- Opening of skiing season 2020/2021 on 2nd Oct
- Market leader in ski resort industry in Finland
- Strategy to be the most snow secure resort in Europe
- Forerunner in environmental programs; carbon neutral, green energy
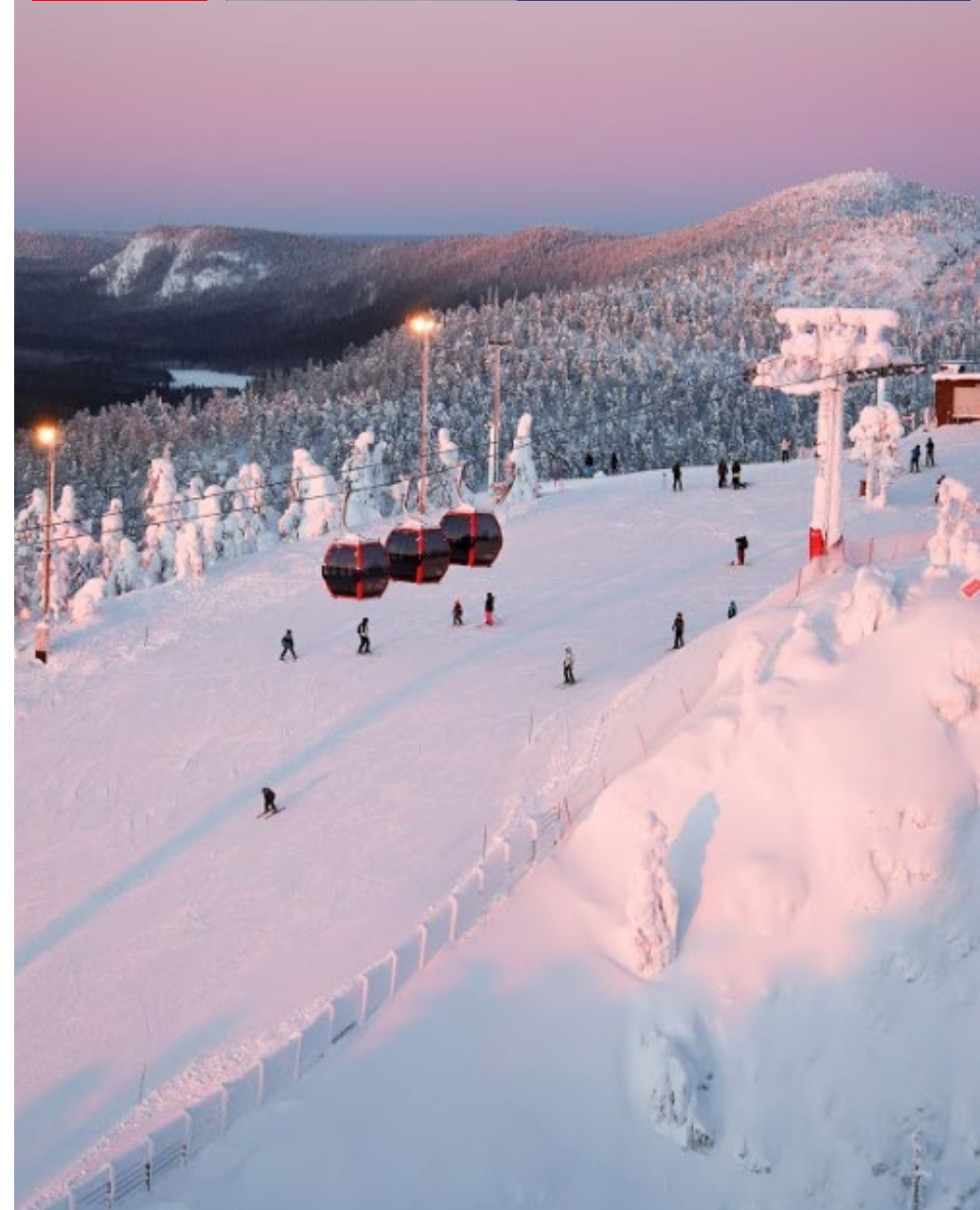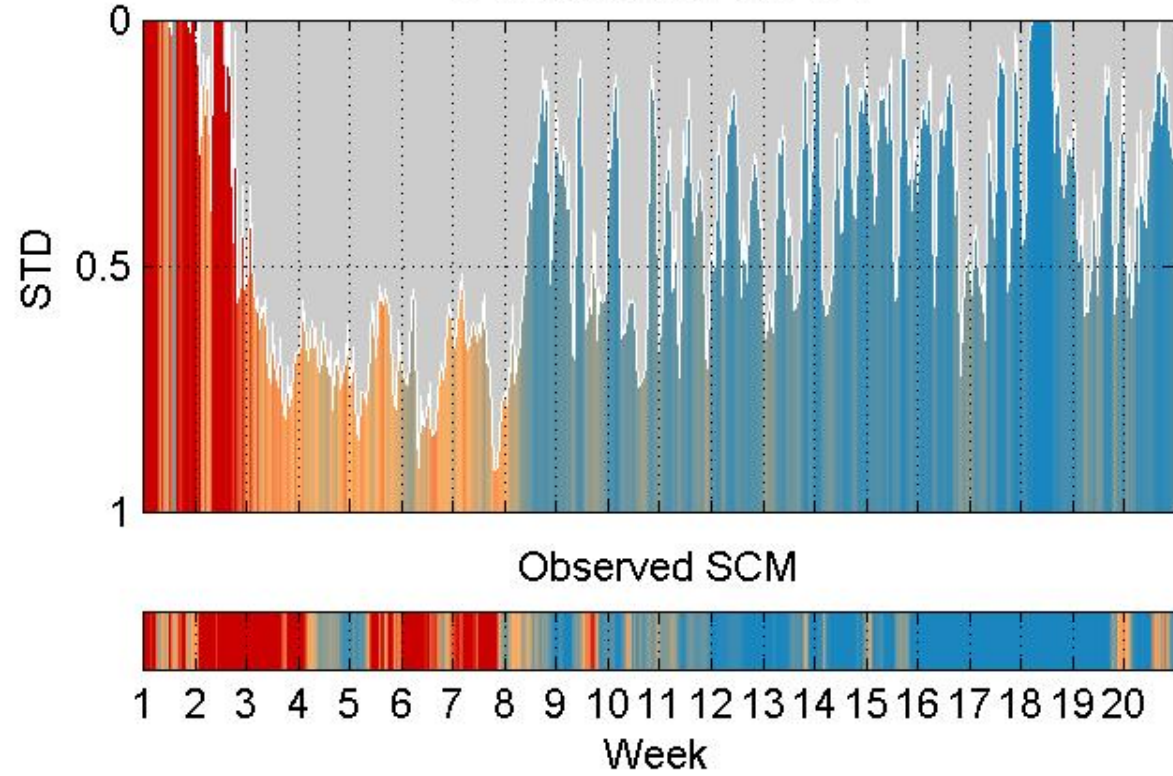
Photo: Jani Kärppä and Rukakeskus Ltd.

# Data

1) All data are six months

2) All data is 6 hourly

3) Each dataset has a grid 15 x15 (225) geographic cells centred on RUKA – i.e. cell(8,8) contains the lat. and lon. of RUKA 66° 11'N 29° 06'E

4) For each cell we have:
    Surface temp,
    2m temp,
    100kPa humidity,
    windspeed (as two orthogonal vectors u, v)
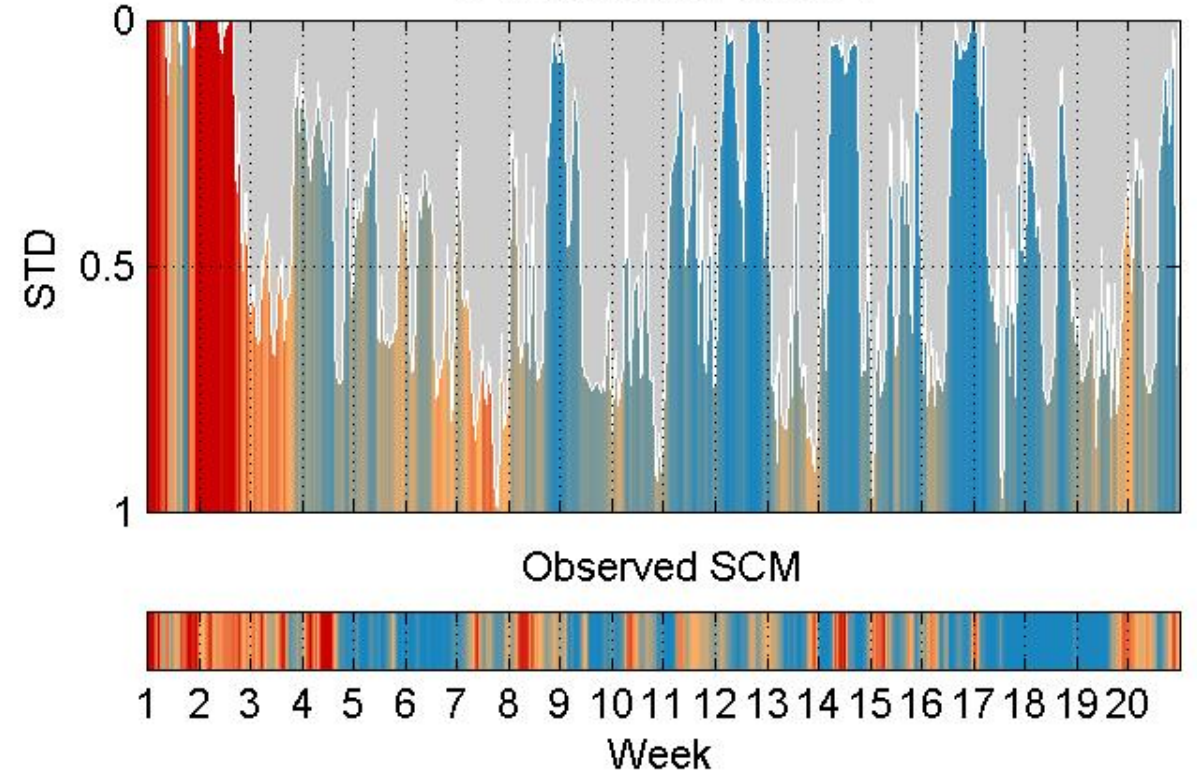
5) each of these comes as an ensemble of 10 realizations

Hindcast analysis
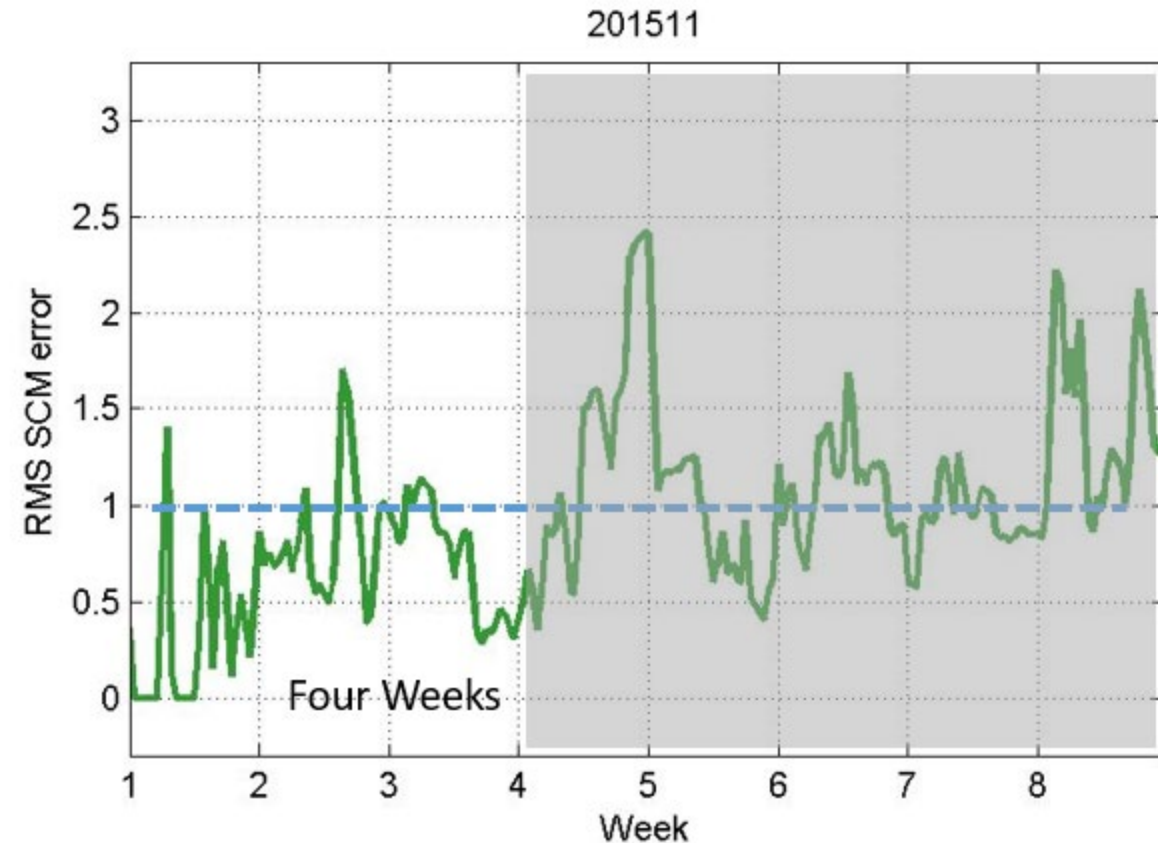
Predicted SCM 201810

Predicted SCM 201910

Observed SCM

# snowApp

**Date range:**

| 2018-10-01 | to | 2019-03-01 |
|---|---|---|

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European Union, Horizon 2020, Grant: 727852

**Language:**

English ▲

- English
- Suomeksi
- Français

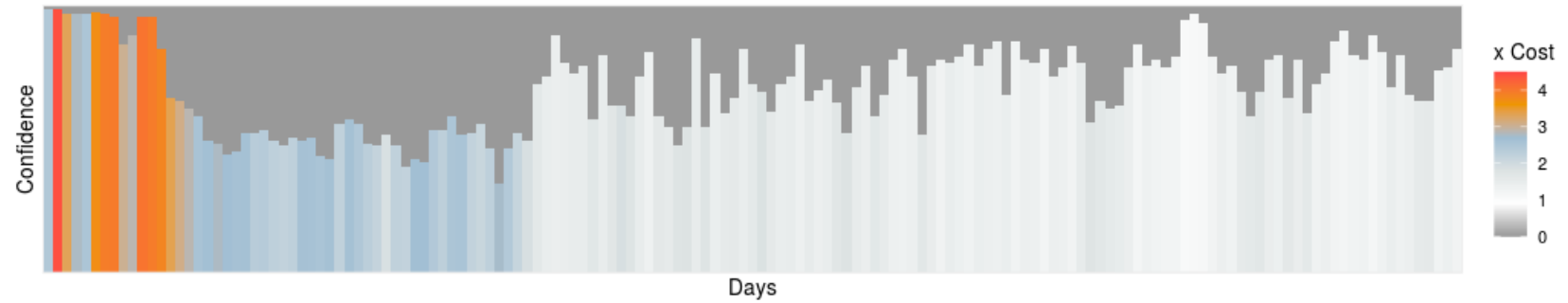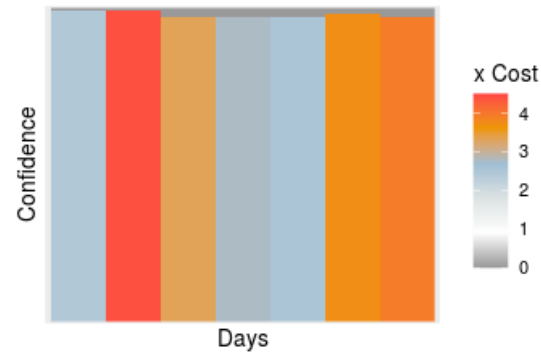| Main | Wind | Help | About |
|---|---|---|---|

All Displays start 2018-10-01 Main Display 151 Days

**A** Date Range

60 Days Minimum



**B** 7 Days



**C** 30 Days

# snowApp

## Date range:

| 2018-10-01 | to | 2019-03-01 |



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Main    Wind    Help    About

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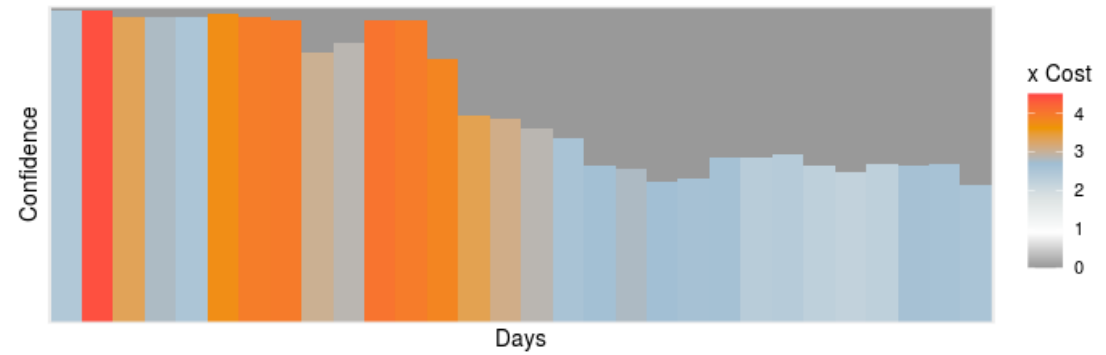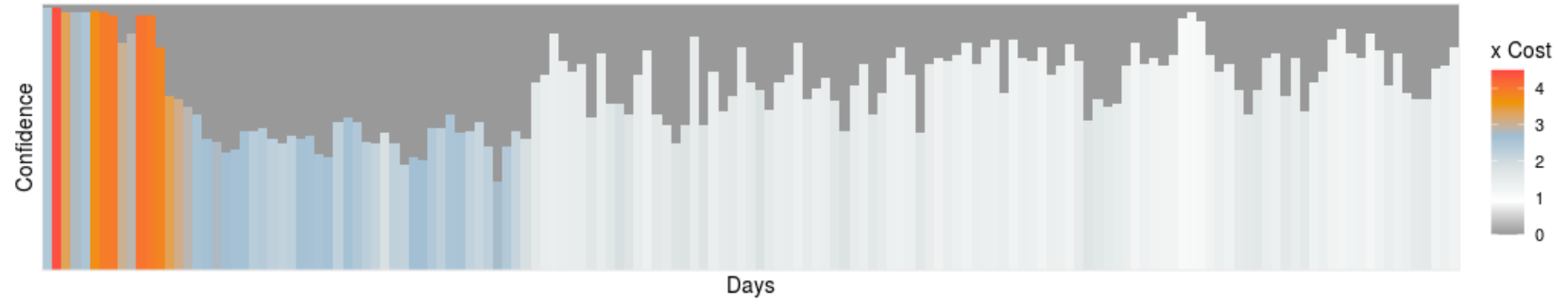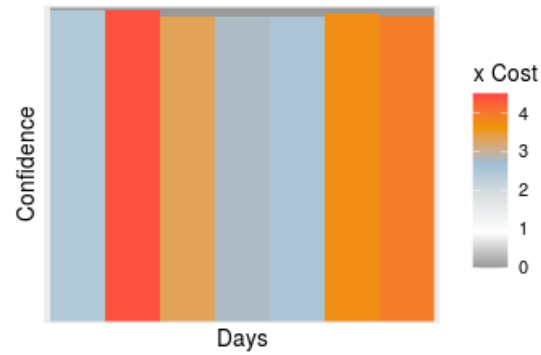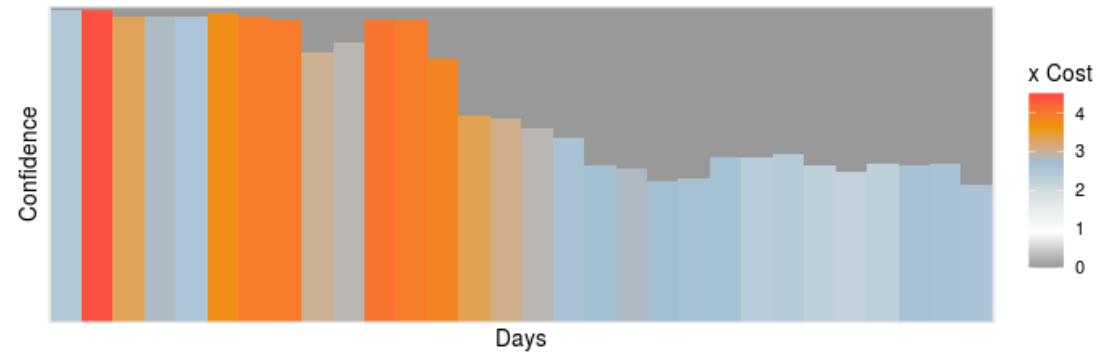
60 Days Minimum



**B** 7 Days



**C** 30 Days

# snowApp

**Date range:**

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European Union, Horizon 2020, Grant: 727852
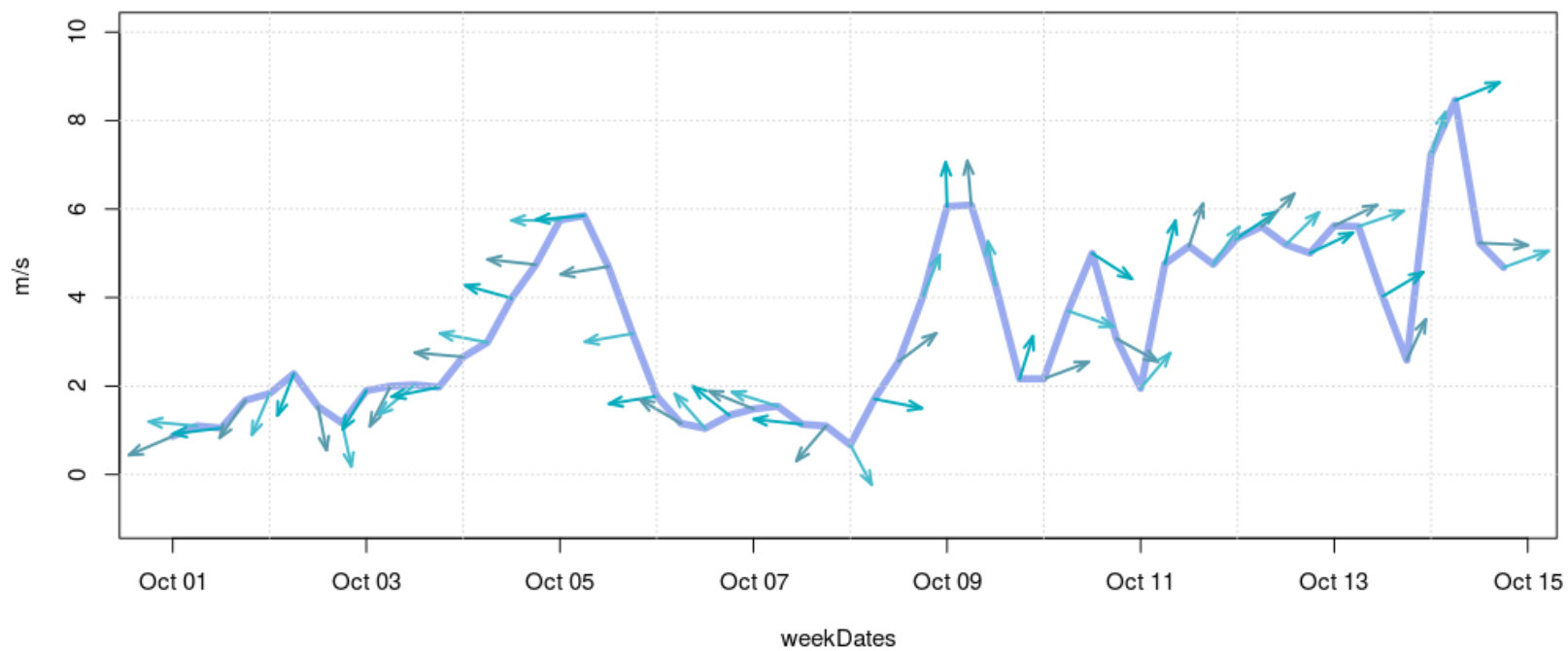
**Language:**

English

Main   Wind   Help   About



**14 Days**

# SnowApp – a summary (1/2)

- Reliable forecast on snowmaking conditions for 4 weeks
  - Provides a remarkable improvement to the current 3-4 days weather forecasts
  - Data can be updated monthly
- A decision-support tool for ski resort management
  - 4-week forecast enables managerial decisions
  - not meant for customer interface
  - not a weather forecast
  - no element of natural snowfall
- Particularly useful in predicting long periods of warmth in early season like in 2018
- Serves primarily snowmaking but can have also other uses through the management system in the ski resort
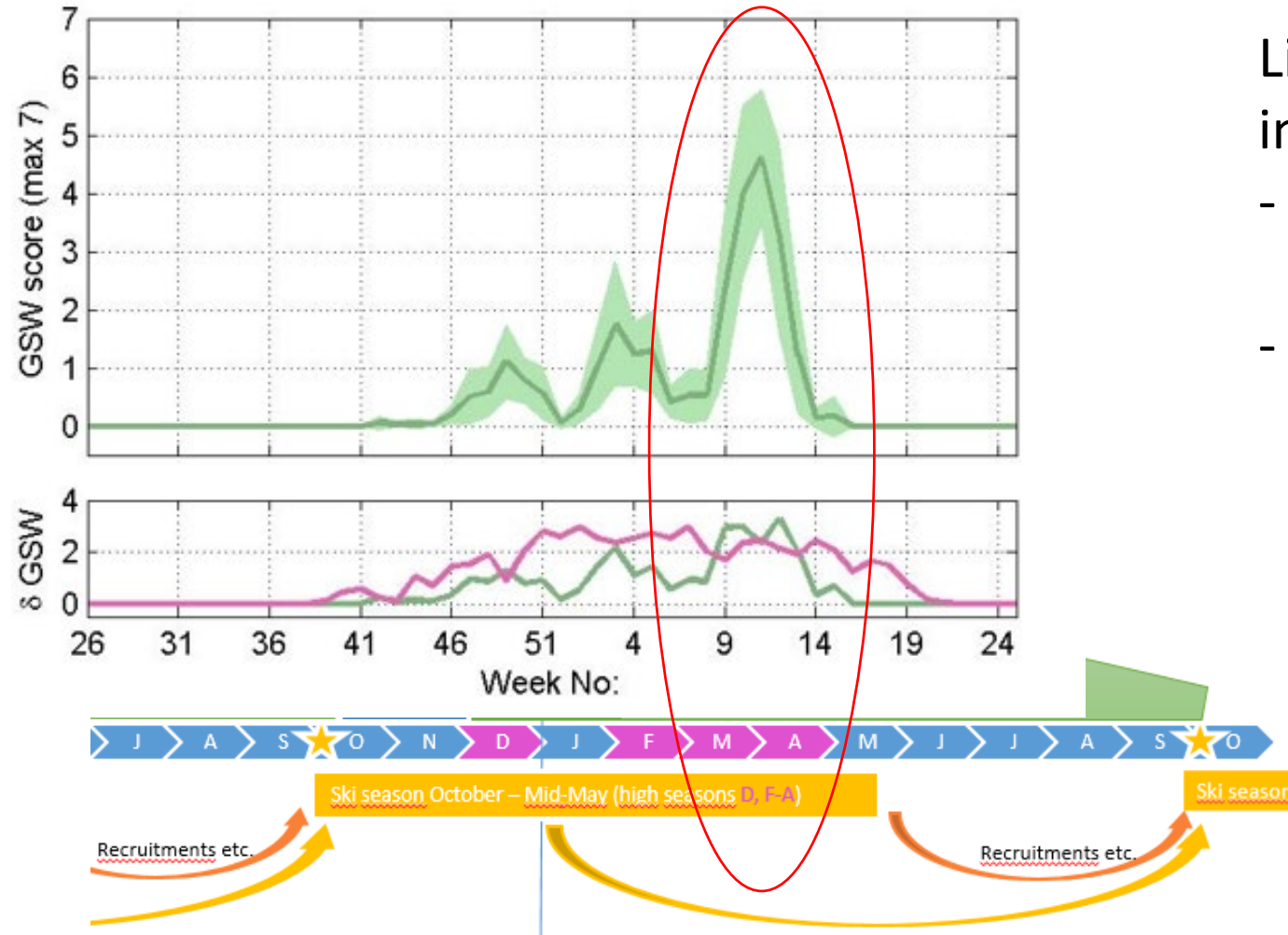
Limitations to the use of SnowApp include
- Top seasons e.g. skiing holiday weeks
- Timelines of sales and other ski resort operations

# SnowApp – a summary (1/2)

- Potential commercialisable product: 6-month subscription September-February each year

- Replicability of the climate service to winter tourism business potentially in all snowy countries
  - Potentially high commercial importance
  - Serves particularly in predicting longer periods of too warm conditions

- Supporting sustainability of snowmaking as an adaptation strategy in ski resorts: our climate service can also be used to minimize extra costs and GHG emissions by optimization

Video on our climate service:
*Securing sustainable snow for winter tourism with a climate service*

A consistent snow base is a key resource for Ruka that has around 200 skiing days from early October to May, and it relies heavily on machine-made and stored snow to ensure the slopes can be opened early and maintained through the winter.

https://vimeo.com/365761832 (published 12.10.2019)

00:30

# More information

- How can we use climate predictions to adapt to the future? (2019)
  - Booklet available online https://zenodo.org/record/3433776#.X3GRZKgzaUk
- Blue-Action website: http://blue-action.eu/climate-services/1-winter-tourism-northern-finland
- Our video https://vimeo.com/365761832
- More information, including an Assessment and Evaluation Report, coming up soon in Zenodo and on the Blue-Action website
- Our final seminar on 2nd October 2020 online, in Finnish

# Thank you for your attention!

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