

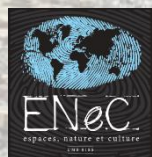
Recent past, present and future temperatures for calving area in Gabna community: cross-checking datasets and first results

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Who?

- Geographer (biogeography and climatology)

Reindeer pastoralism relative questions in northern Sweden (Norrbotten county)

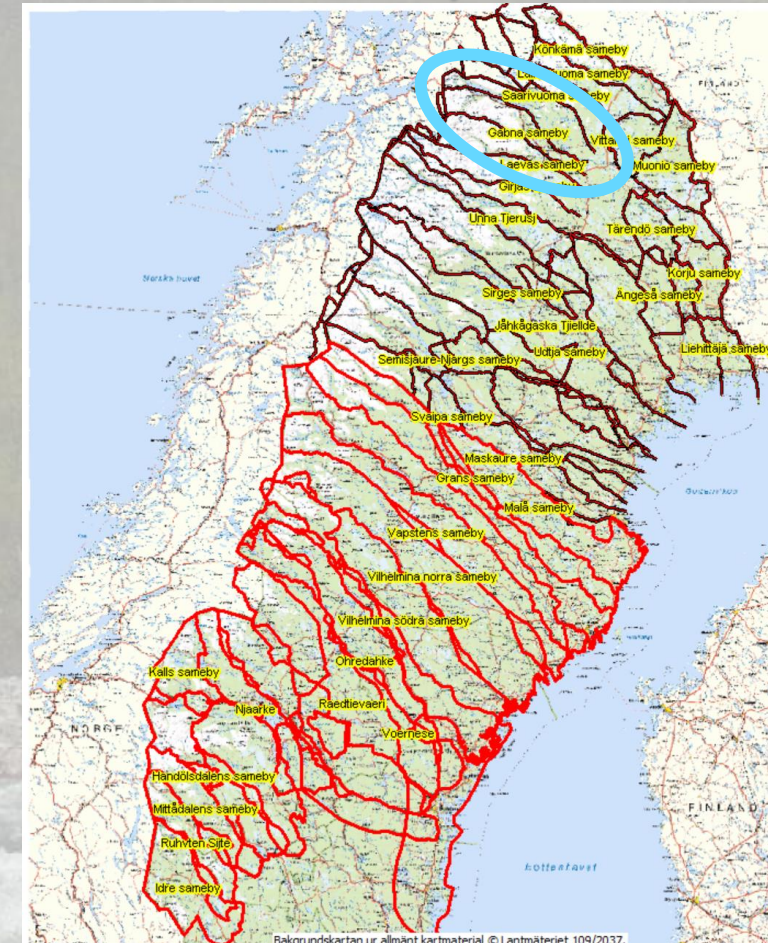
Quantifying local effects of global warming on :

- Reindeer biology and associated pastures

(Dynamics of population + vegetation biodiversity/phenology + habitat choices/migration)

Studying in particular Gabna community extent, here calving area (RenGIS 2.0)

Study area



Source: RenGIS 2.0

Why?

- Calving area bioclimatic conditions, in particular MAY – JUNE are :
 - Vital for reindeers (calves, females): body fat (re-)constitution
 - Important for mountainous landscapes conservation and management; proner to vascular plants colonization / shrubification processes

+

 - The WorldClim 2.0 project:
OpenAccess, reanalysis + projected monthly Tmin/averaged/max (raster = continuous dataset)
- ⇒ What are, and would be temperatures for Gabna' calving area ? In particular ecological habitats?

What for?

Recent past

All along Torneträske valley and compared to historical records of temperatures, can we consider WorldClim reanalysis as reliable ?

Present

May MOD11A2 daily Land Surface Temperatures time series be a consistent proxy for the 2m temperatures of the whole calving area?

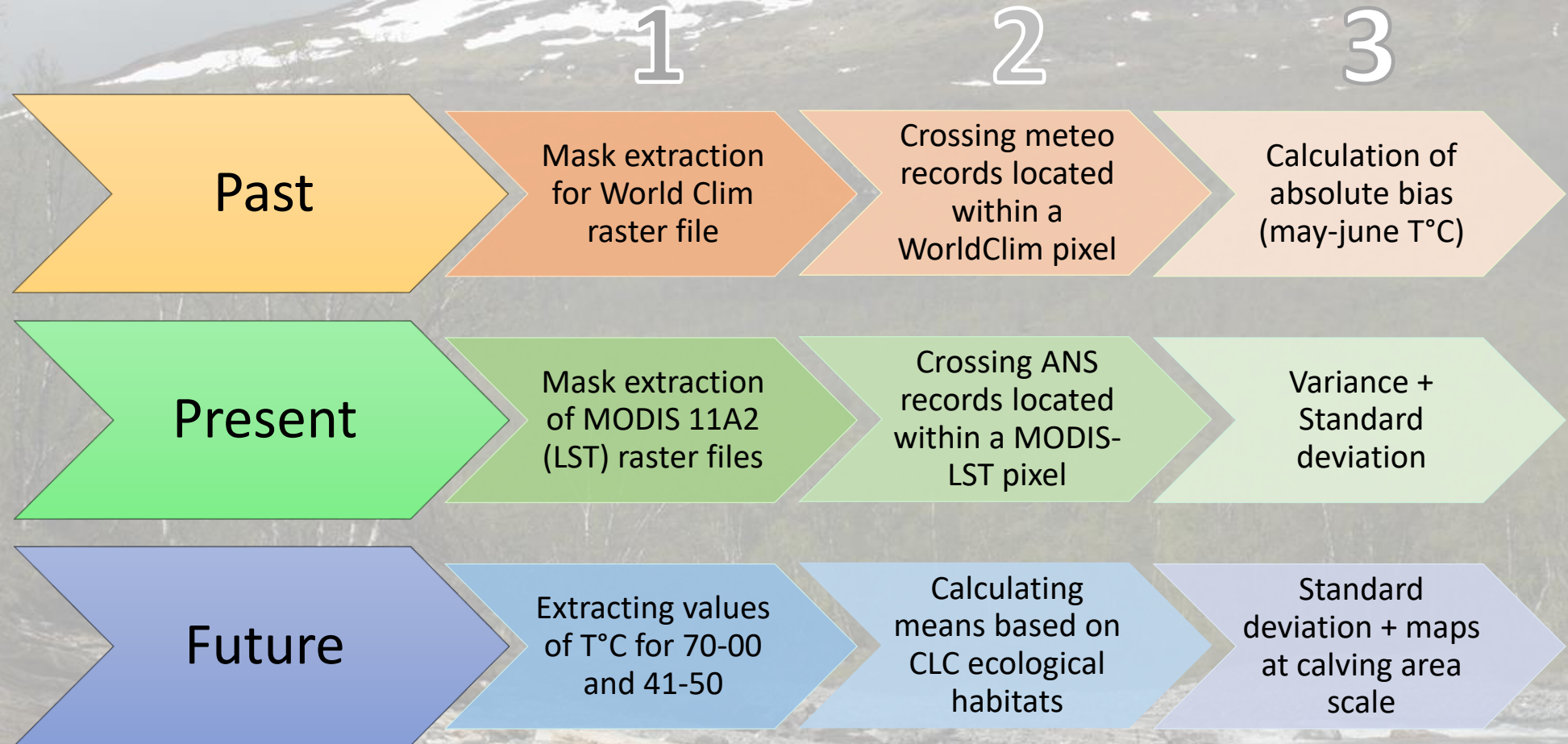
Near future

If WorldClim interpolations fit, what about the future climate of the calving area ?

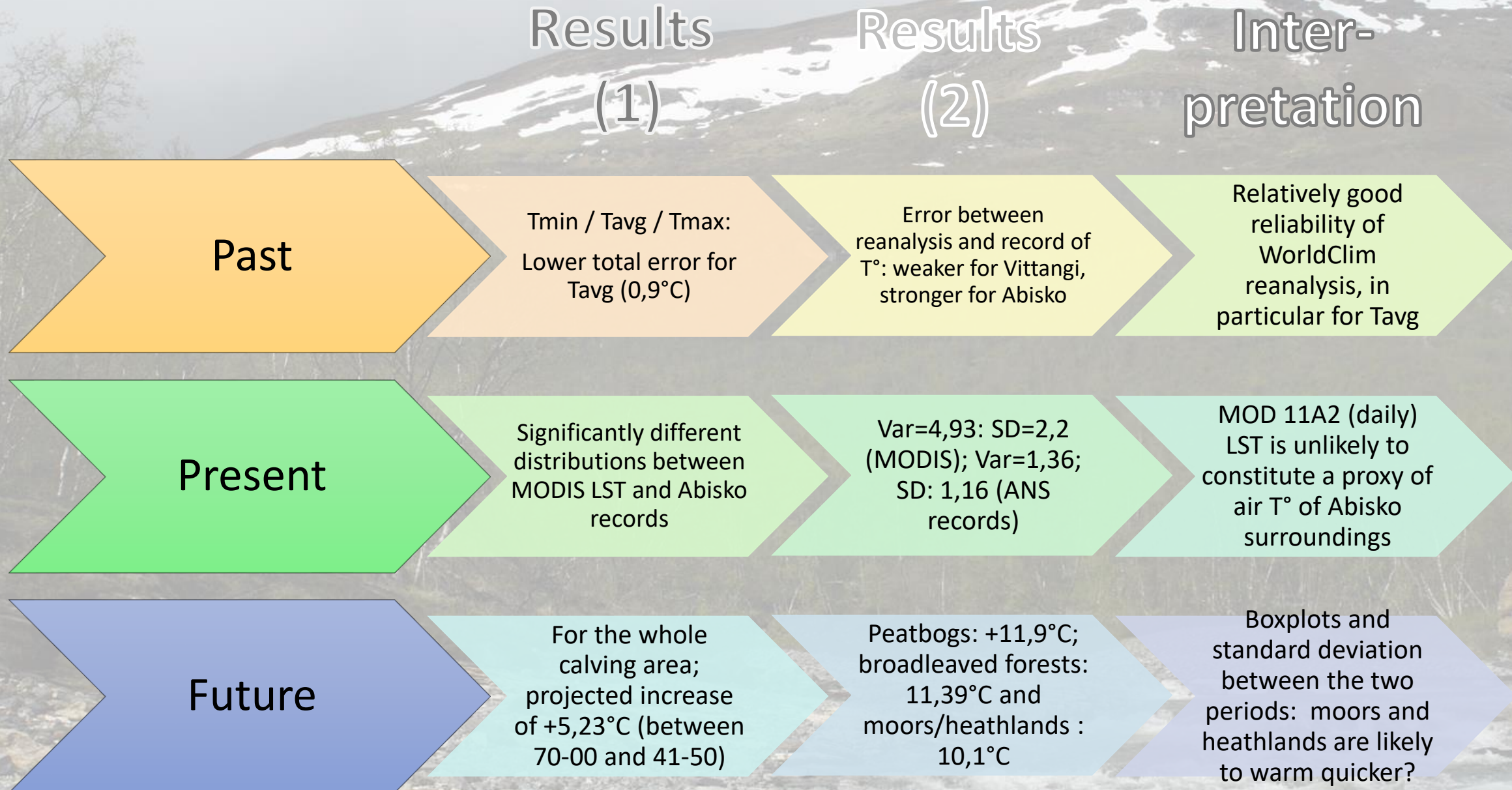
What?

Period	Recent past (1970-2000)	Past + Present	Present (2000-2016)	Past, Present, Future	Near future (2041-2050)
Data	World Clim reanalysis	Meteorological records	MODIS LST	Corine Land Cover 2012	World Clim projection T°C
Format	Raster ; *.bil	Text; *.txt	Raster; *.HDF	Raster; *.TIF	Raster; *.bil
Extent	World	Abisko; Kiruna; Vittangi meteorological stations	MODIS Tile (~1100 km)	Europe	World
Spatial resolution	~900 m	Synoptic	~1000 m	~100 m	~900 m
Method	Interpolation (on weather stations + topographical correction)	Physical T°C (min, max)	Emissivity band selection + algorithm application (from 2 bytes value => °K => °C)	Habitat assessment combining intergovernmental photointerpretation missions + remote sensing classification	Define RCP + GCM
Temporal repeatability	Monthly	Daily	Weekly	~ 6 years	Monthly
Source	(Ficks, Hijmans et al., 2017; worldclim.org/)	ANS; ncdc.noaa.gov/	USGS – Earth Explorer www.earthexplorer.gov	European Environmental Agency eea.europa.eu	(Ficks, Hijmans et al., 2005; worldclim.org/)

How? (1)

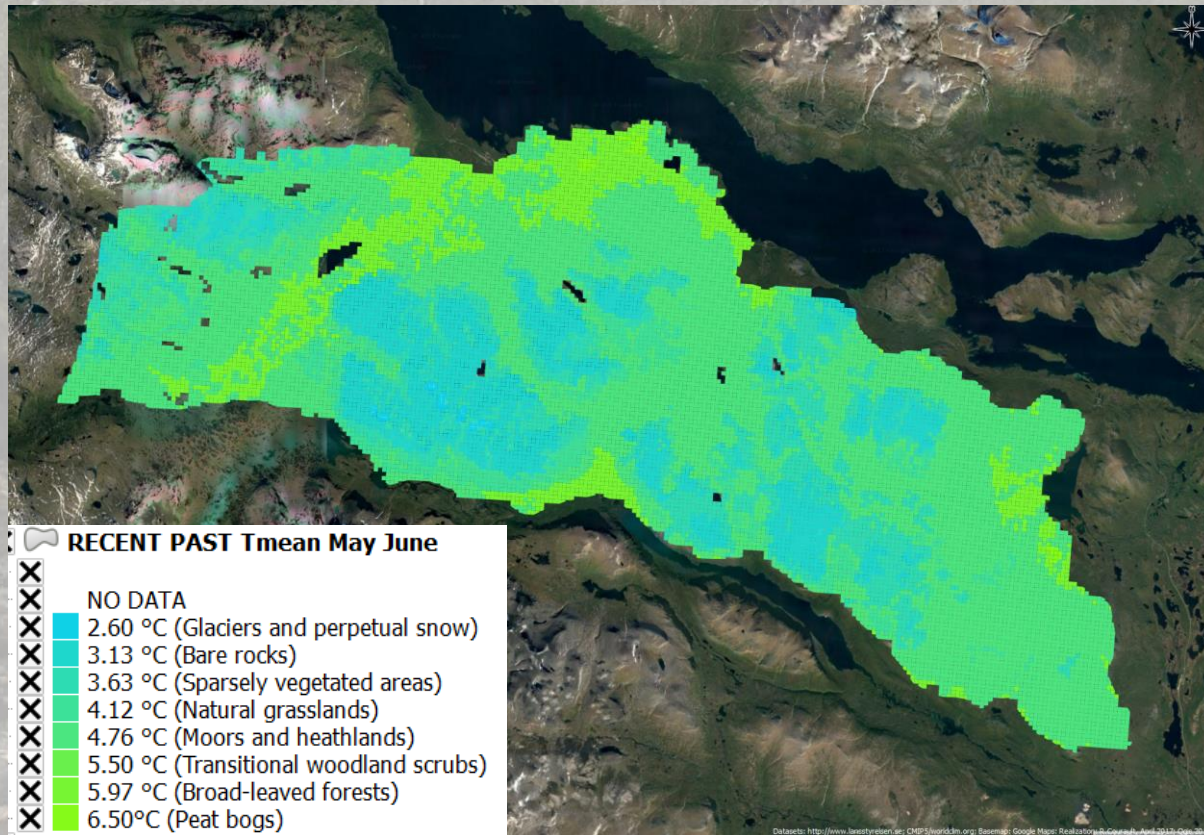


Results

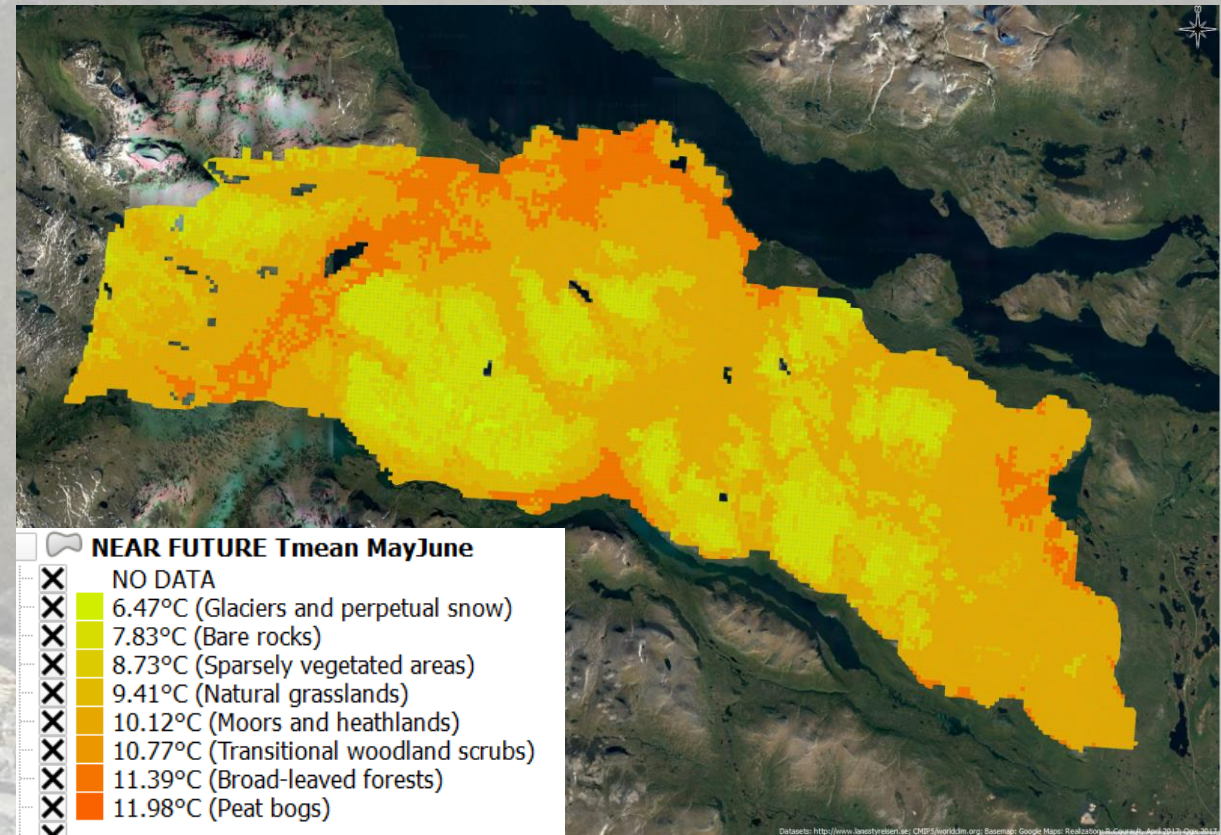


Mapped results

RECENT PAST TEMPERATURES (April-May, 1970-2000)



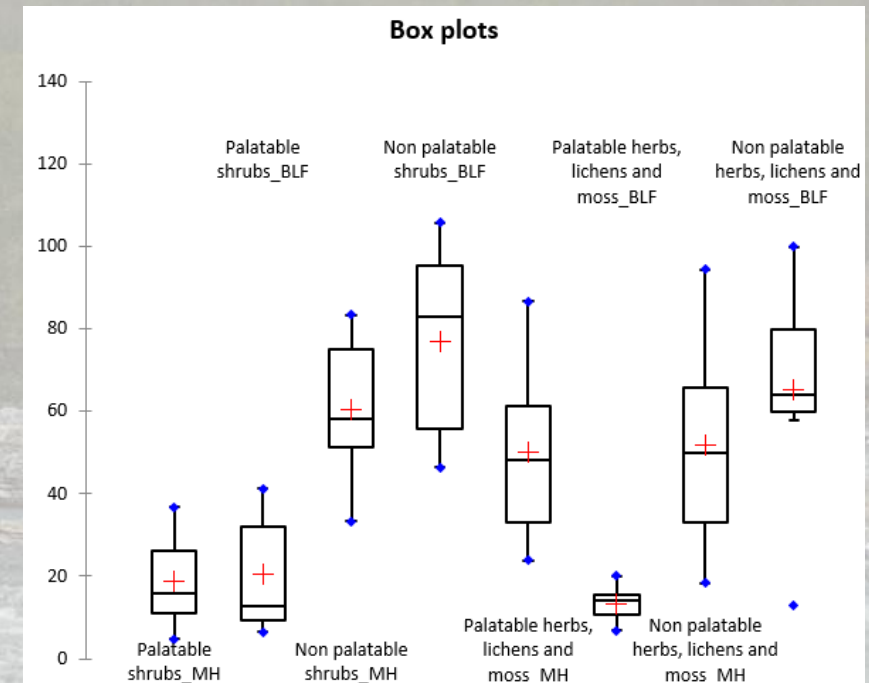
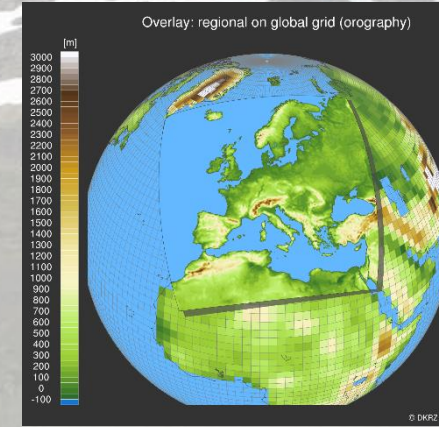
NEAR FUTURE TEMPERATURES (April-May, 2041-2050)



Source: CMIP5, WorldClim2.0; Rengis 2.0/länsstyrelsen; Corine Land Cover 2012; Google Physical; R. Courault 2017

What's next?

- Reinforcing climatic projection reliability :
 - Crossing GCM performances
 - Testing Regional Models
- Identifying geographical structures to explain strongest increase of T°
- With floristic surveys and phytosociology, toward a simulation of the future vascular plant coverage, in particular species palatable for reindeer?

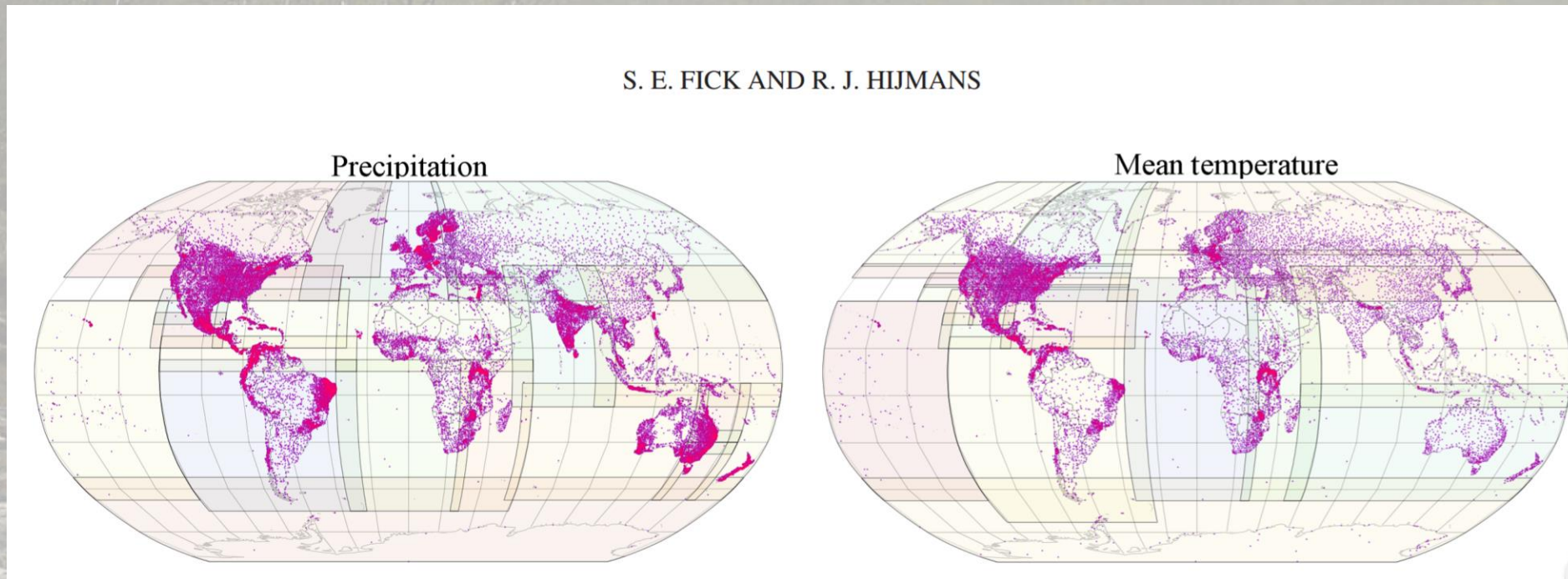


Bibliography

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- Skarin, A., Danell, Ö., Bergström, R., & Moen, J. (2008). Summer habitat preferences of GPS-collared reindeer *Rangifer tarandus tarandus*. *Wildlife Biology*, 14(1), 1-15.
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WorldClim 2.0 : 70-00 temperatures

- « Interpolation: thin-plate splines with covariates including elevation, distance to the coast, and 3 satellite-derived covariates: min and max LST [...] Interpolation was done for 23 regions » Fick, Hijman, 2017



WorldClim 2.0 : projections

- RCP : Representative Concentrations Pathways (2.6; 4.5;6;8.5 W/m^2 expected radiative forcing in 2100; e.g. different assumings on greenhouse emissions)
- CMIP 5 : Coupled Model Intercomparison Project (20 climate modelling groups all around the world) => a part of the 1st Assessment Report, IPCC , 2013
- Methodology: « GCM output was downscaled and calibrated (bias corrected) using WorldClim 1.4 as baseline 'current' climate » (worldclim.org/CMIP5v1)

