

How to preserve the tundra in changing climate

Date/time: December 2, 13:00-14:30

Room: Gofoten

Session organizer: Johan Olofsson, Umeå University

Sonja Kivinen: Current and future climate conditions and vegetation in Northern Fennoscandia

Elina Kaarlejarvi: Tundra plant diversity in a changing climate – what is the role of herbivores.

Jane Jepsen: Birch forest resilience to insect outbreaks at the forest-tundra ecotone: interactions with mammalian herbivores

Mariska te Beest: Reindeer grazing influences vegetation structure and alters summer albedo

Cécile Ménard: The "butterfly effect", herbivory and modelling the energy budget in Fennoscandia: Does the flap of a moth's wings in Norway set off a tornado in Texas?

Tim Horstkotte: The social-ecological hoof print: Integrating science and policy in social-ecological systems of Northern Fennoscandia

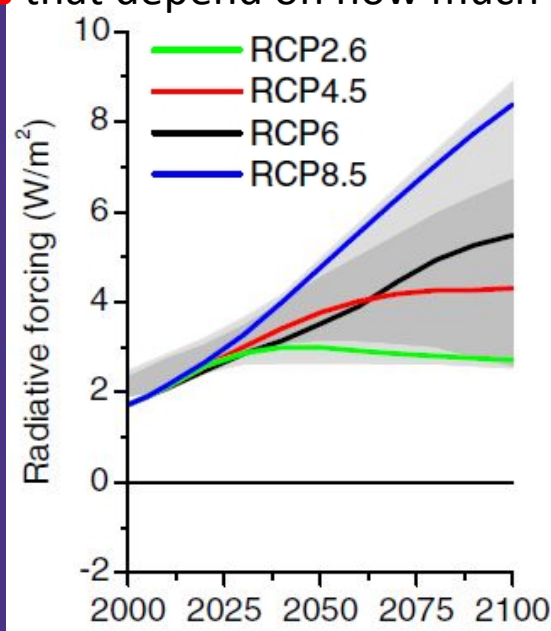
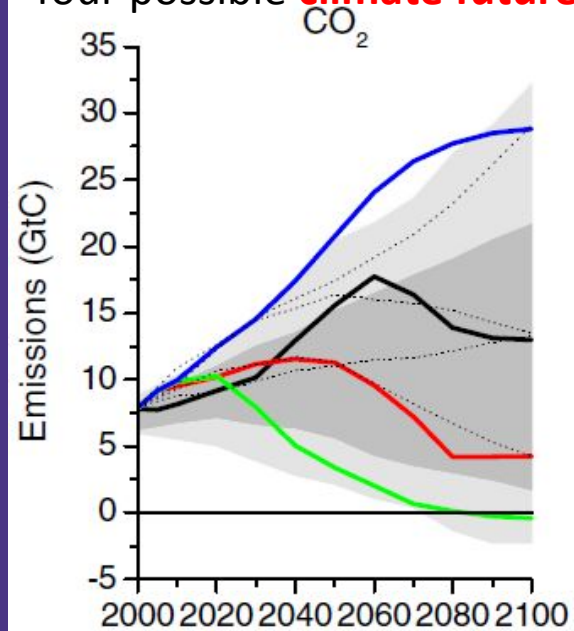
The background image is a wide-angle landscape photograph of a tundra in Northern Fennoscandia. The foreground is filled with numerous grey, lichen-covered rocks of various sizes, interspersed with low-lying vegetation in shades of green and red. The middle ground shows a vast, flat expanse of tundra stretching towards distant, low hills. The sky is filled with large, white and grey clouds, with patches of blue visible. The overall scene conveys a sense of a cold, open, and natural environment.

Current and future climate conditions and vegetation in Northern Fennoscandia

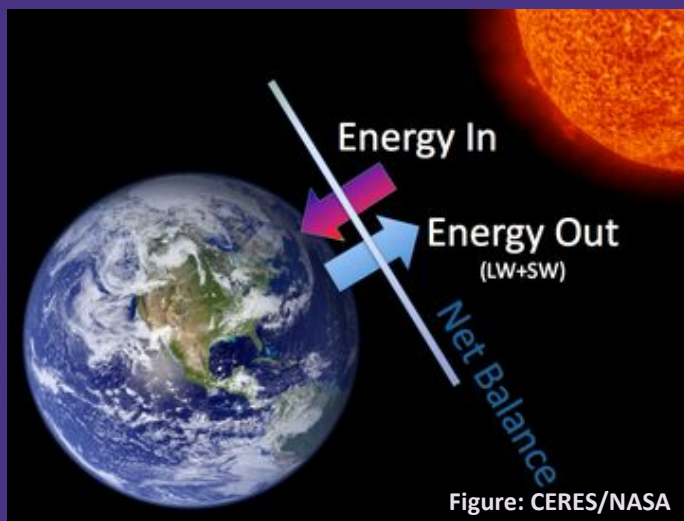
Sonja Kivinen, Tim Horstkotte & Jukka Käyhkö (University of Turku)
Bernt Johansen (NORUT)

Representative Concentration Pathways (RCP) are new IPCC5 greenhouse gas scenarios

= four possible **climate futures** that depend on how much greenhouse gases are emitted



RCPs are named after a possible range of **radiative forcing values** in the year 2100 relative to pre-industrial values (+2.6, +4.5, +6.0, and +8.5 W/m²; van Vuuren et al. 2011).

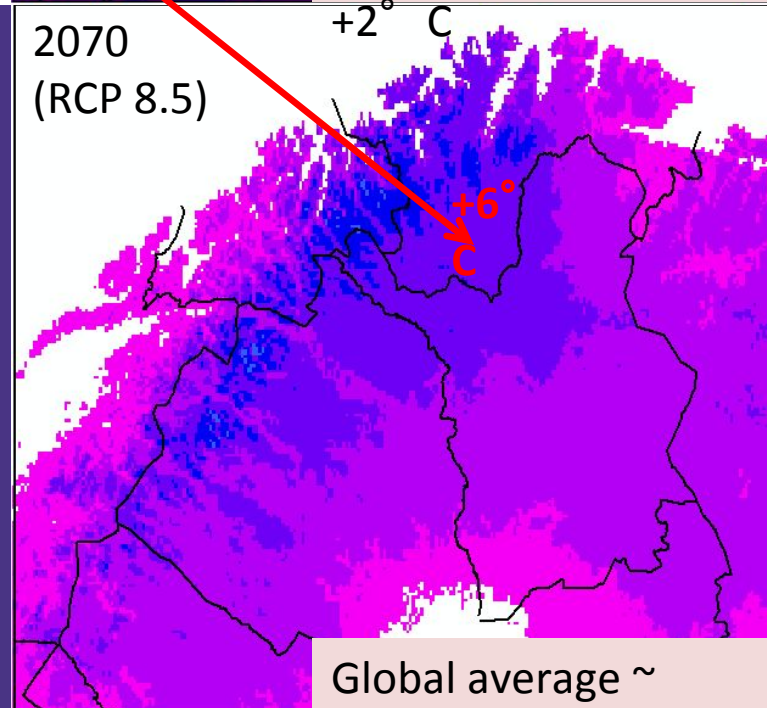
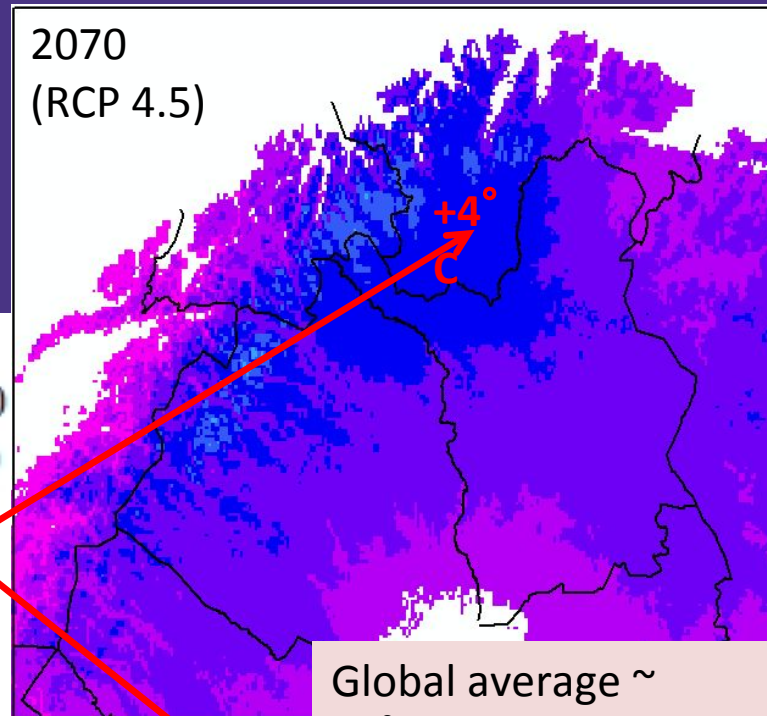
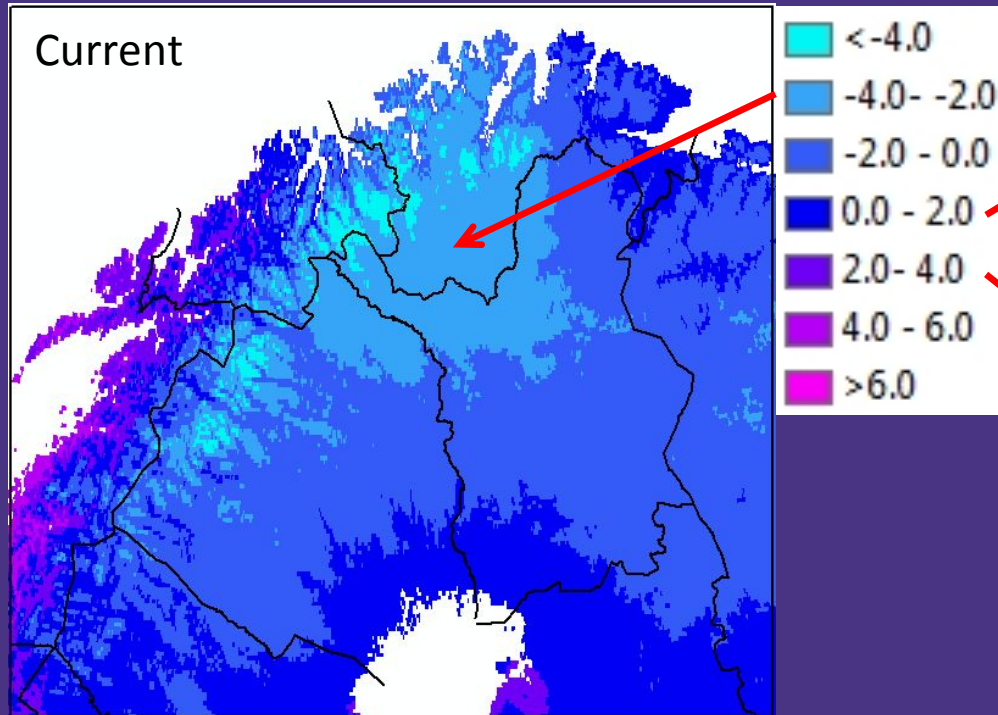


Radiative forcing = “imbalance” between incoming solar radiation and outgoing infrared radiation

→ Earth’s radiative balance to stray away from its normal state

→ Changes in global temperatures

Projected changes in mean annual temperature (° C)

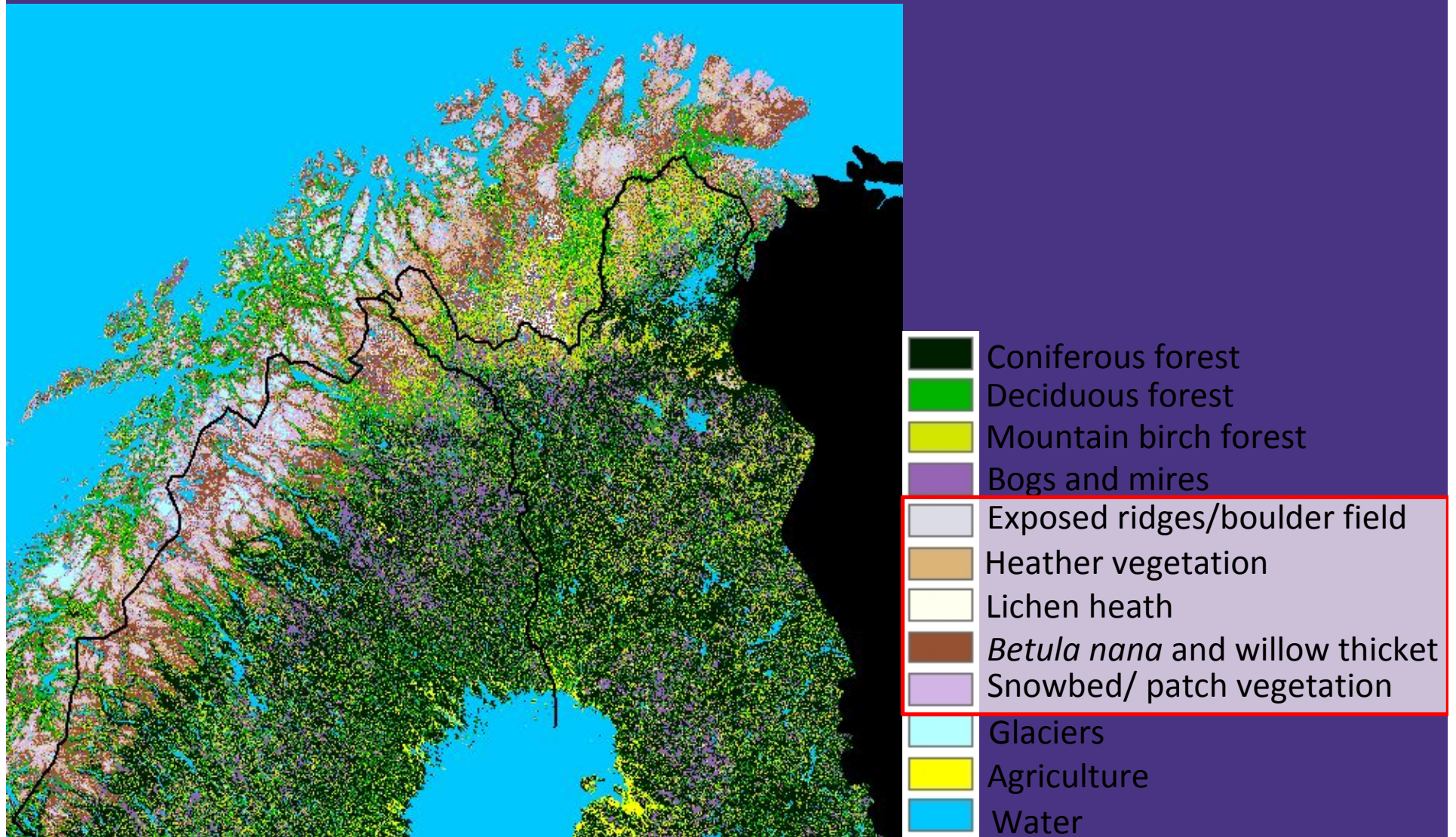


Temperatures are derived from WorldClim data
(spatial resolution 2.5 arc min; ~ 5 km x 2.5 km)

Current conditions describe the period 1950 - 2000

Projected temperatures in 2070 are based on the
average of 17 global circulation models (GCM; CMIP5)

Vegetation types in Northern Fennoscandia

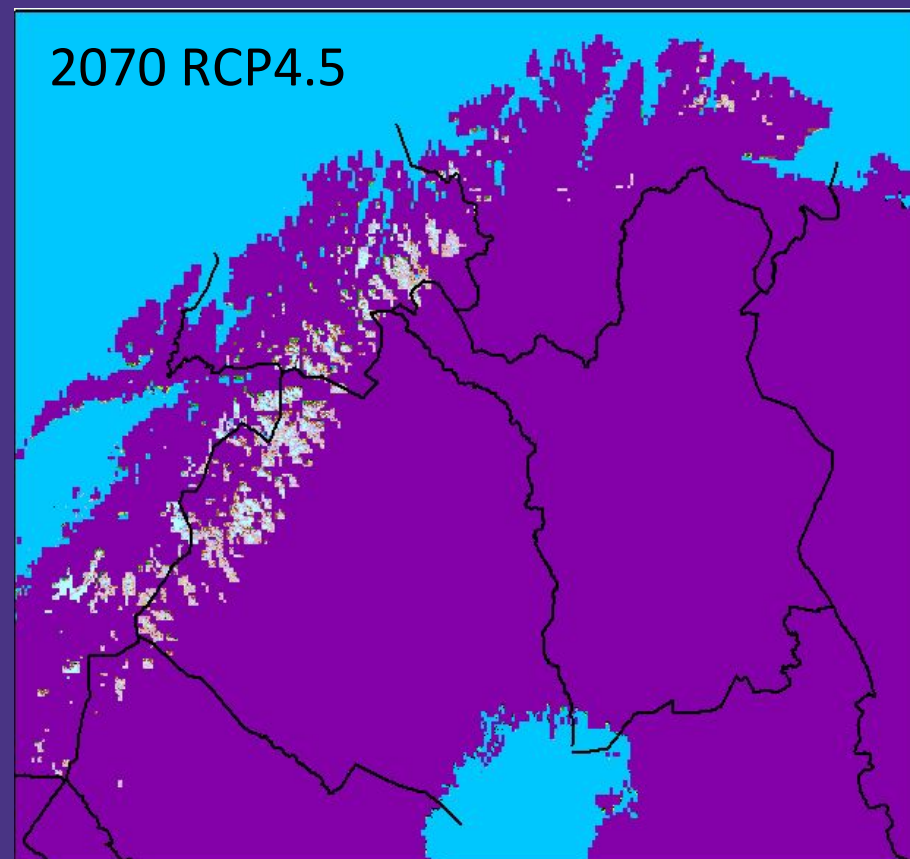
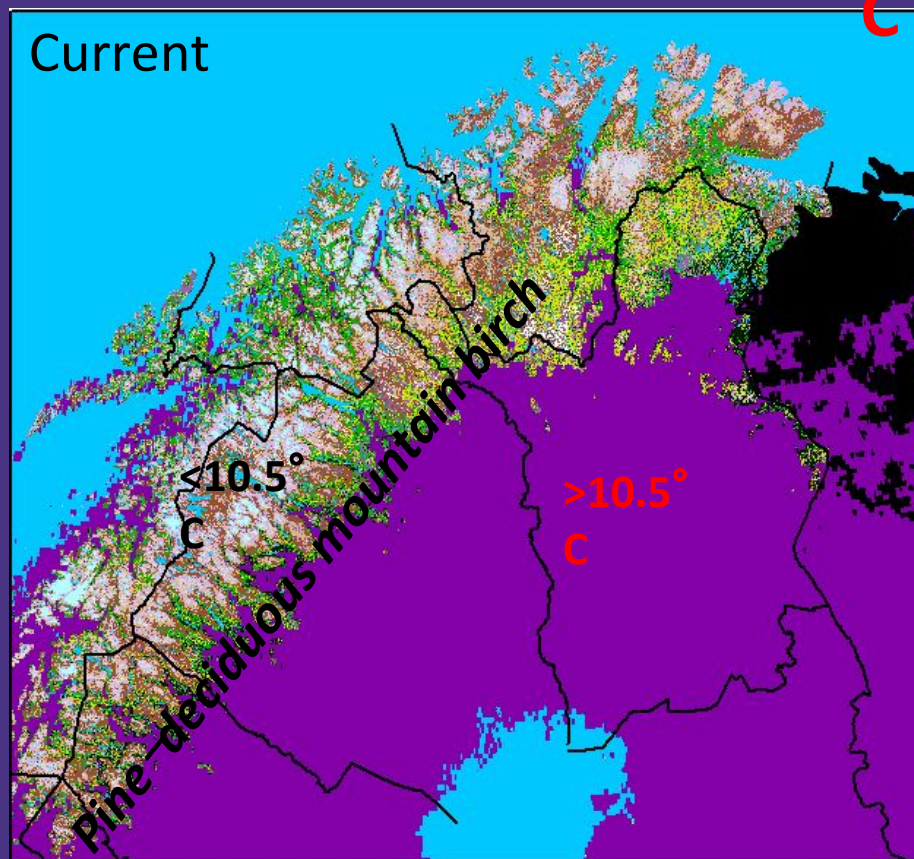


Map: Bernt Johansen

Mean temperature of the warmest quater

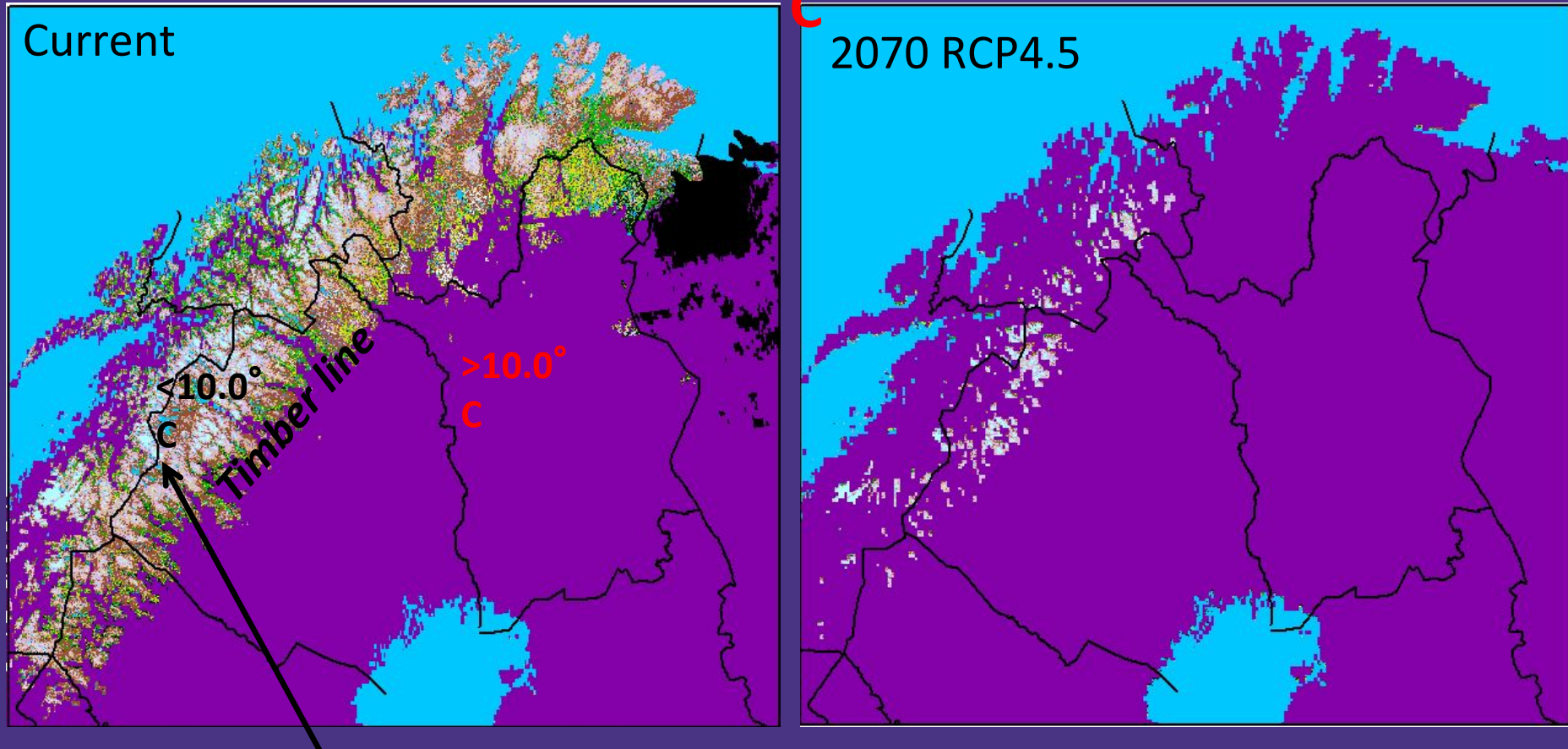
10.5°

C



Mean temperature of the warmest quater

10.0
°C



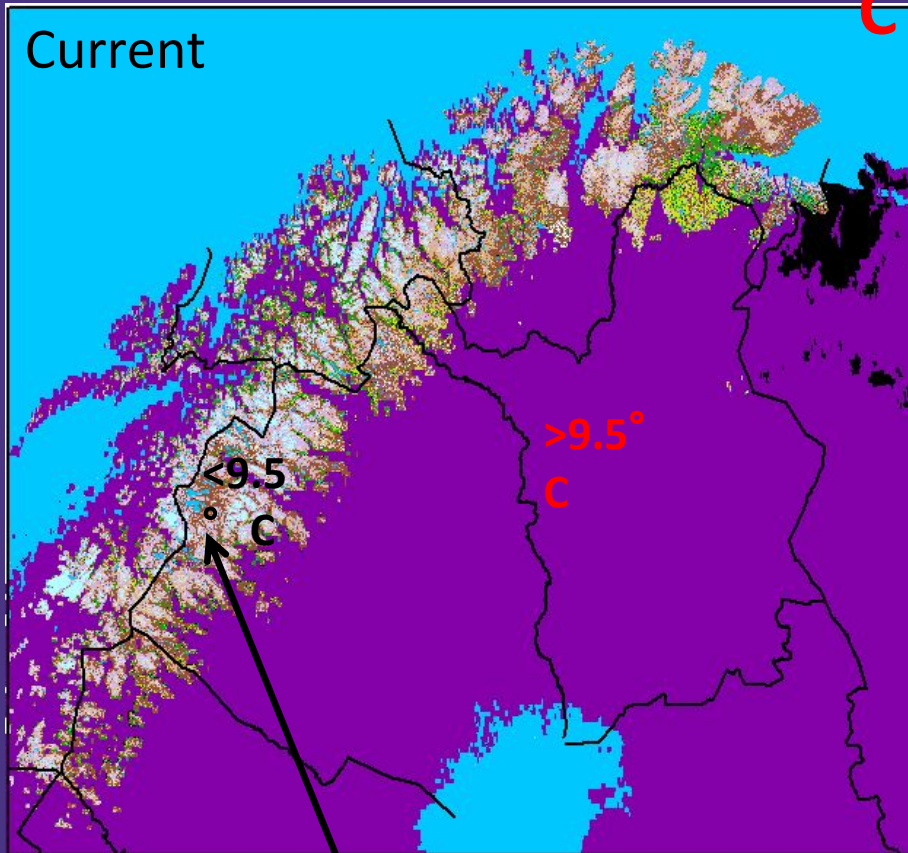
Mountain/open lowland vegetation covers
circa 75% of land area where $T < 10^{\circ} \text{C}$

Mean temperature of the warmest quater

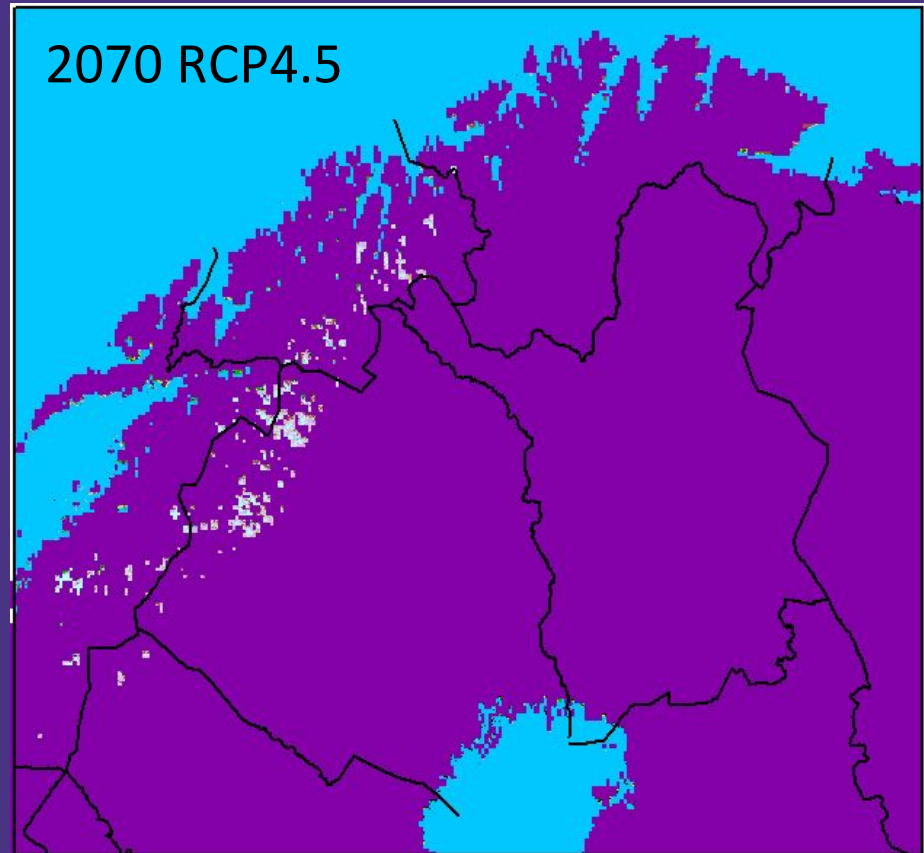
9.5°

°C

Current

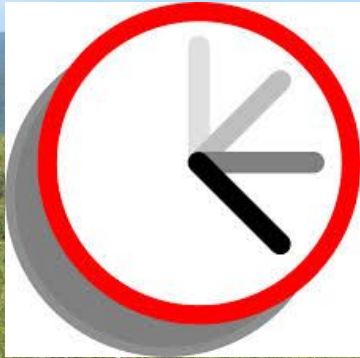


2070 RCP4.5



Mountain/open lowland vegetation covers
circa 85% of land area where $T < 9.5^{\circ}\text{C}$

Shrubification and tree line advances



Time lag



Biotic factors

Abiotic factors

