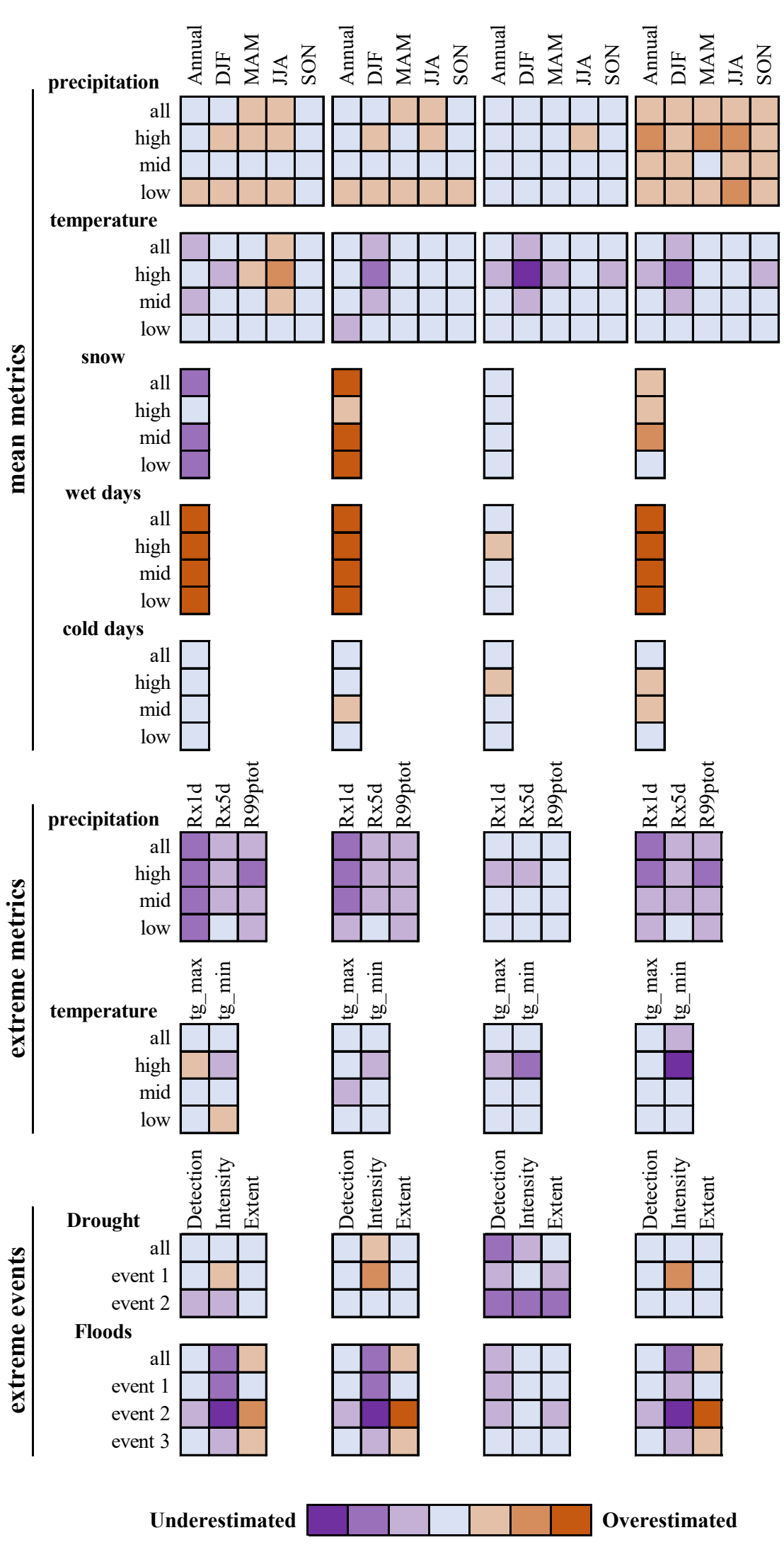

Conclusions and limitations

Mean precipitation is generally slightly overestimated by ERA5, ERA5-Land and CHELSA, especially in lower and higher elevation. In addition, CHELSA shows moderate overestimation in higher elevation. CERRA shows no clear biases and represents mean precipitation well. In summer, mean precipitation is overestimated by all reanalysis datasets.

Mean temperature is generally well represented by all reanalyses, but in some seasons temperature is biased, especially in higher elevation. In winter, all datasets show a slight (ERA5), moderate (ERA5-Land, CHELSA), and strong (CERRA) cold bias in high elevation. Especially, CERRA and CHELSA show increasing biases with increasing elevation. In summer, ERA5 overestimates mean temperature with larger biases with increasing elevation.

ERA5 moderately underestimates the snow fraction and the annual amount of solid precipitation, except for high elevations. ERA5-Land strongly overestimates the amount of snow and the snow fraction, except in higher elevation. CHELSA represents the snow fraction well -especially in low elevations-, but moderately overestimates the amount of snow. CERRA represents both snow fraction and amount well.

ERA5, ERA5-Land and CHELSA strongly overestimate the number of wet days (P>1mm) per year in all elevation bands. CERRA only shows a small overestimation of wet days in high elevations, otherwise no clear biases.

The number of cold days (T<0°C) is well represented by all reanalyses. ERA5-Land slightly overestimates cold days in low elevation, CERRA in high elevation, and CHELSA in mid and high elevation catchments.

ERA5, ERA5-Land and CHELSA underestimate annual maximum daily precipitation (Rx1d), especially in mid and high elevations. Smaller biases are seen for annual maximum 5-day precipitation (Rx5d), especially at lower elevation. Similarly, the fraction of annual precipitation from very wet days (R99ptot) is slightly underestimated and higher biases are seen in higher elevation. CERRA shows only slight underestimation for Rx1d and Rx5d in high elevation, otherwise shows a good representation of the extreme metrics

All datasets show a slight (ERA5, ERA5-Land), moderate (CERRA) or strong (CHELSA) cold bias for the temperature of the coldest day of the year (tg_min) in higher elevation and a tendency towards a warm bias in lower elevation. The biases for the warmest day of the year (tg_max) are overall smaller than for tg_min in all datasets. ERA5 shows a slight warm bias in high elevation and CERRA a cold bias in high elevation.

All reanalyses can detect to varying degree the droughts in 2003 and 2018. CERRA generally shows the poorest performance for the analysis of meteorological droughts. While CERRA shows a good agreement in the intensity of the drought in 2003, it underestimates the drought extent. CERRA has difficulties in detecting the 2018 drought, extent and intensity. ERA5, ERA5-Land and CHELSA do an equally good job overall in detecting both drought events. However, the intensity of the 2003 drought is slightly (ERA5) to moderately overestimated (ERA5-Land, CHELSA).

All reanalyses can detect the three heavy precipitation events in 1999 and 2005. CERRA reflects the intensity and extent of all three events best, while ERA5, ERA5-Land and CHELSA show moderate to large underestimation of the event intensity and overestimate the extent of the events.