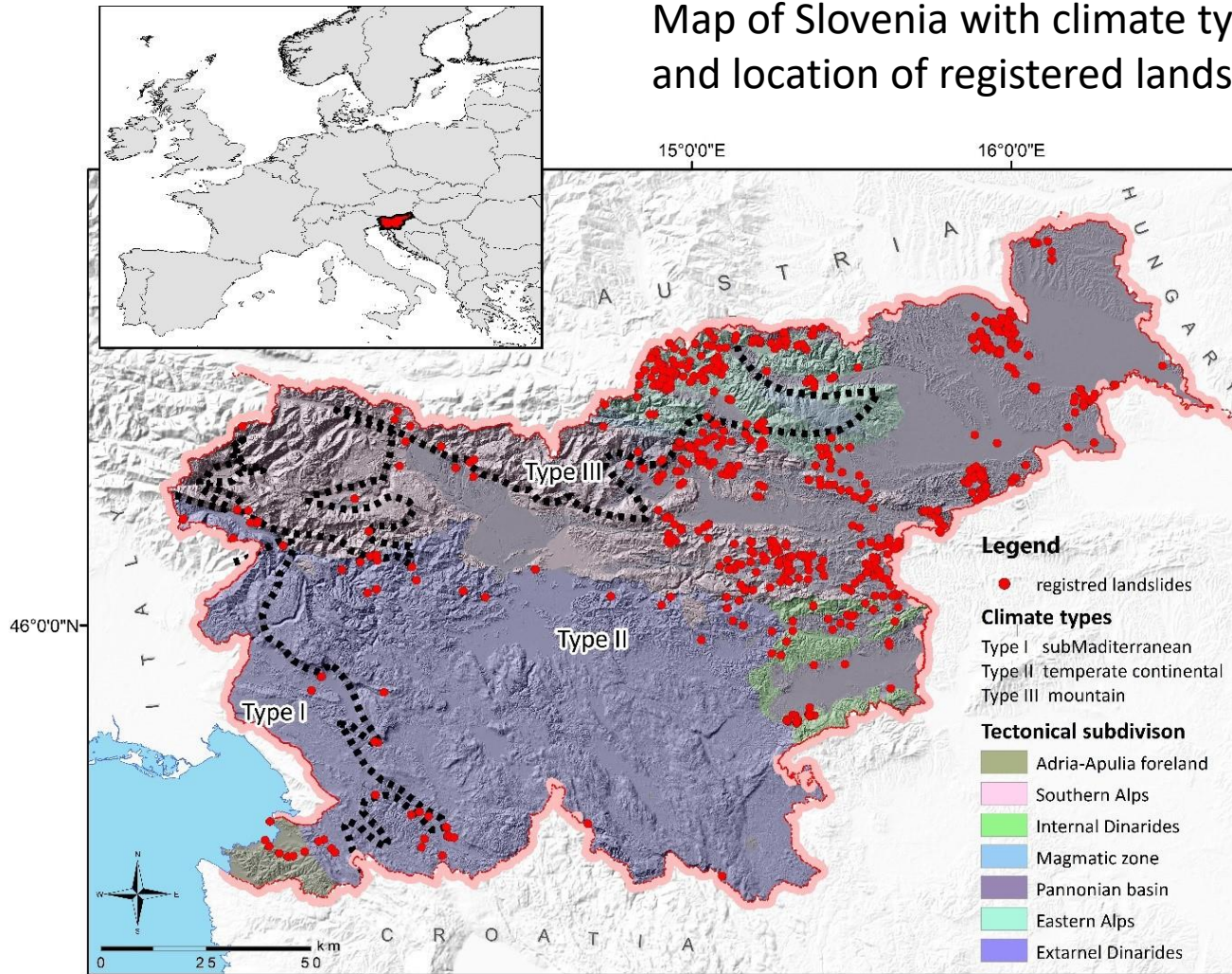


Future seasonal rainfall patterns and impact on landslide prone areas in Slovenia

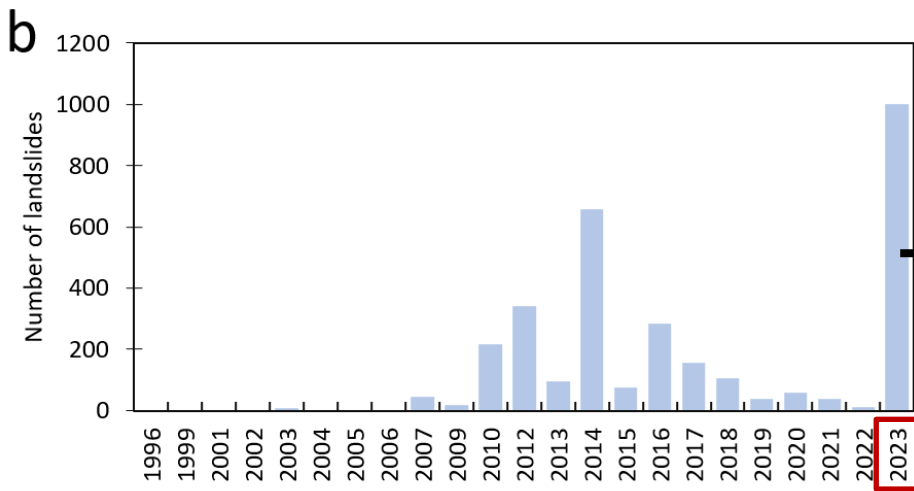
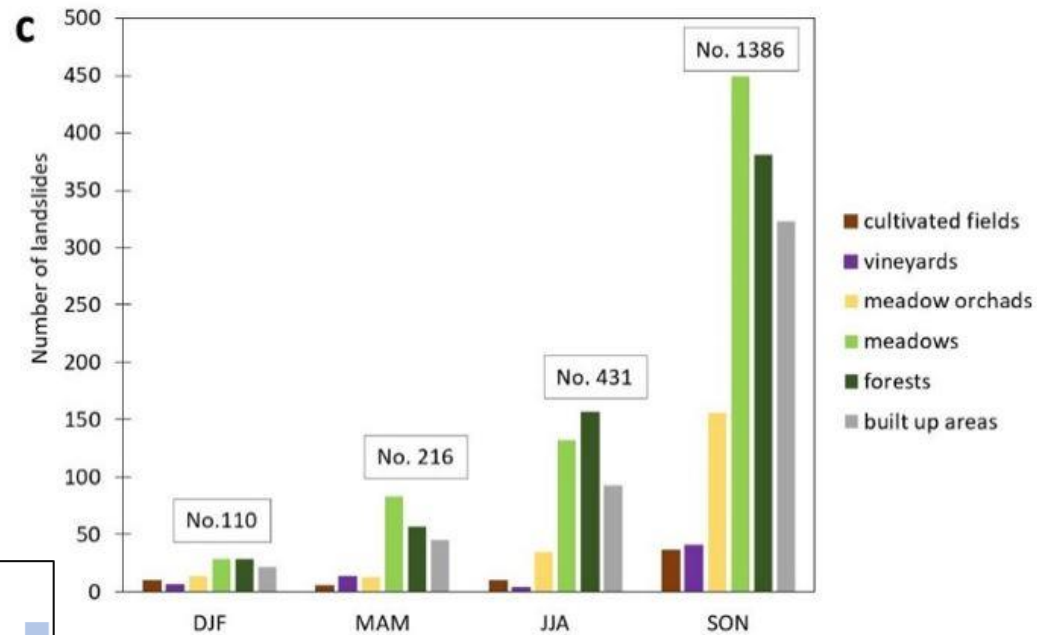
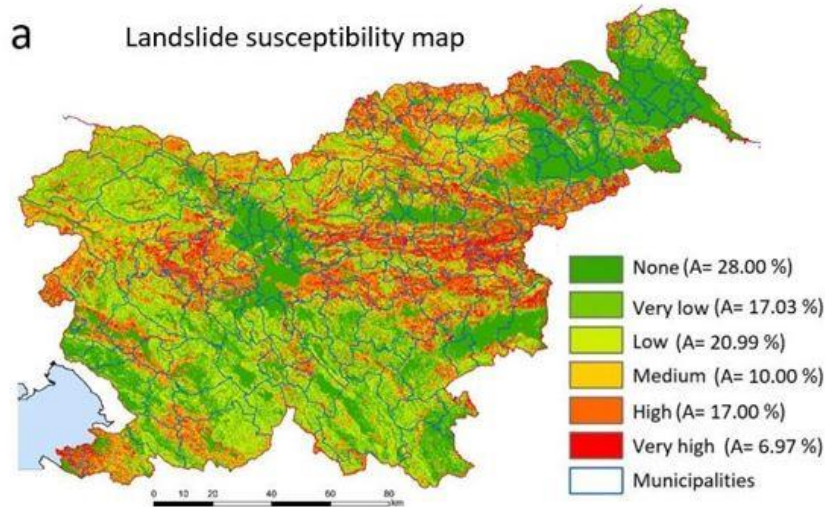
Mateja Jemec Auflič, Geological Survey of Slovenia,
14 September 2023, Graz
mateja.jemec-auflic@geo-zs.si

Regional settings

Map of Slovenia with climate types, tectonic subdivision, and location of registered landslides in Slovenia.



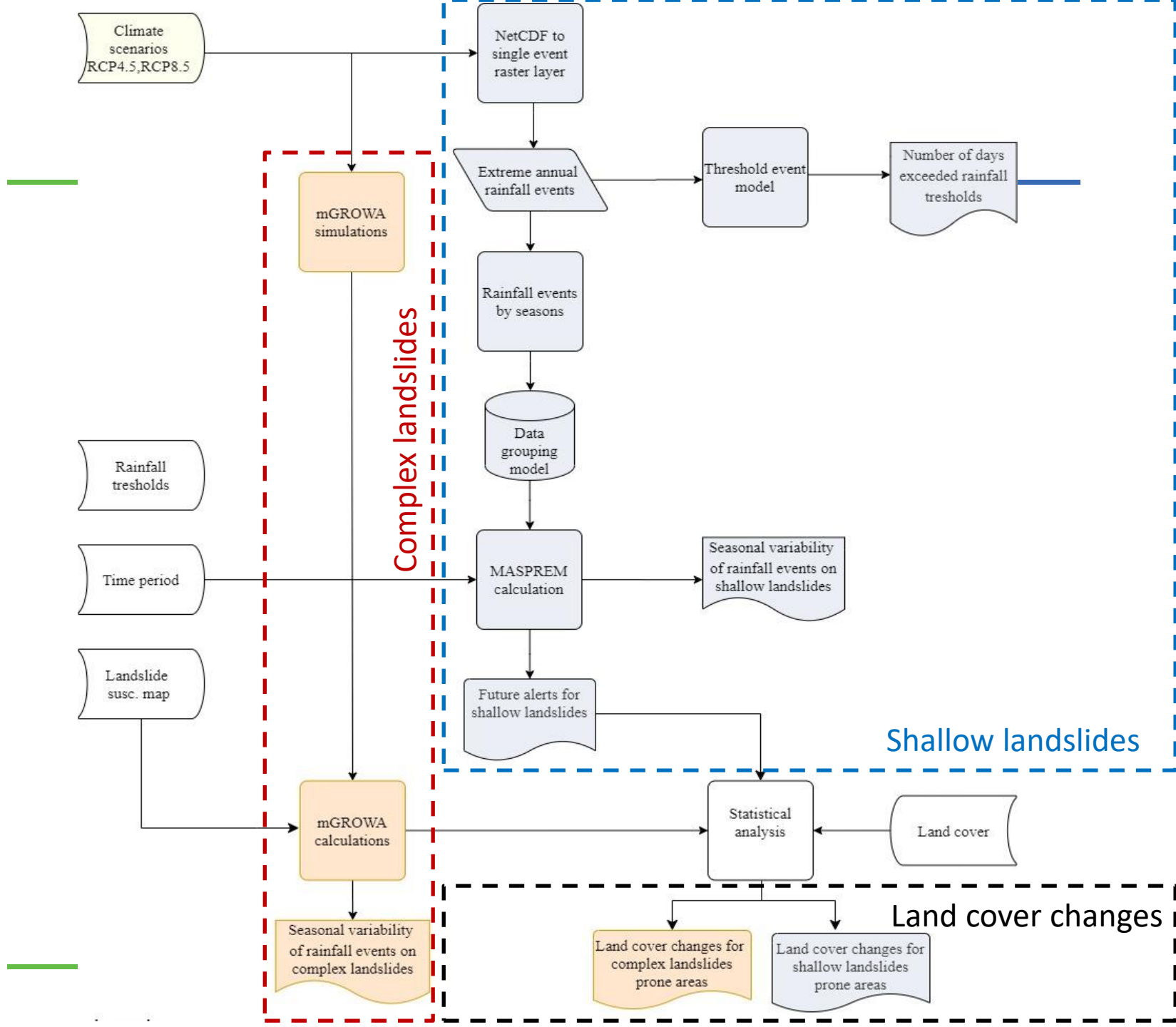
Landslides statistics



Not registered yet
Two extreme rainfall events
May and August

Data and Methods

Global climate model (GCM) CMIP5	Regional climate model (RCM)	Model	RCP 4.5	RCP 8.5
CERFACS-CNRM-CM5	CCLM4-8-17	CCLM1*	x	x
MPI-ESM-LR	CCLM4-8-17	CCLM2*	x	x
EC-EARTH	HIRHAM5	DMI	x	x
IPSL-CM5A-MR	WRF331F	IPSL	x	x
HadGEM2-ES	RACMO22E	KNMI	x	x
MPI-ESM-LR	RCA4	SMHI	x	x

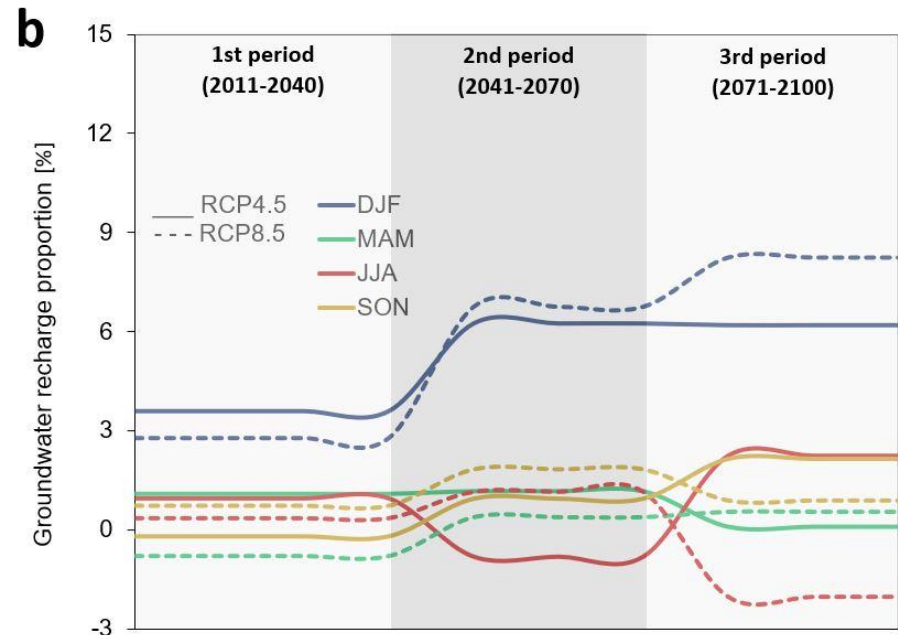
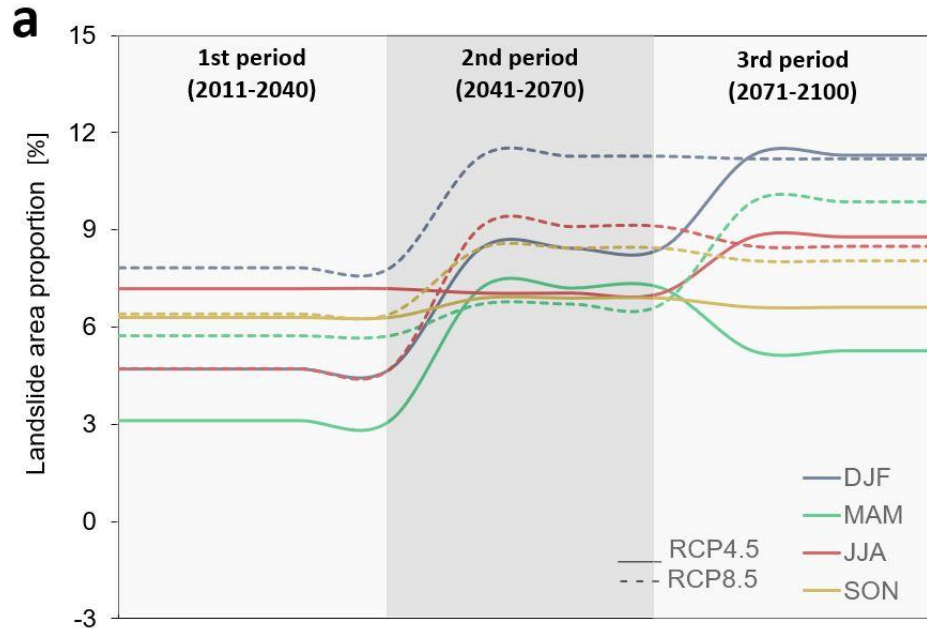


Results

Seasonal variability of landslide proportion area:

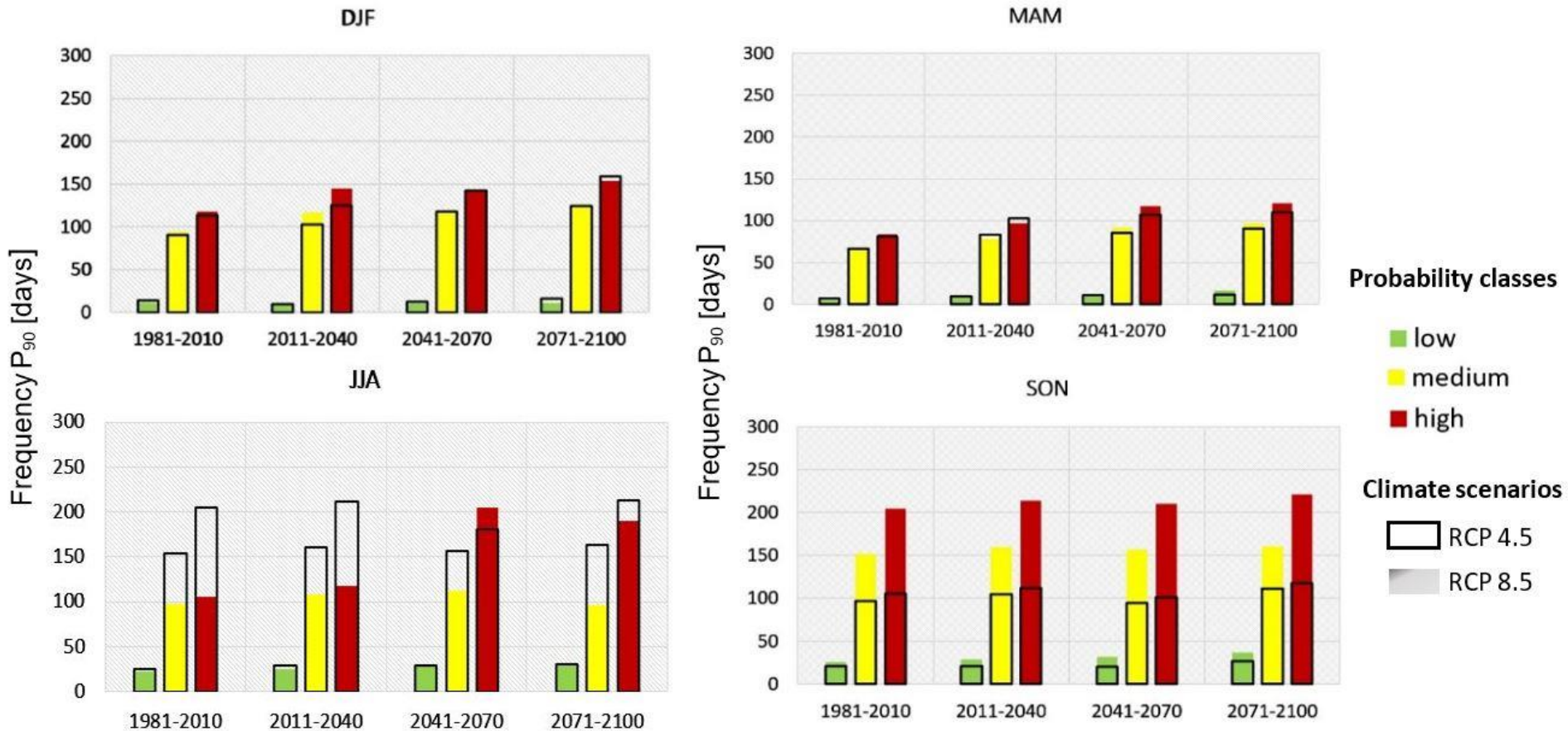
a) shallow landslide (using MASPREM)

b) complex landslides (using mGrova)



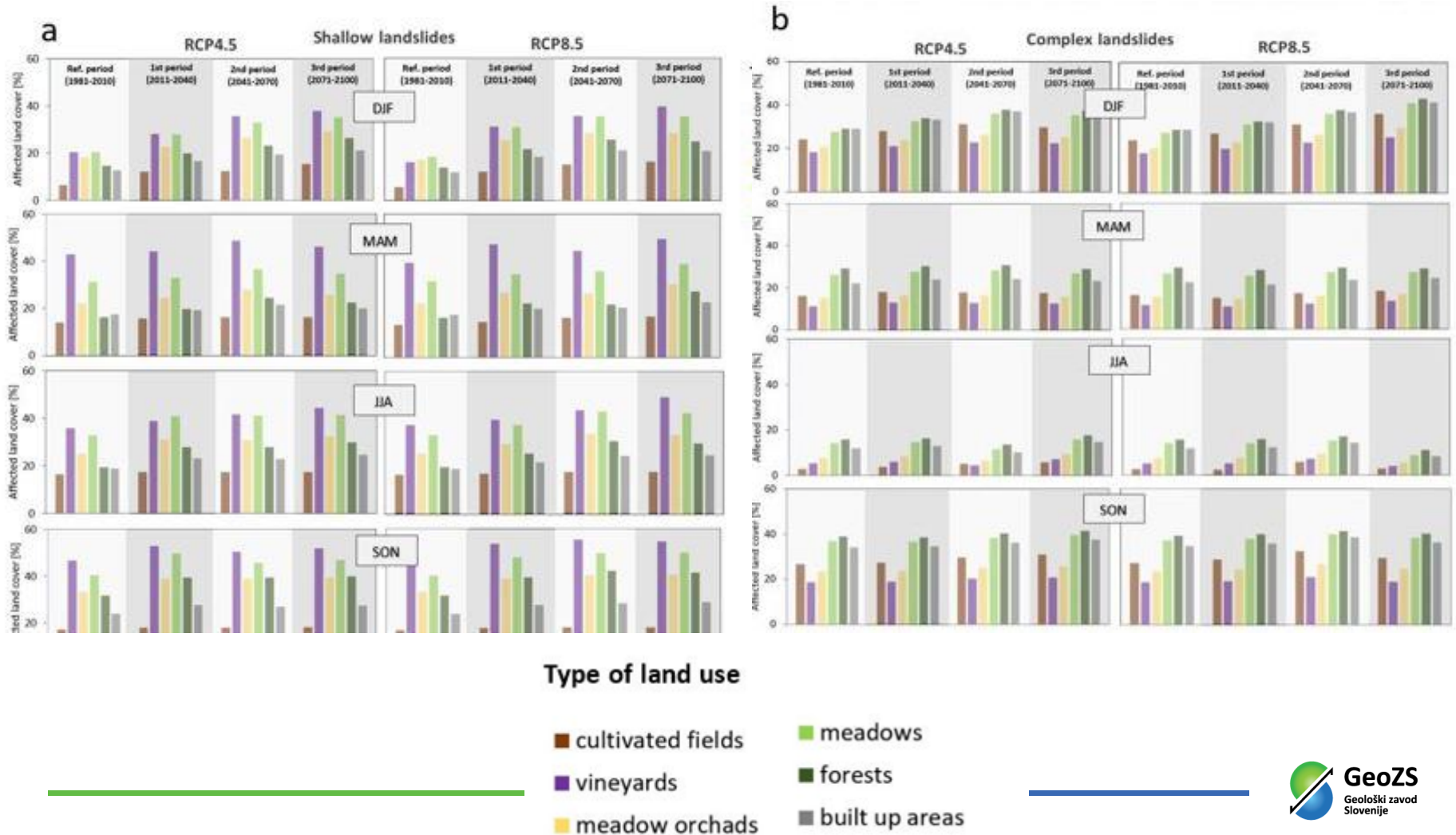
Results

Frequency of shallow landslide prediction alarms in days



Results

Land cover changes from due to seasonal rainfall variability

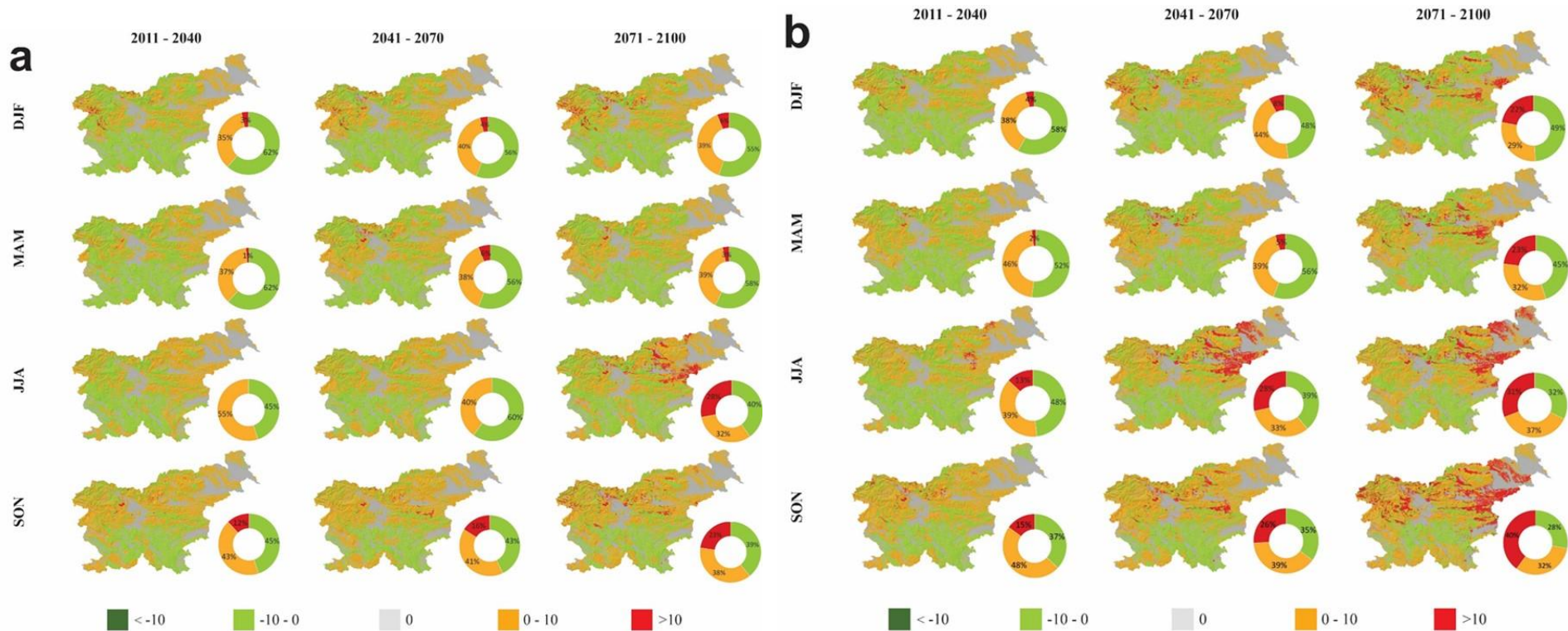


Can we expect landslides in future?

Spatial distribution of future shallow landslide alerts compared to the baseline period

RCP4.5

RCP8.5



In revision in Nature Comm. Jemec Auflič et al.2023

Summary

- Changes in seasonal rainfall variations on landslide occurrences by the end of the 21st century were assessed.
- A moderate and a worst-case climate scenario from the CMIP5 global climate simulations were considered.
- Seasonal rainfall variations are more significant for winter months.
- The highest number of landslide warnings is expected in the mid- to end-century in summer and autumn in the eastern part of the country.
- Shallow landslides will have a greater impact on the landscape than complex landslides.

Future adaptation to climate change

- In the last 20 years, several preventive measures have been implemented
 - GeoZS has developed a similar methodology for delineating landslide-prone areas that can be used for spatial planning (1:25,000 scale maps)
 - Establishment of a monitoring system for the larger landslides
 - ePlaz (central database for landslide registration)
 - MASPREM (early warning system for shallow landslides)
 - EO4MASRISK project (use of Sentinel-1 data for early landslide detection)
- Building in landslide-prone areas is possible in Slovenia (!), but after the August 2023 floods, the government is working on a ban on building in areas with very high landslide risk