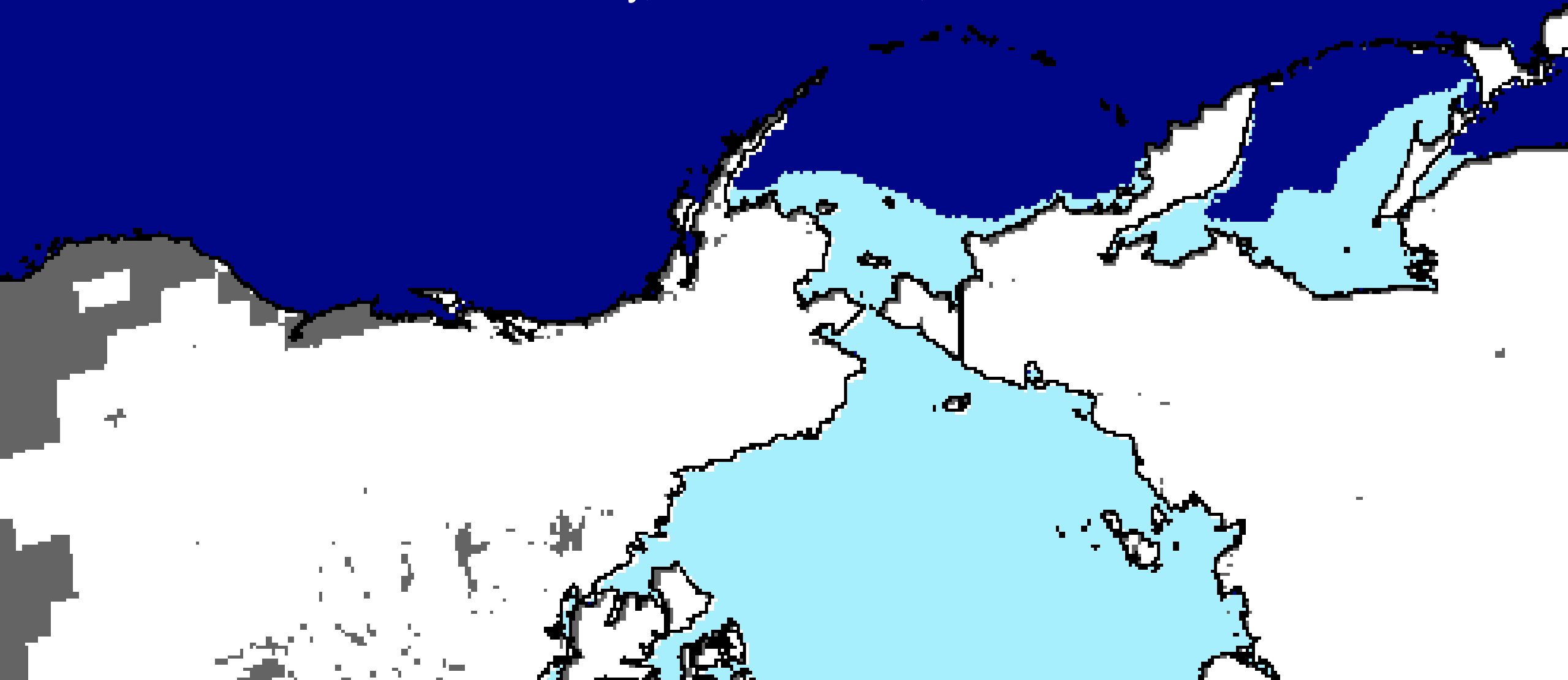
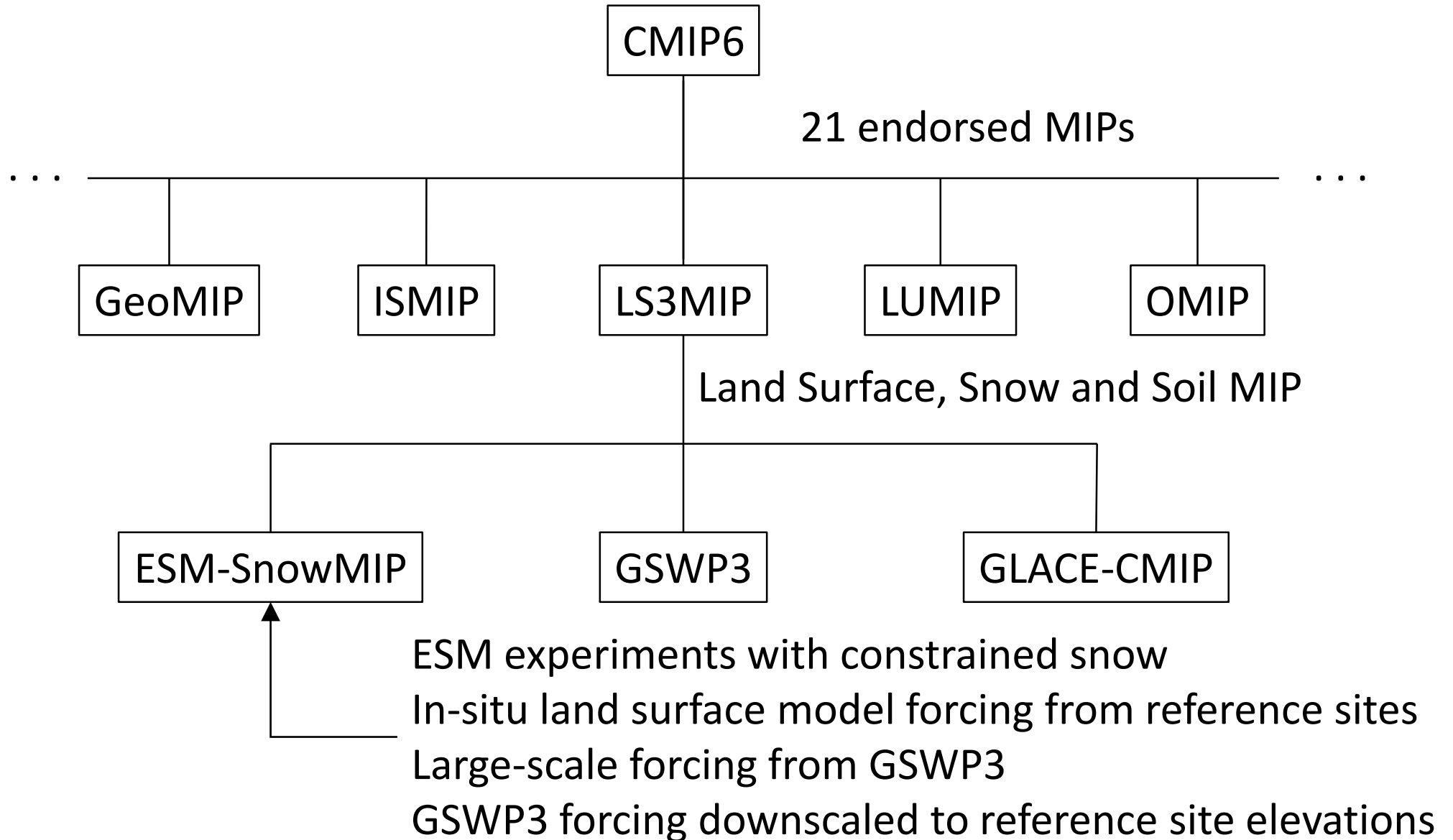


Decadal snow cover trends in response to precipitation and temperature forcing

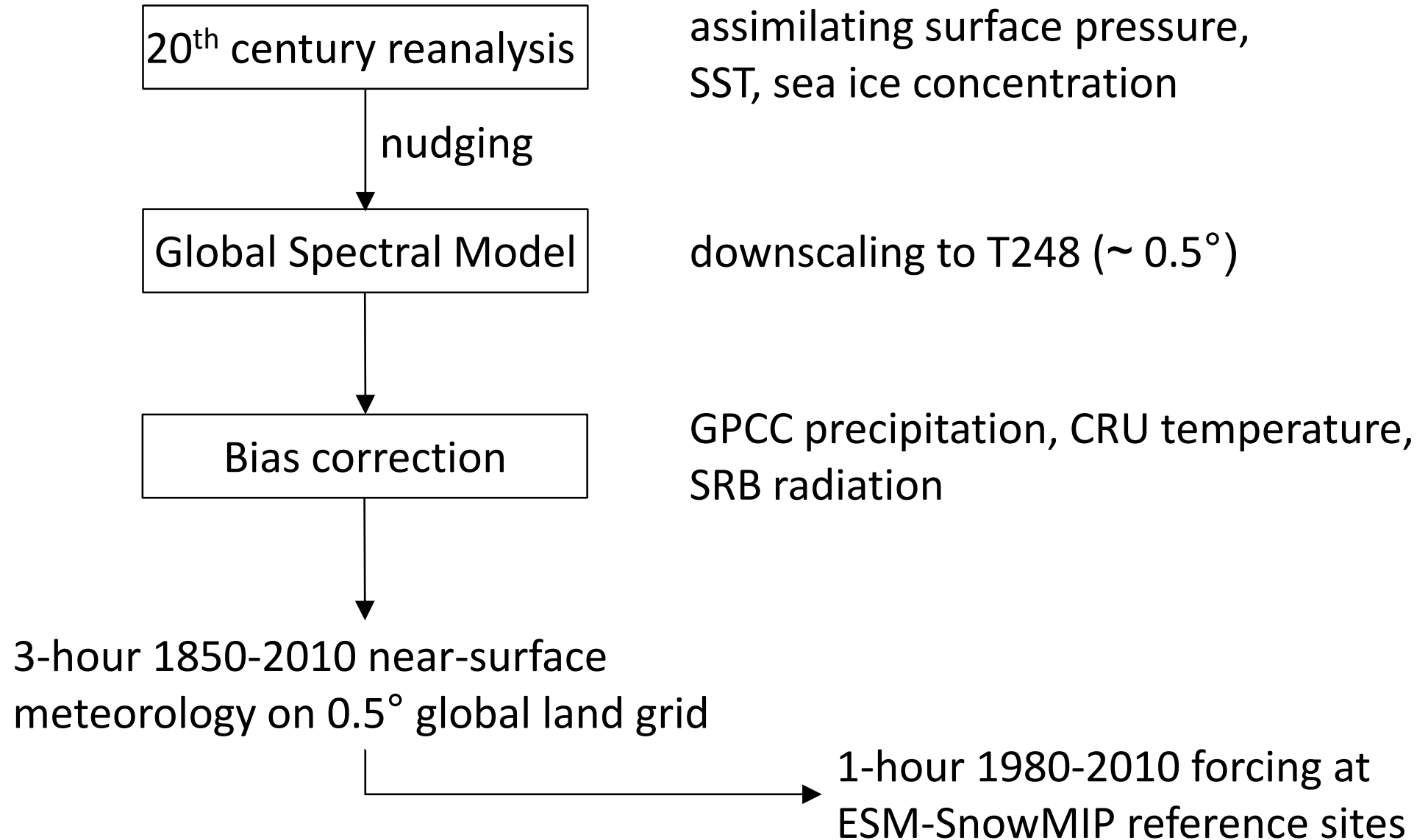
Richard Essery, Cécile Ménard, Eleanor Burke



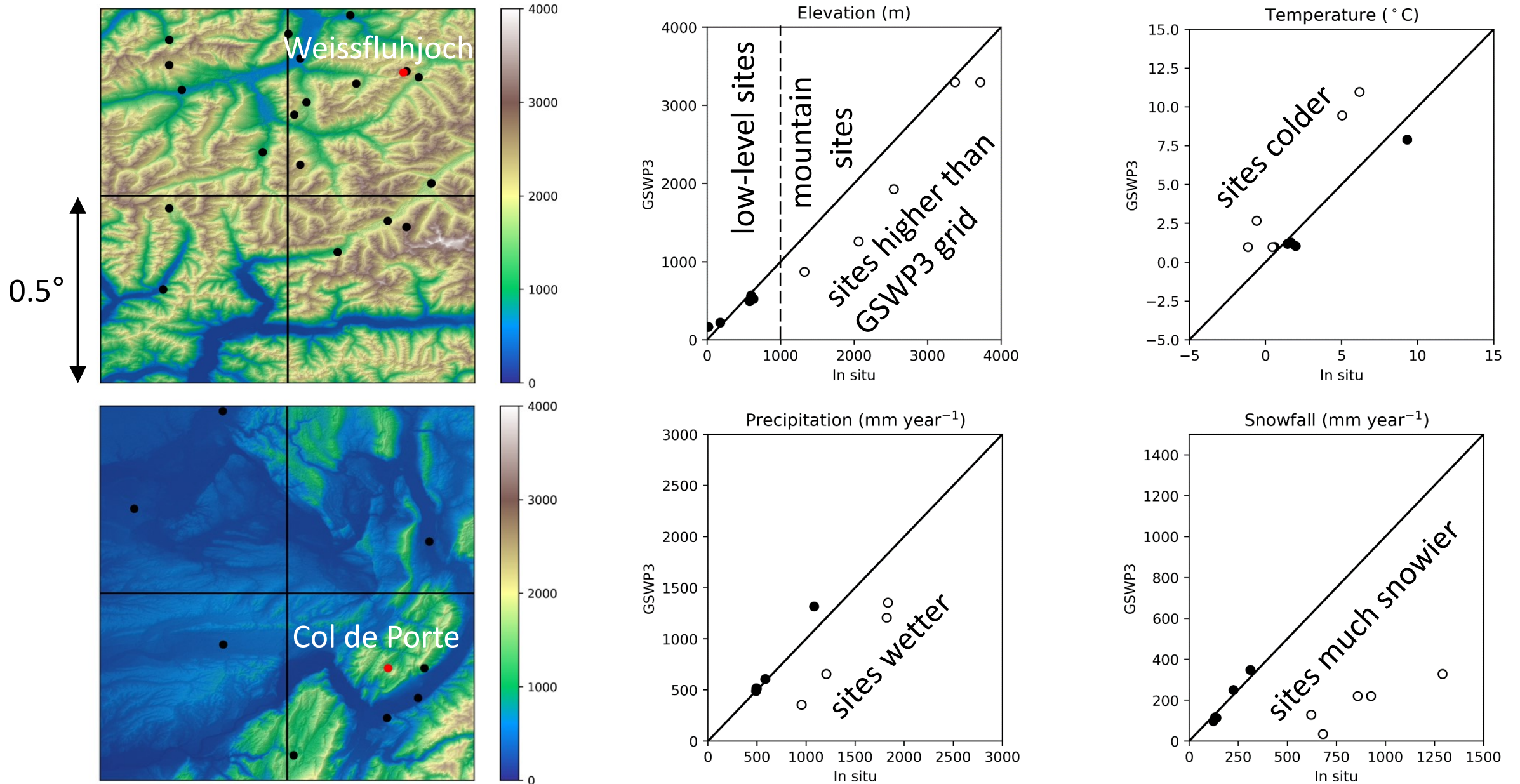
MIPs, MIPs, MIPs



GSWP3 large-scale forcing data

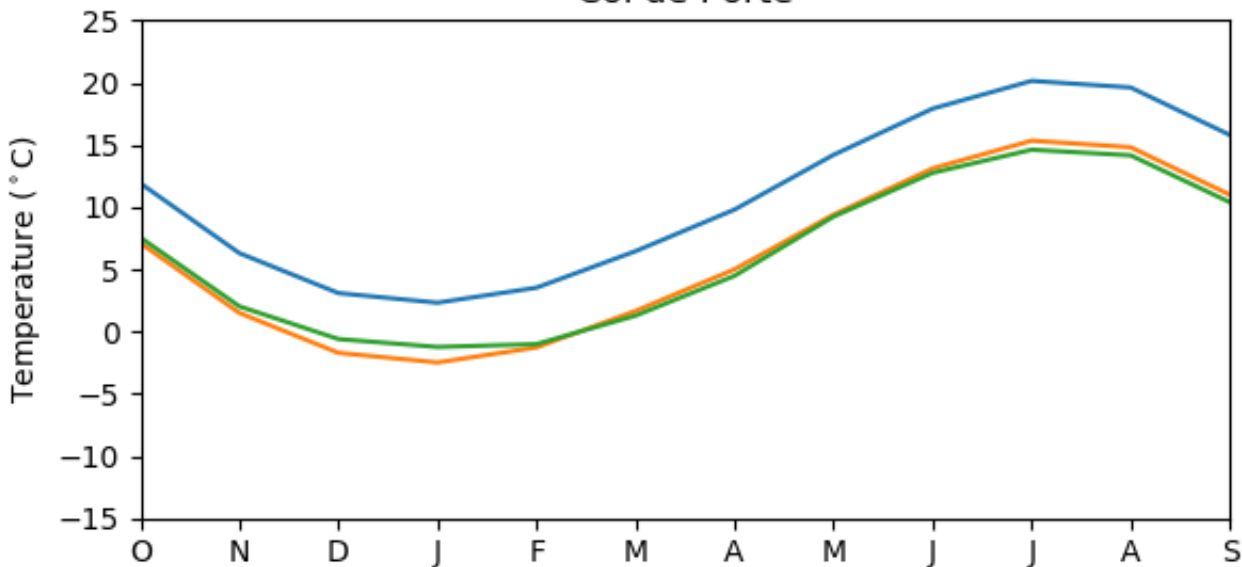


Elevation bias in reference sites c.f. GSWP3

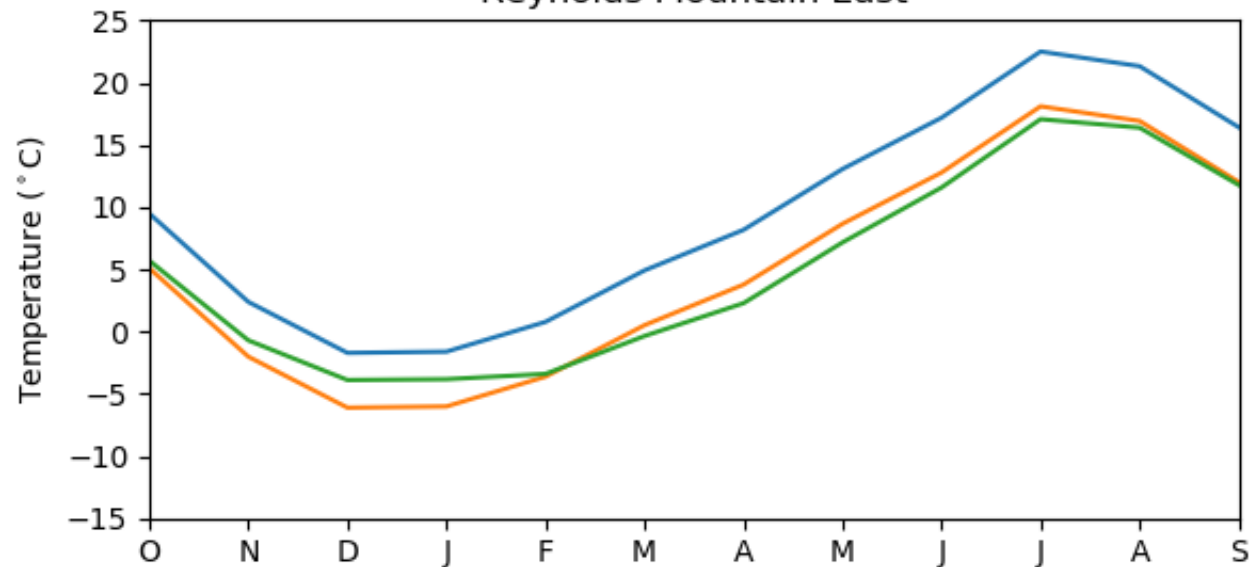


Bias-corrected temperature

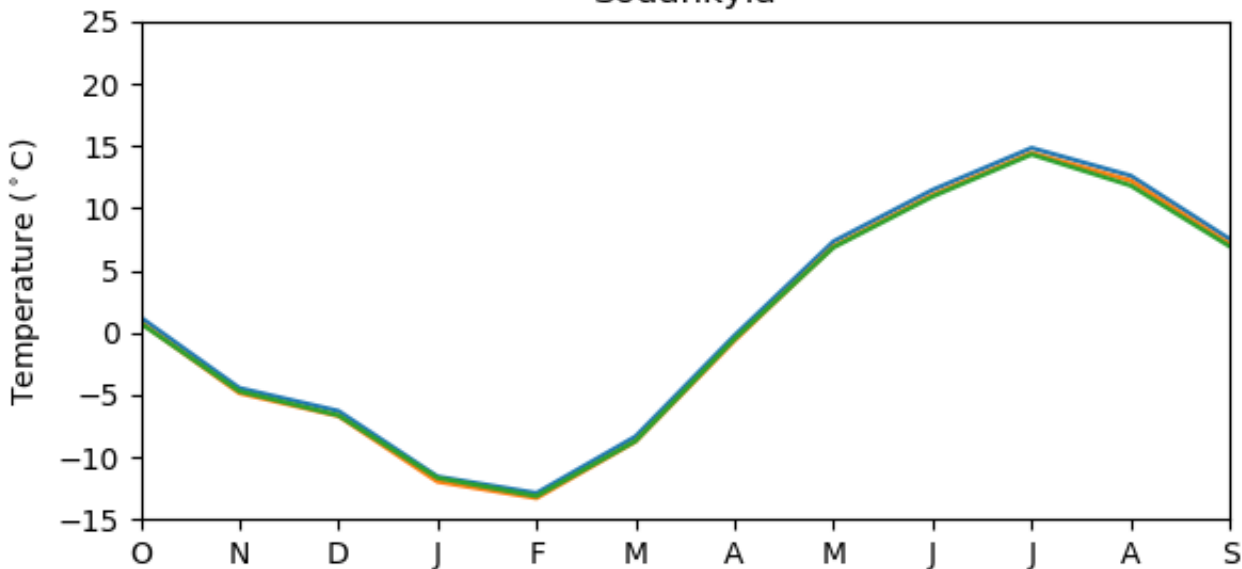
Col de Porte



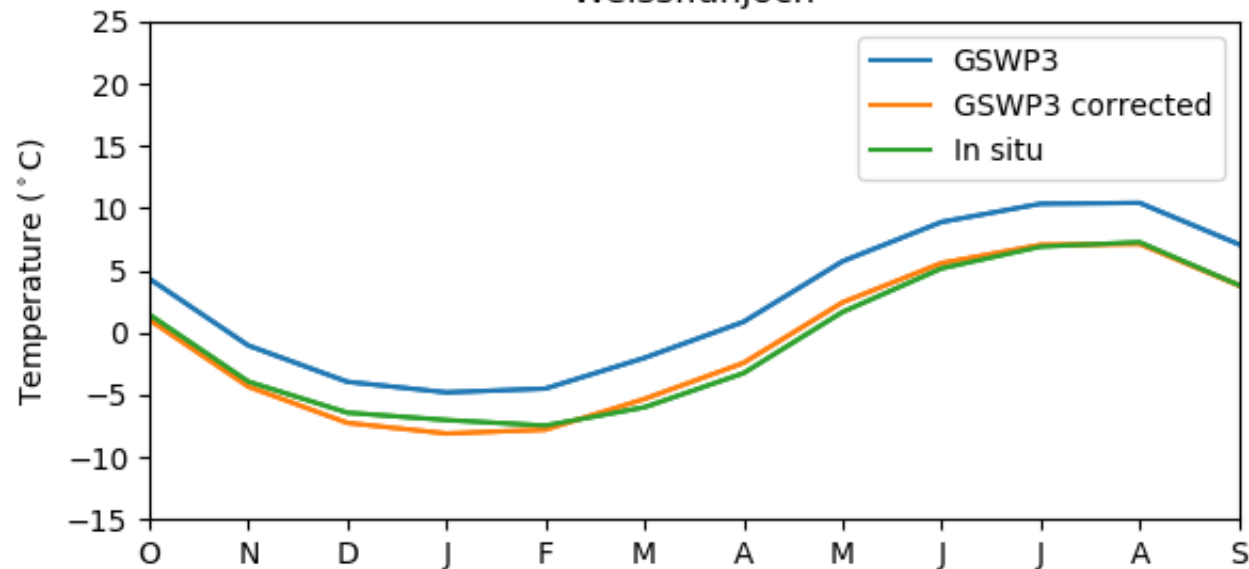
Reynolds Mountain East



Sodankyla

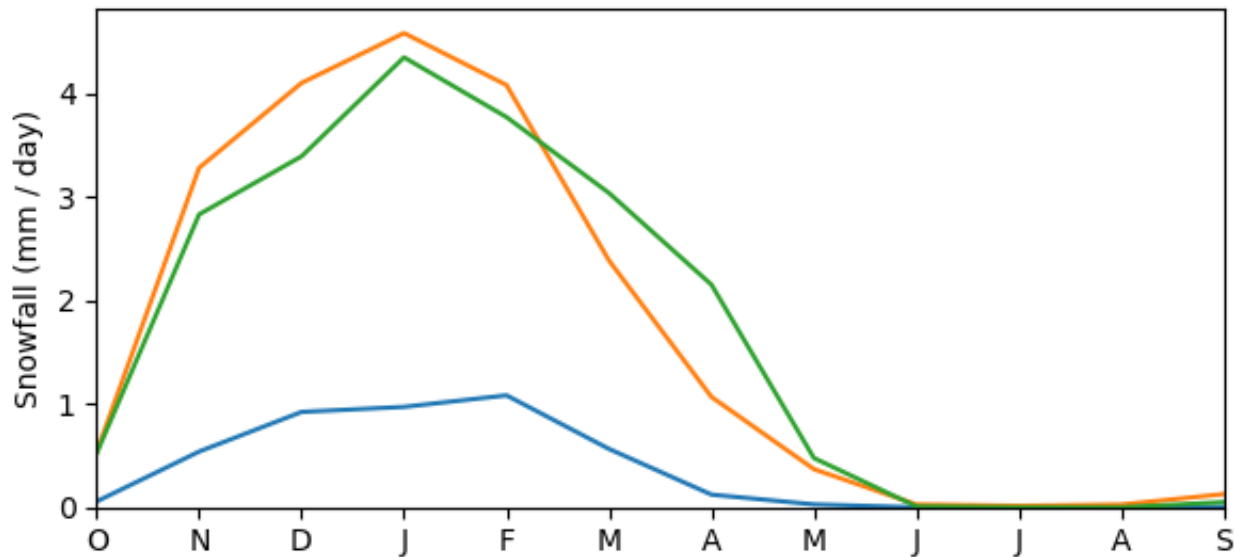


Weissfluhjoch

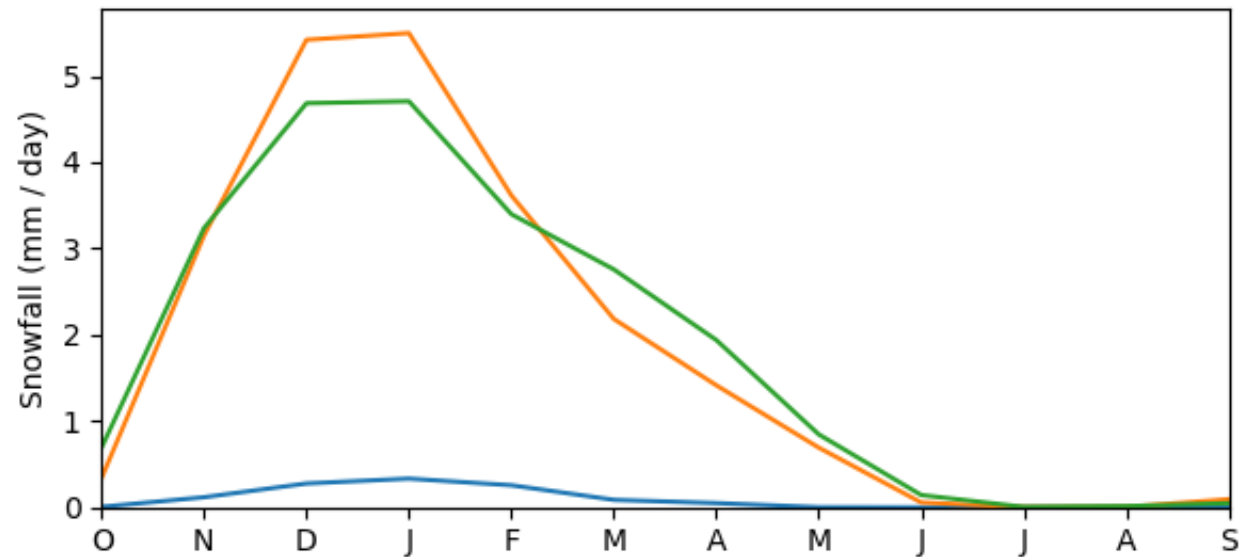


Bias-corrected snowfall

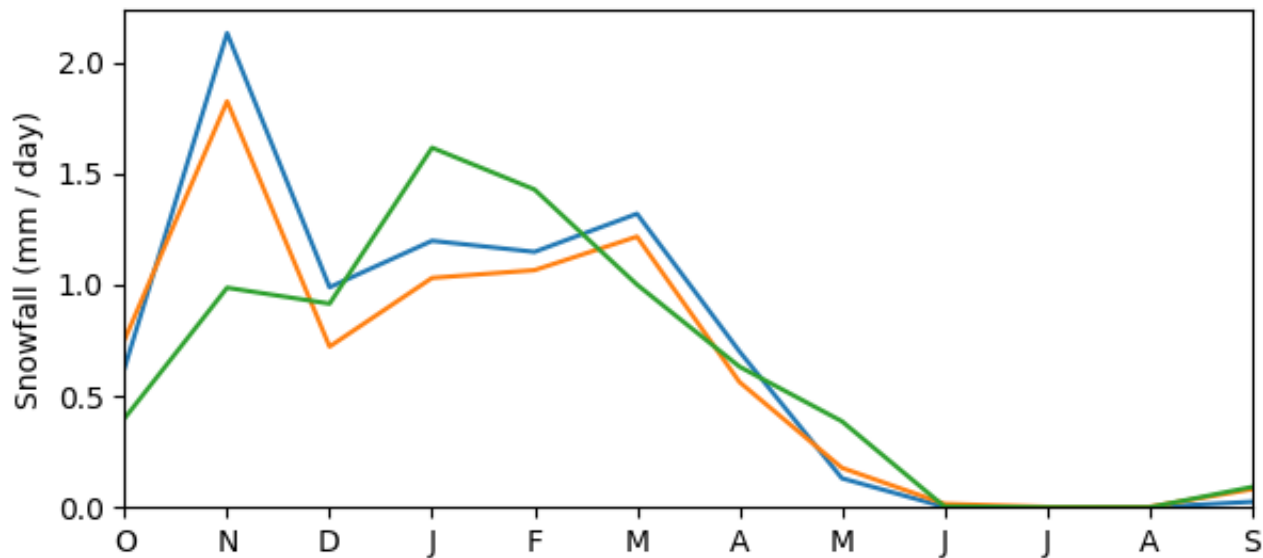
Col de Porte



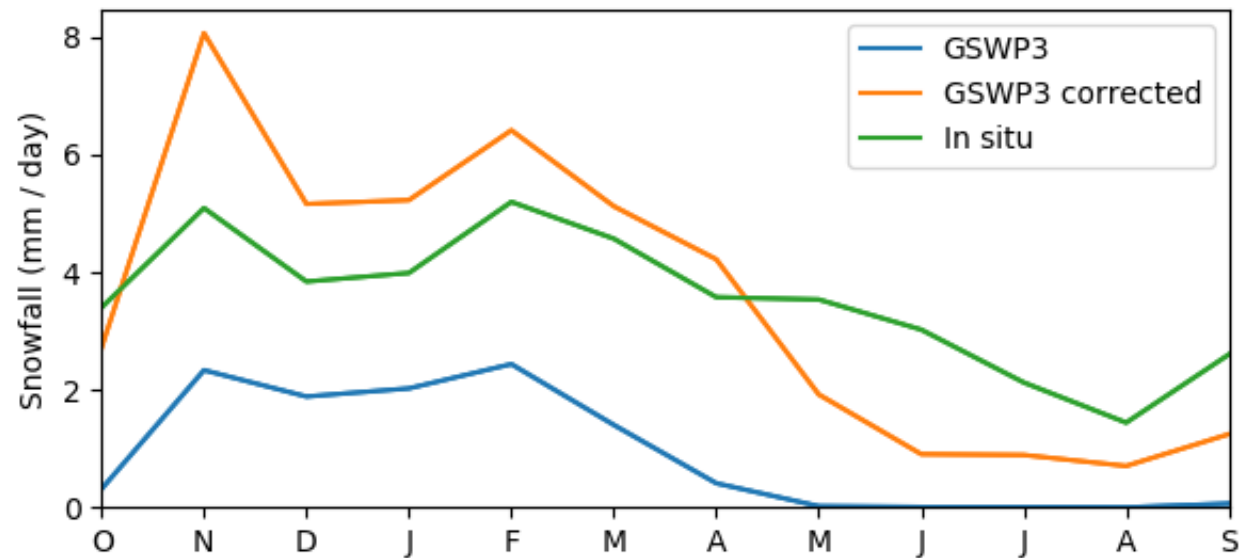
Reynolds Mountain East



Sodankyla



Weissfluhjoch



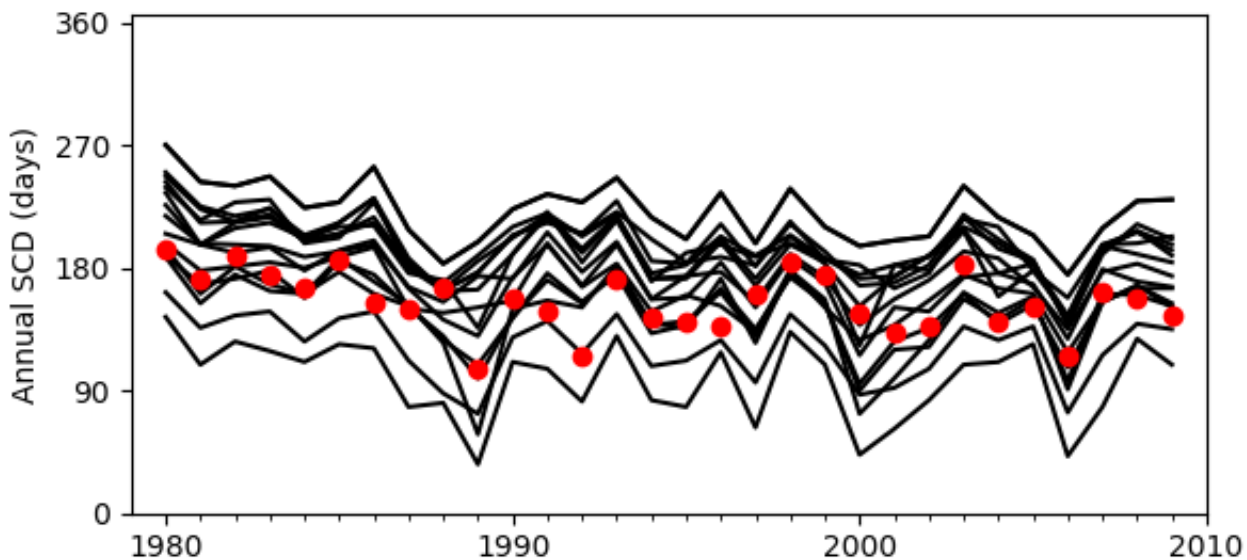
ESM land surface schemes in ESM-SnowMIP

LSS	ESM / GCM
JULES_GL7	HadGEM3
JULES_UKESM	UKESM1
“MOSES”	HadCM3
CABLE	ACCESS
CLASS	CanESM
CLM5	CESM
CoLM	BNU-ESM
EC-Earth	EC-Earth
ISBA	CNRM-CM
2 × JSBACH	MPI-ESM
MATSIRO	MIROC
3 × ORCHIDEE	IPSL-CM

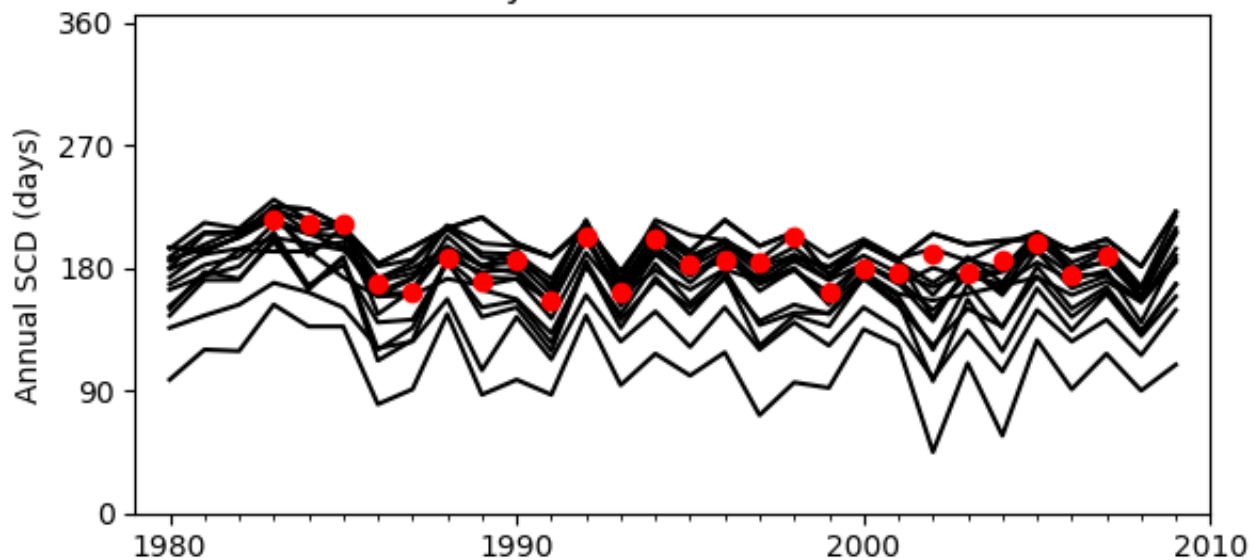
+ snow physics and hydrology models

Snow cover duration

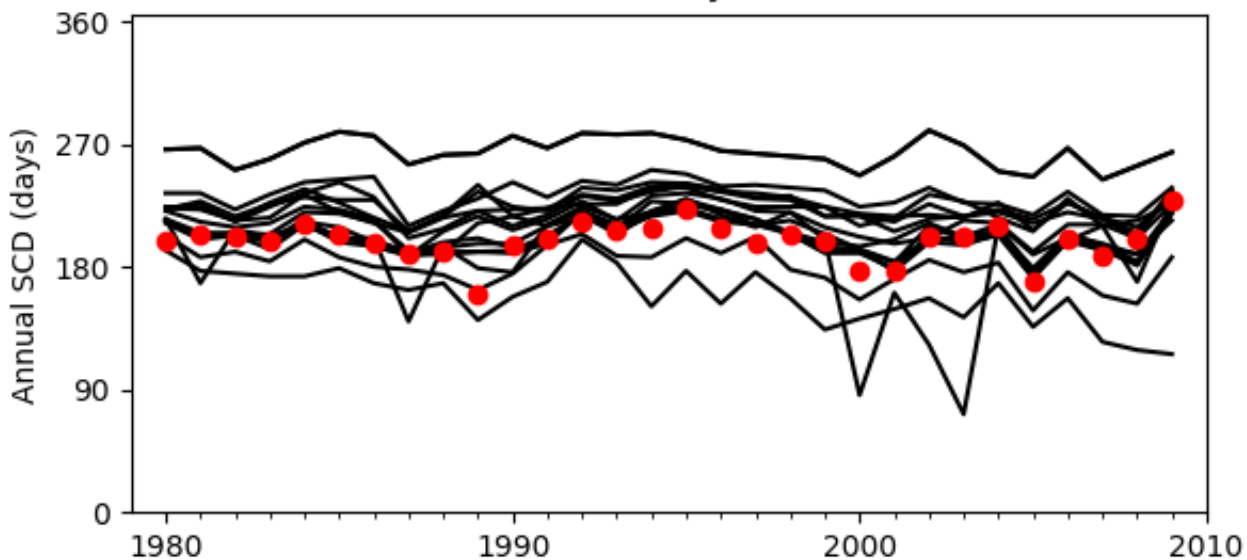
Col de Porte



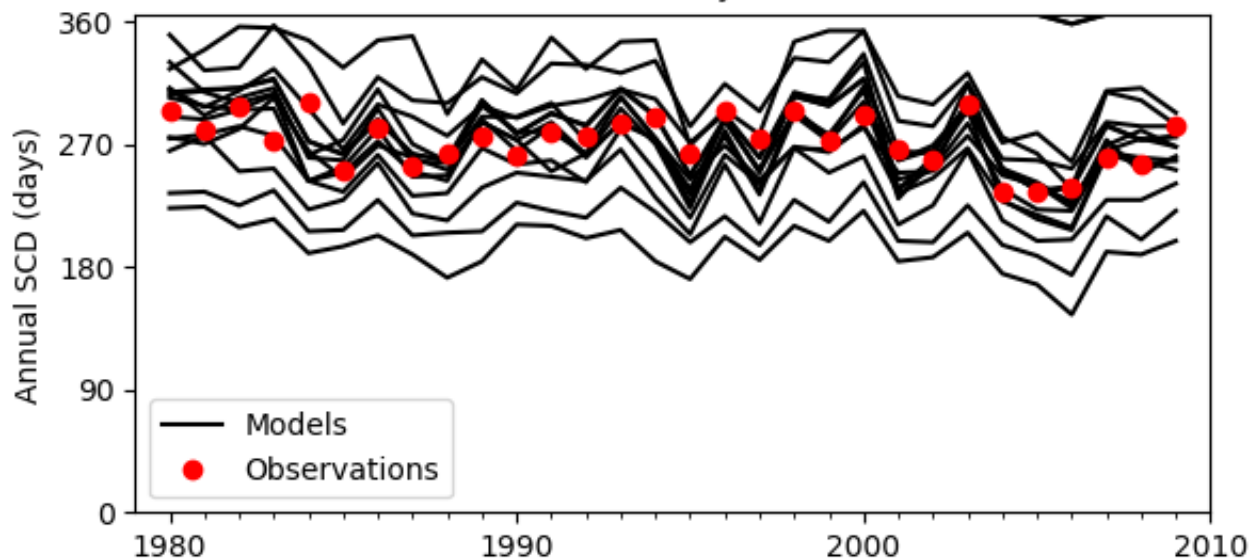
Reynolds Mountain East



Sodankyla

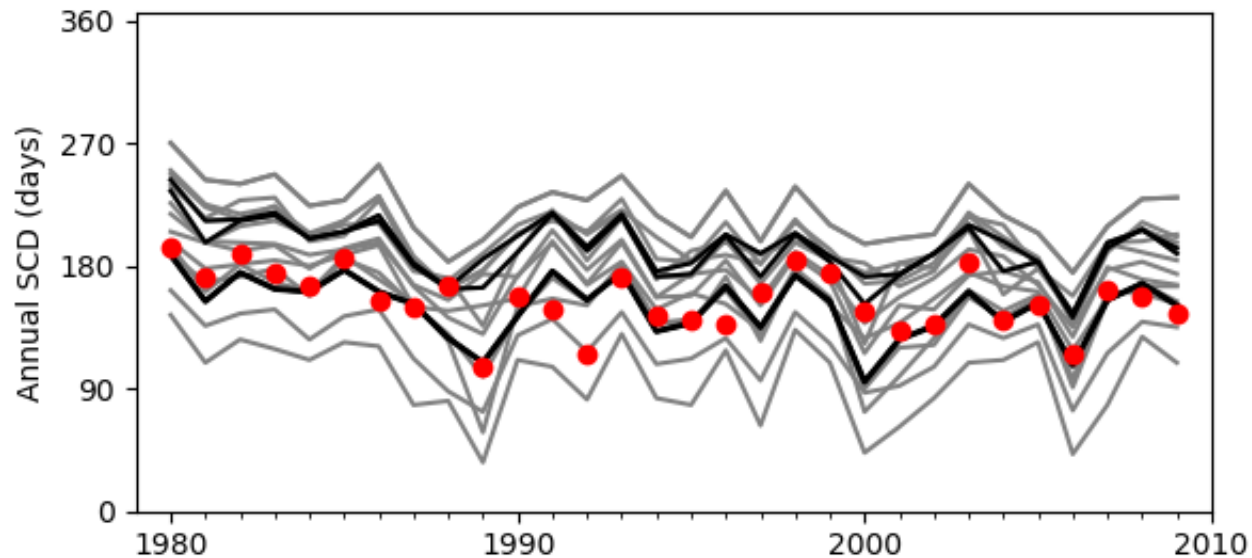


Weissfluhjoch

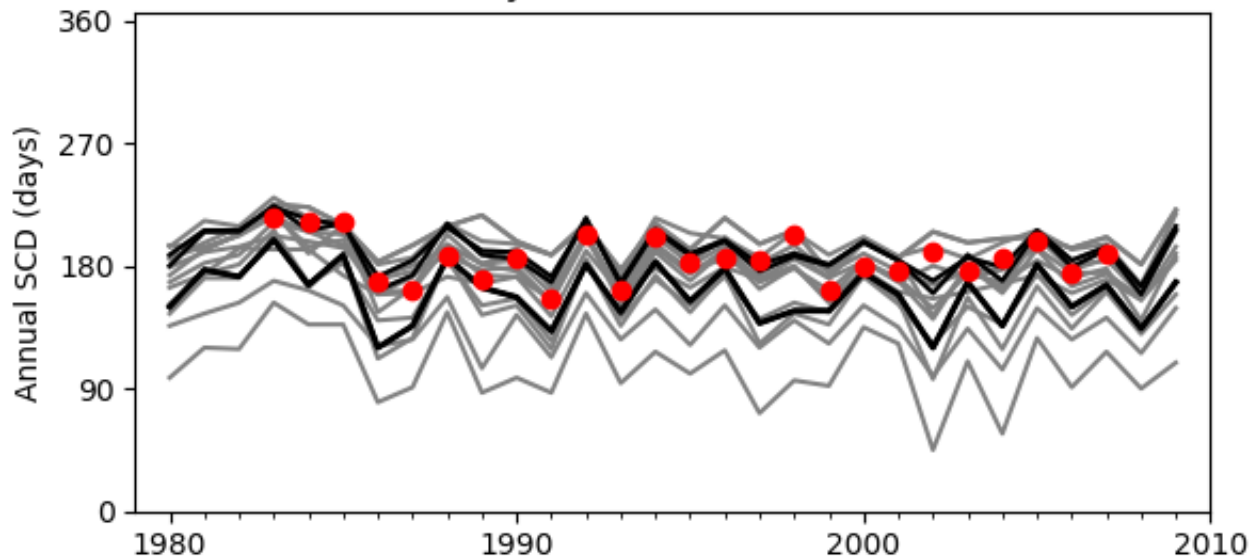


Snow cover duration

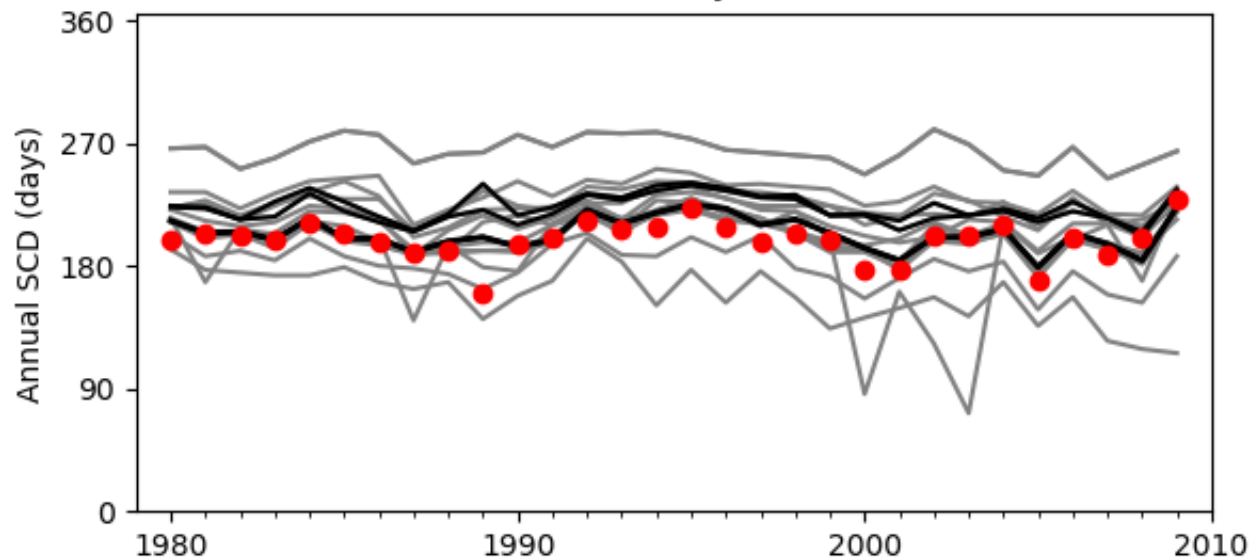
Col de Porte



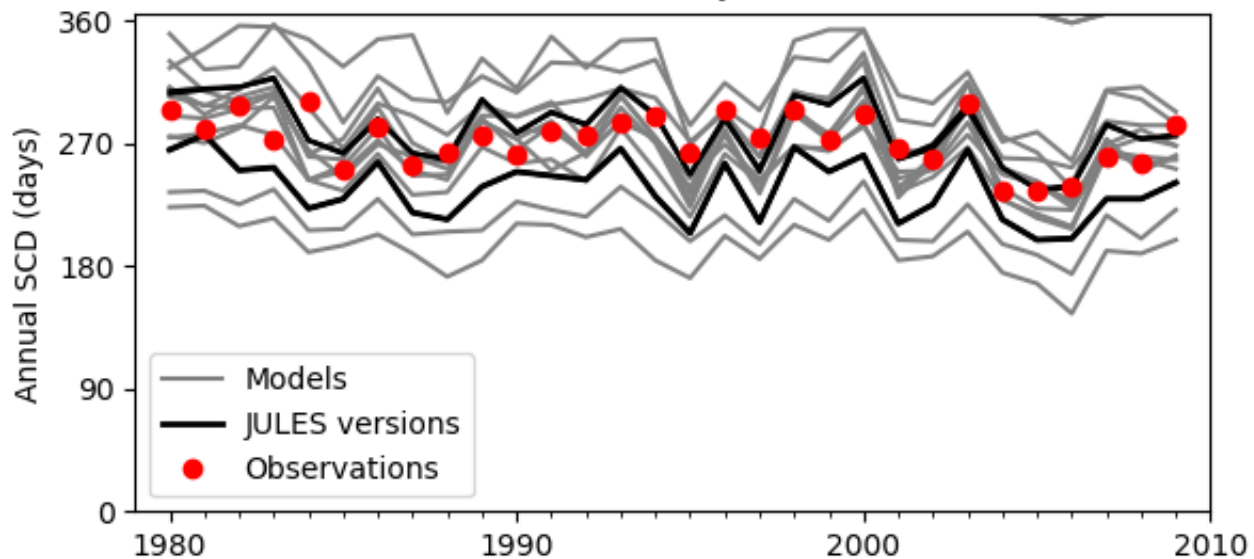
Reynolds Mountain East



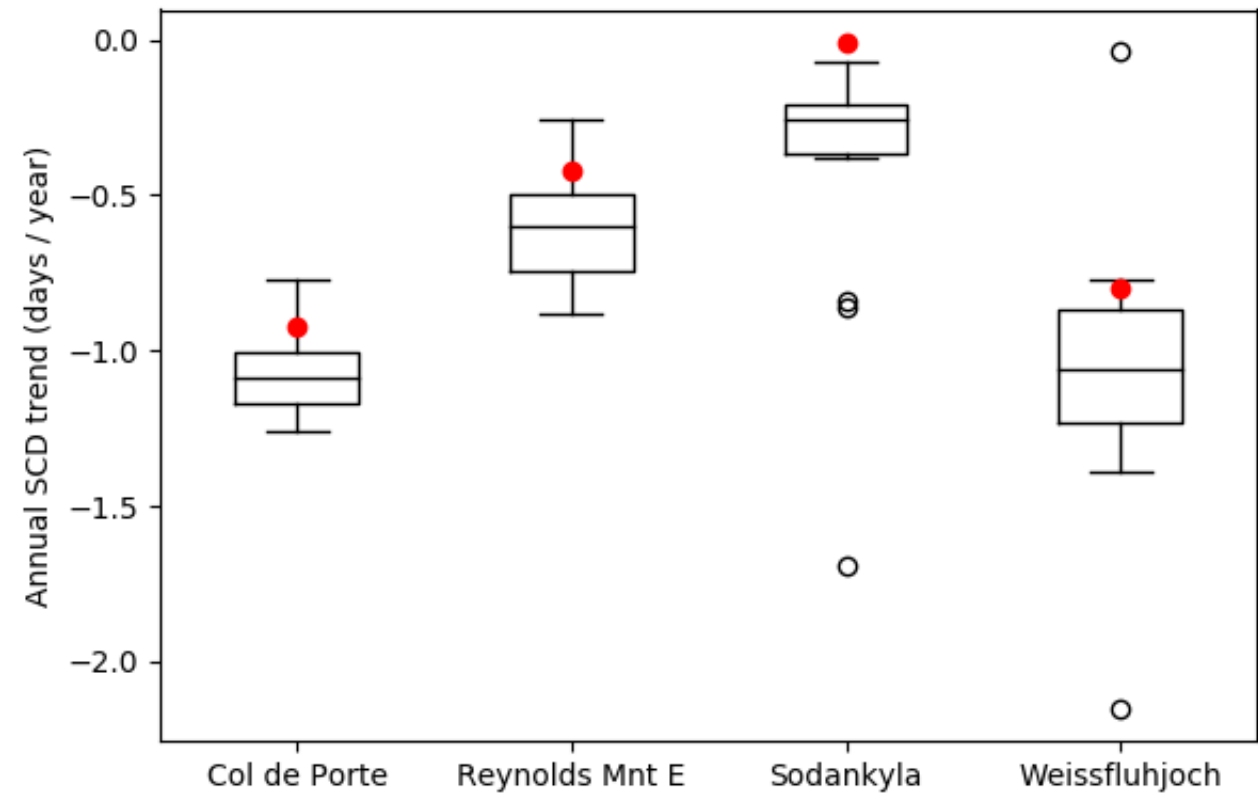
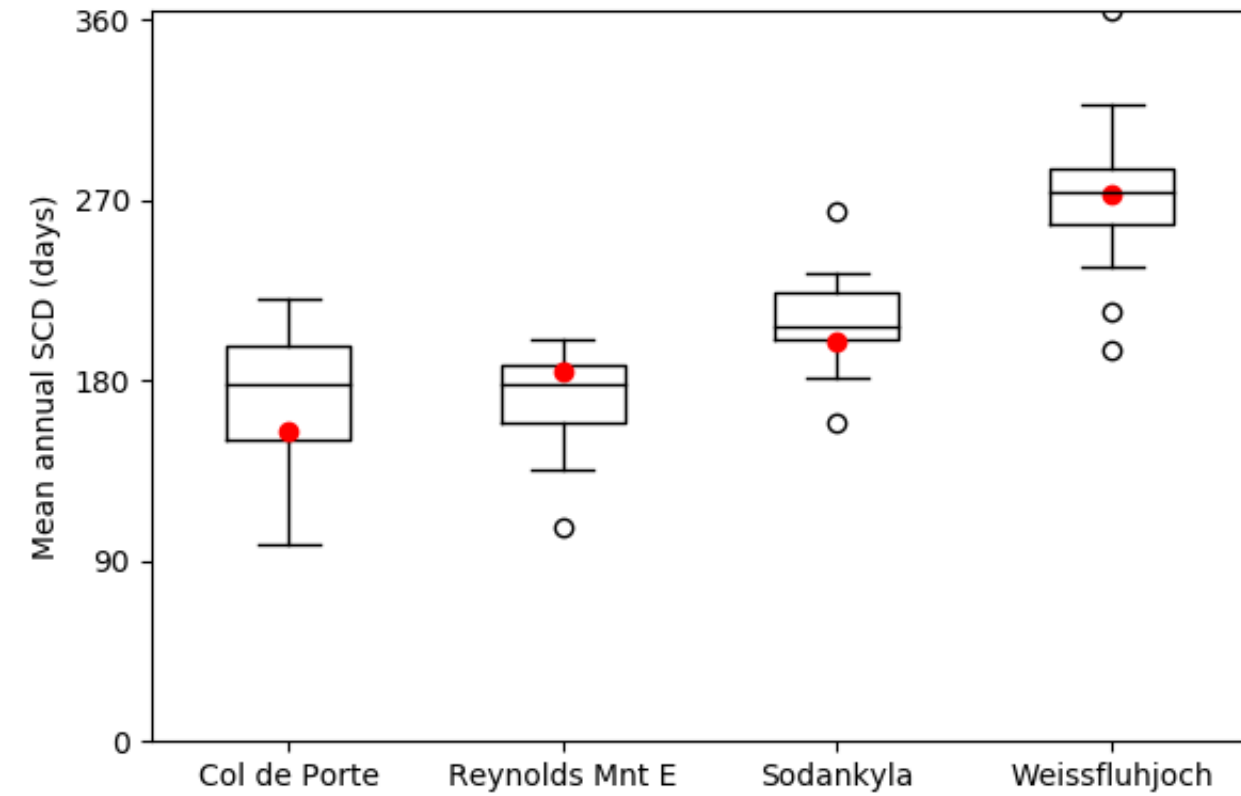
Sodankyla



Weissfluhjoch



Snow cover duration mean and trend statistics



Conclusions

- observed 1980-2010 snow cover durations lie within the interquartile ranges of the ESM-SnowMIP ensemble for four long-term snow monitoring sites
- ensemble spread is large, but correlation between models is large due to common forcing
 - model spread will be larger in CMIP6 with atmospheric coupling and feedbacks than in GSWP3 without
- models predict that snow cover duration has decreased at all four sites but tend to exceed the observed trends (c.f. snow cover extend trend underestimated in CMIP5)
- JULES multi-layer snow model has longer snow cover duration and larger trends than the zero-layer snow model