

Variability in Weather Generator Simulations

This technical note illustrates and assesses the variability introduced by the Weather Generator relative to that from the change factors within the UKCP09 probabilistic projections.



The approach taken is to explore the relative variability introduced using statistics estimated from 100 30-year Weather Generator simulations for the 2080s (medium emissions scenarios) at ten key sites across the UK. Eight different statistics have been estimated for each half month from these 30-year simulations for each location: probability of a dry day, mean wet day amount of precipitation, interannual variability of the half-monthly precipitation totals, sunshine totals, maximum and minimum temperature, vapour pressure and reference potential evapotranspiration.

To illustrate the relative variability introduced, each of these statistics has been plotted for each location (see figures at the end of this note). These plots include:

- The estimated statistics and range encompassing 95% of the variability using the set of 100 30-year simulations based on the UKCP09 change factors (shown in red);
- The statistic based on using the 1961-90 baseline period (shown by the blue cross); and
- The estimated statistic and range encompassing 95% of the variability in the Weather Generator using a single set of change factors (shown in black).

In the later case, the single set of change factors is derived from the single integration of the RCM, with the standard set of parameter values, and is the difference (or ratio for some of the precipitation and temperature measures) between the 2080s integration and that for the baseline period (1961-90) for the RCM 25 km grid square in which the key site is located.

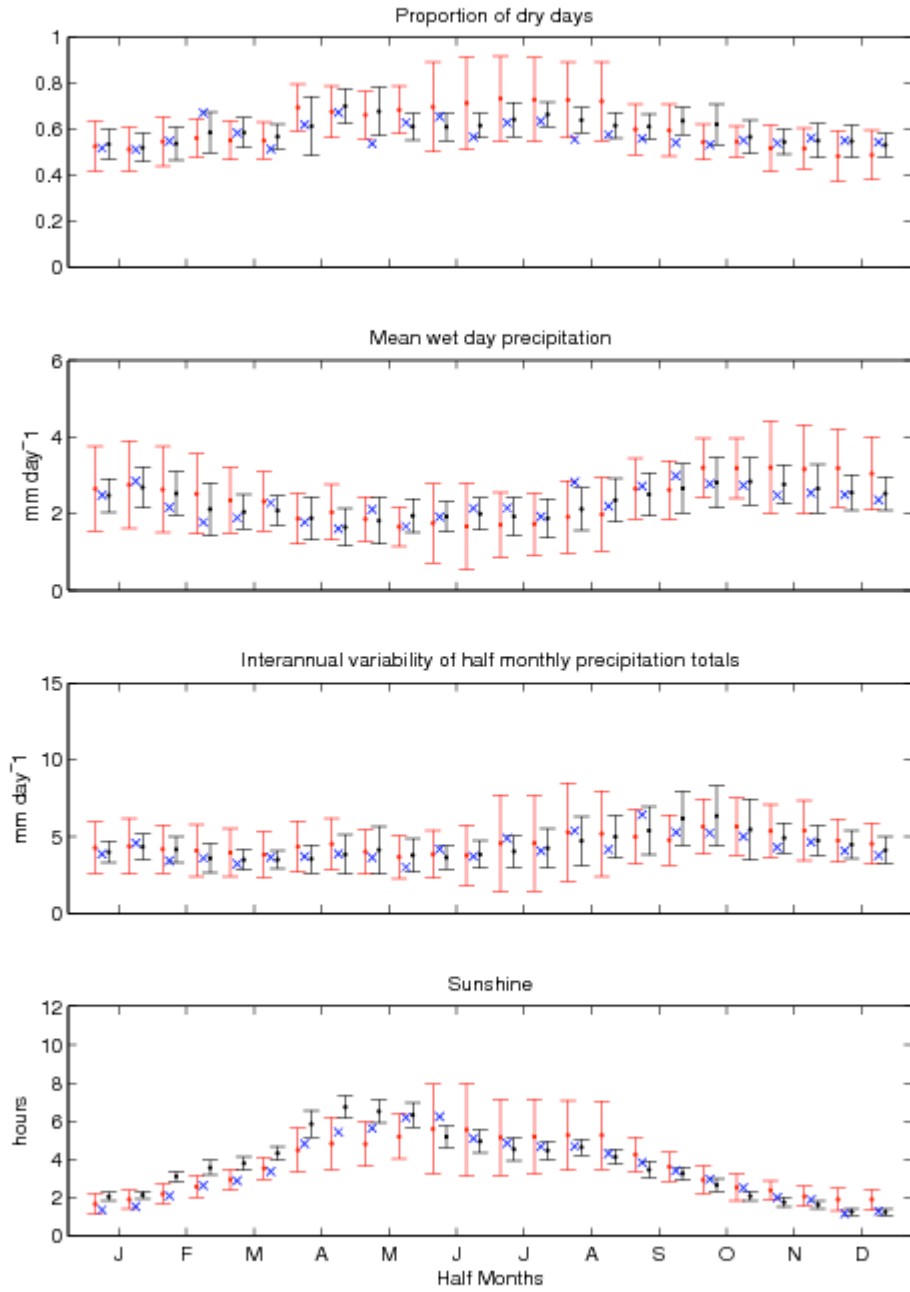
As shown by examining these plots, the variability of the statistics derived using a single set of change factors is markedly smaller than the variability evident in the simulations where the change factors are drawn from the probabilistic projections. Thus, it can be concluded that the variability introduced by the Weather Generator is small compared to that coming from the probabilistic projections and as such can be essentially ignored. In terms of differences in the relative variability introduced for different variables, the plots also show that the variability introduced by the Weather Generator for temperature statistics is much smaller than that for precipitation.

Post script

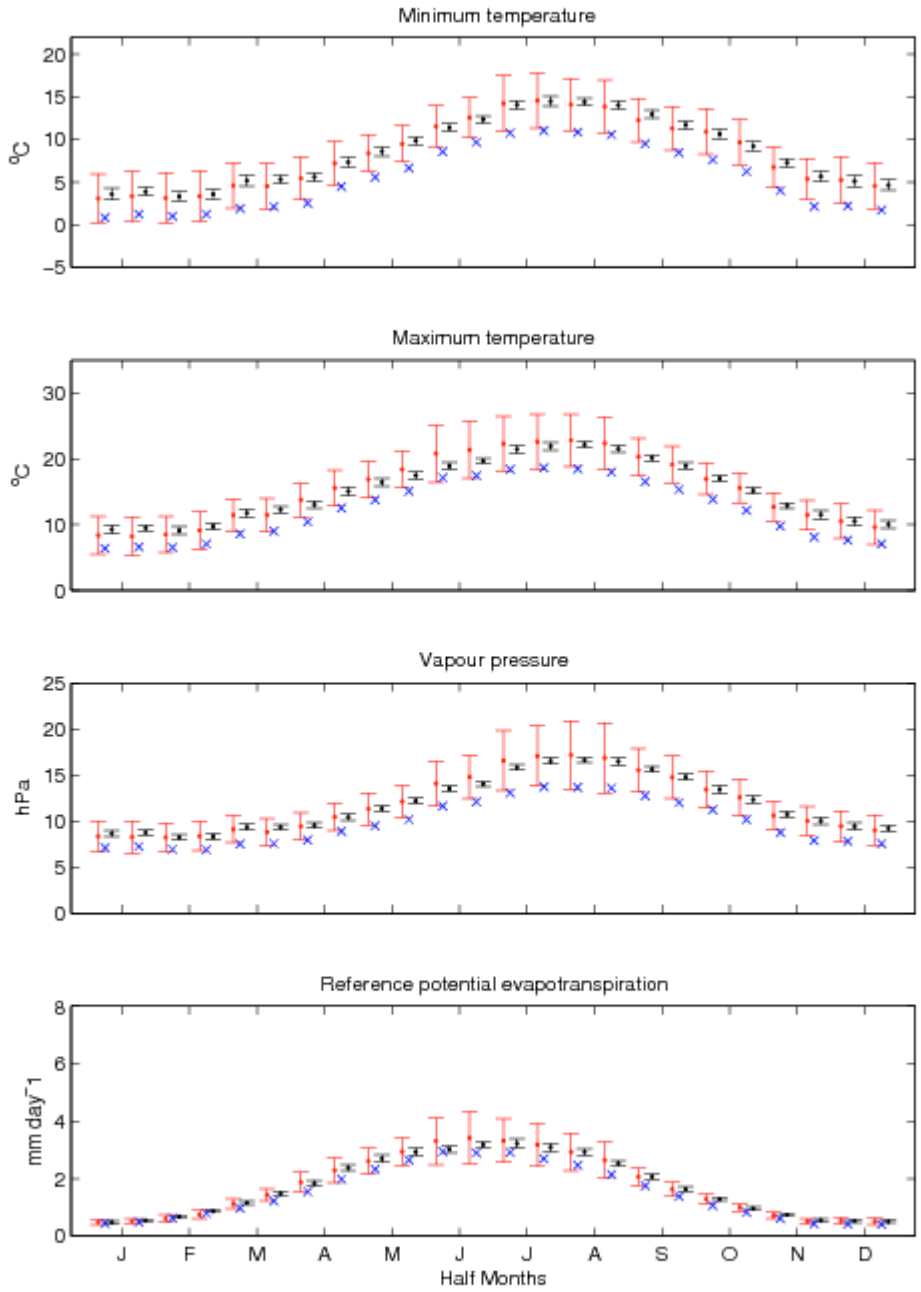
An additional point evident from these plots is that for minimum and maximum temperature, vapour pressure and reference potential evapotranspiration, virtually all 30-year statistics for the 2080s under the medium emissions scenario are above the values for the baseline period.

P.D. Jones, C. Harpham (Climate Research Unit, School of Environmental Sciences, University of East Anglia, Norwich) and C.G. Kilsby (School of Civil Engineering and Geosciences, Newcastle University)

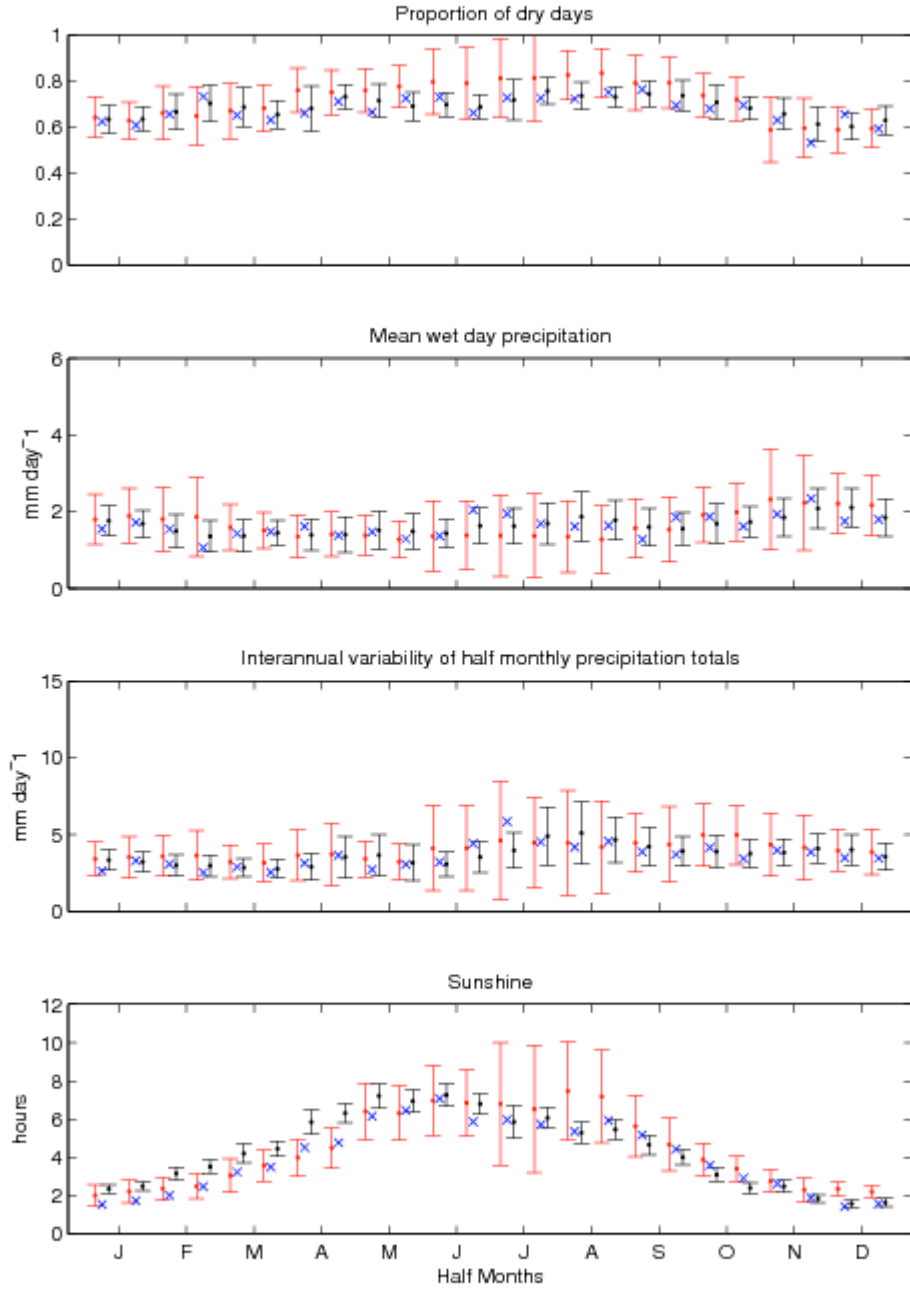
Aldergrove 2080s UKCP09 sampled (red) UKCP09 "normal" (black) Obs (blue)
(WG calibrated on observed data for "normal" RCM)



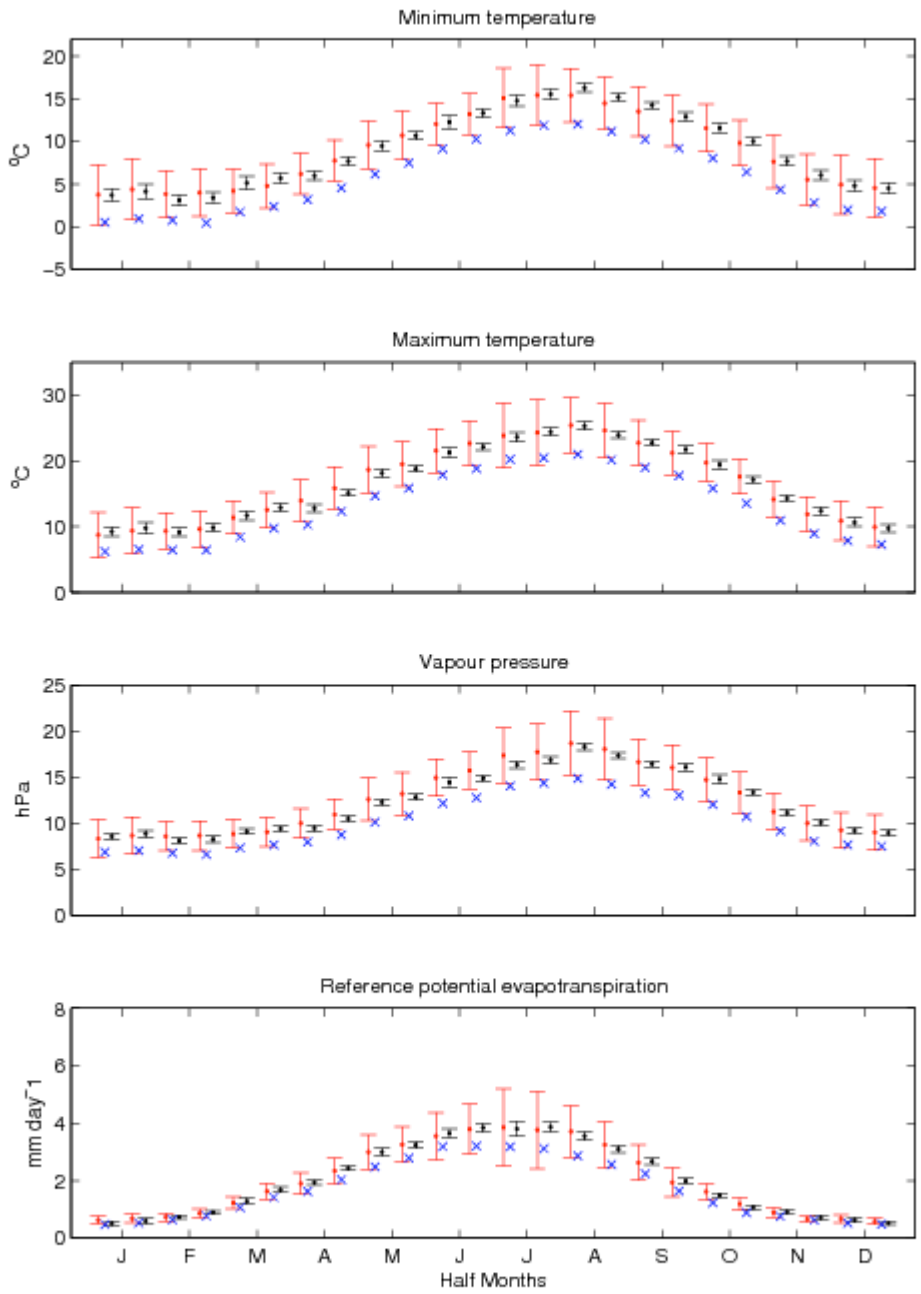
Aldergrove 2080s UKCP09 sampled (red) UKCP09 "normal" (black) Obs (blue)
(WG calibrated on observed data for "normal" RCM)



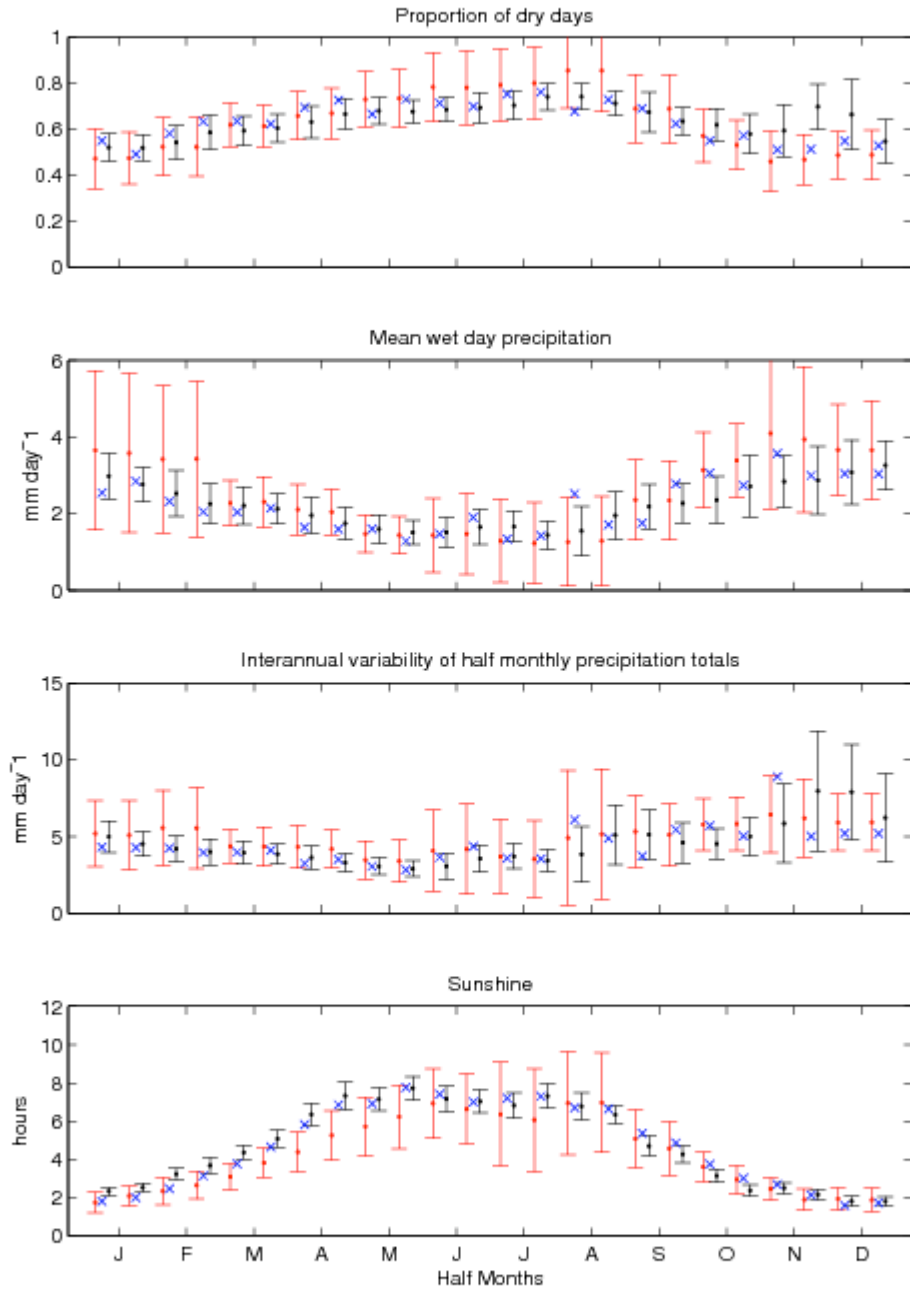
Coltishall 2080s UKCP09 sampled (red) UKCP09 "normal" (black) Obs (blue)
(WG calibrated on observed data for "normal" RCM)



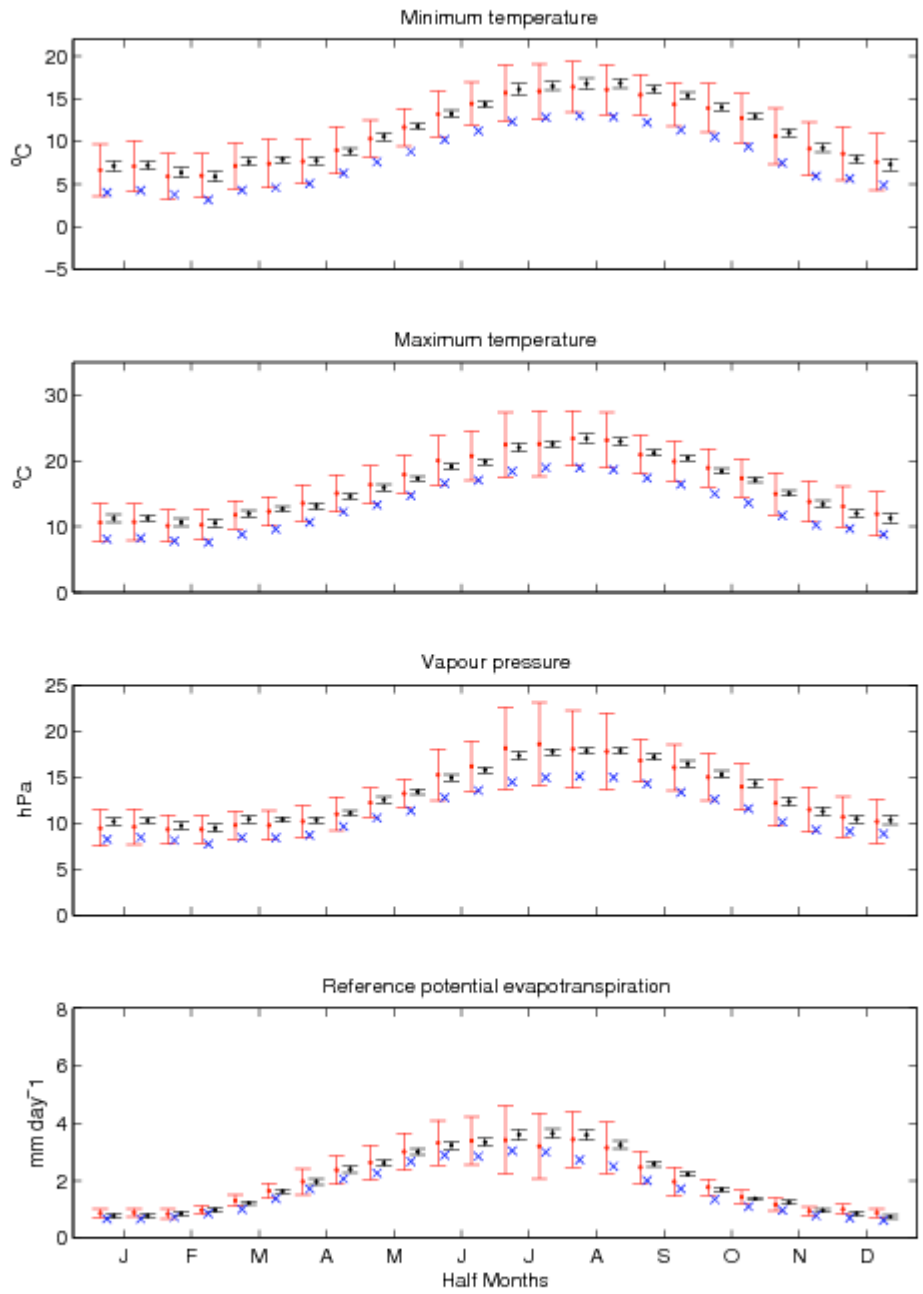
Coltishall 2080s UKCP09 sampled (red) UKCP09 "normal" (black) Obs (blue)
(WG calibrated on observed data for "normal" RCM)



Dale Fort 2080s UKCP09 sampled (red) UKCP09 "normal" (black) Obs (blue)
 (WG calibrated on observed data for "normal" RCM)

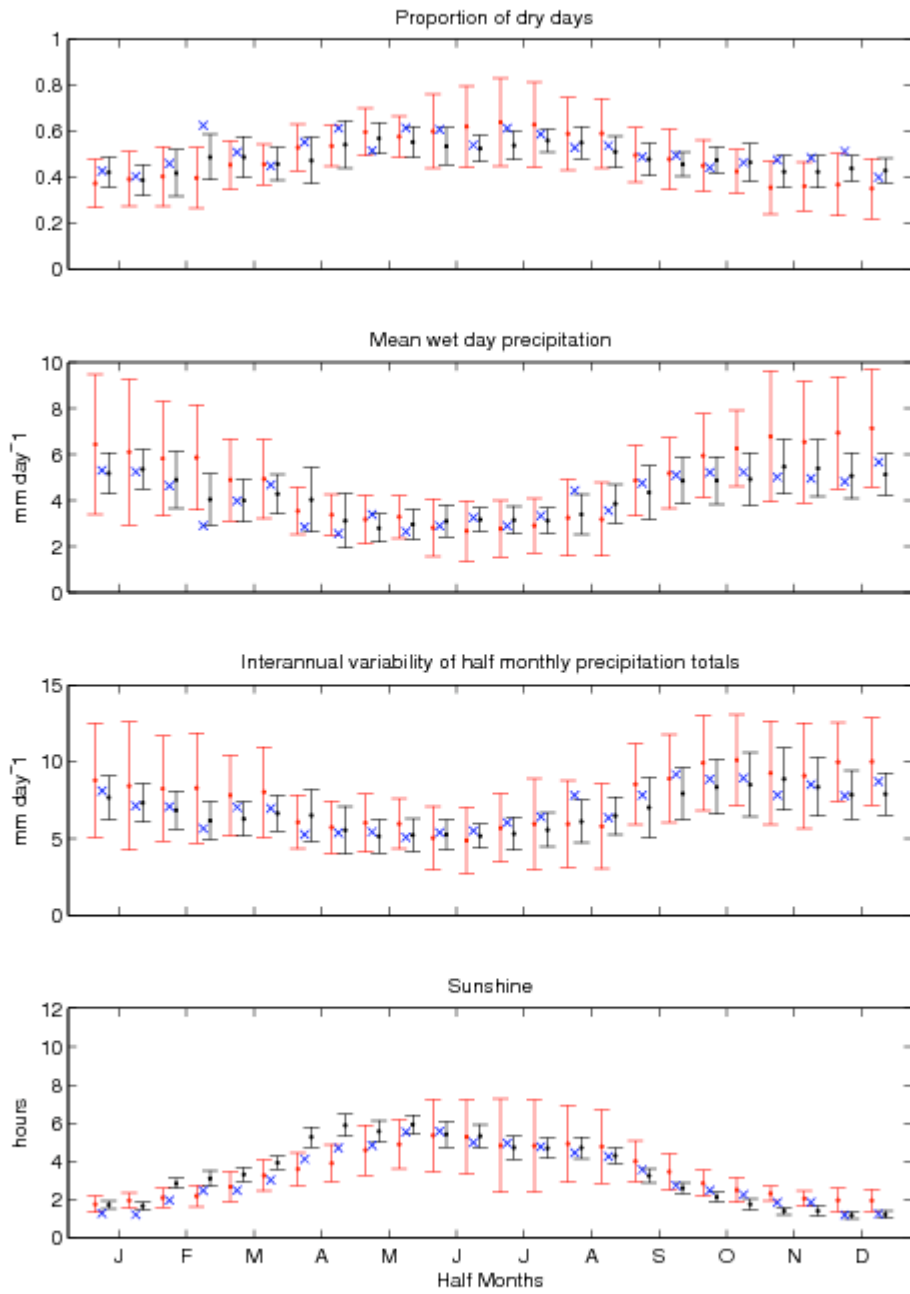


Dale Fort 2080s UKCP09 sampled (red) UKCP09 "normal" (black) Obs (blue)
(WG calibrated on observed data for "normal" RCM)

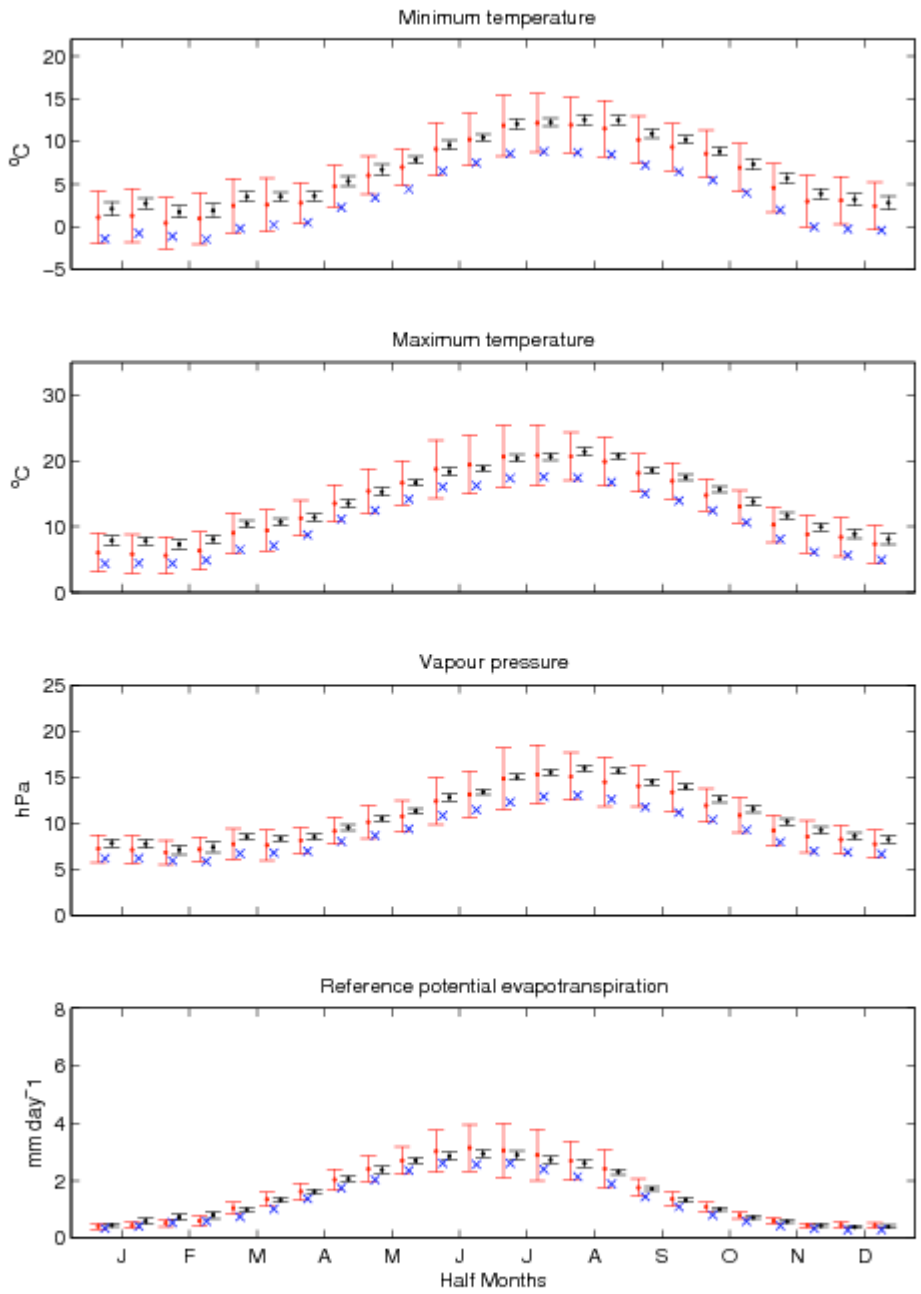


Eskdalemuir 2080s UKCP09 sampled (red) UKCP09 "normal" (black) Obs (blue)

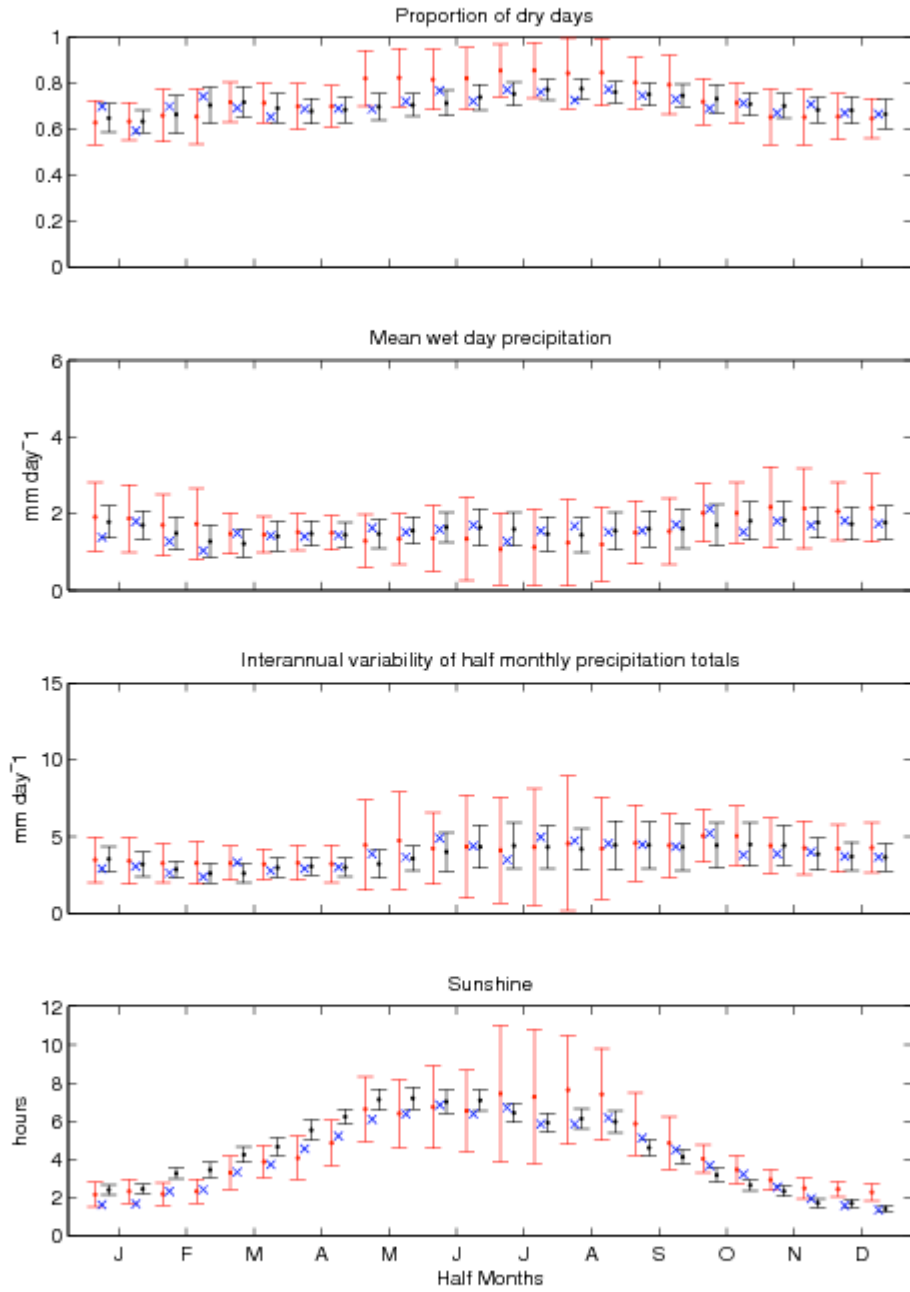
(WG calibrated on observed data for "normal" RCM)



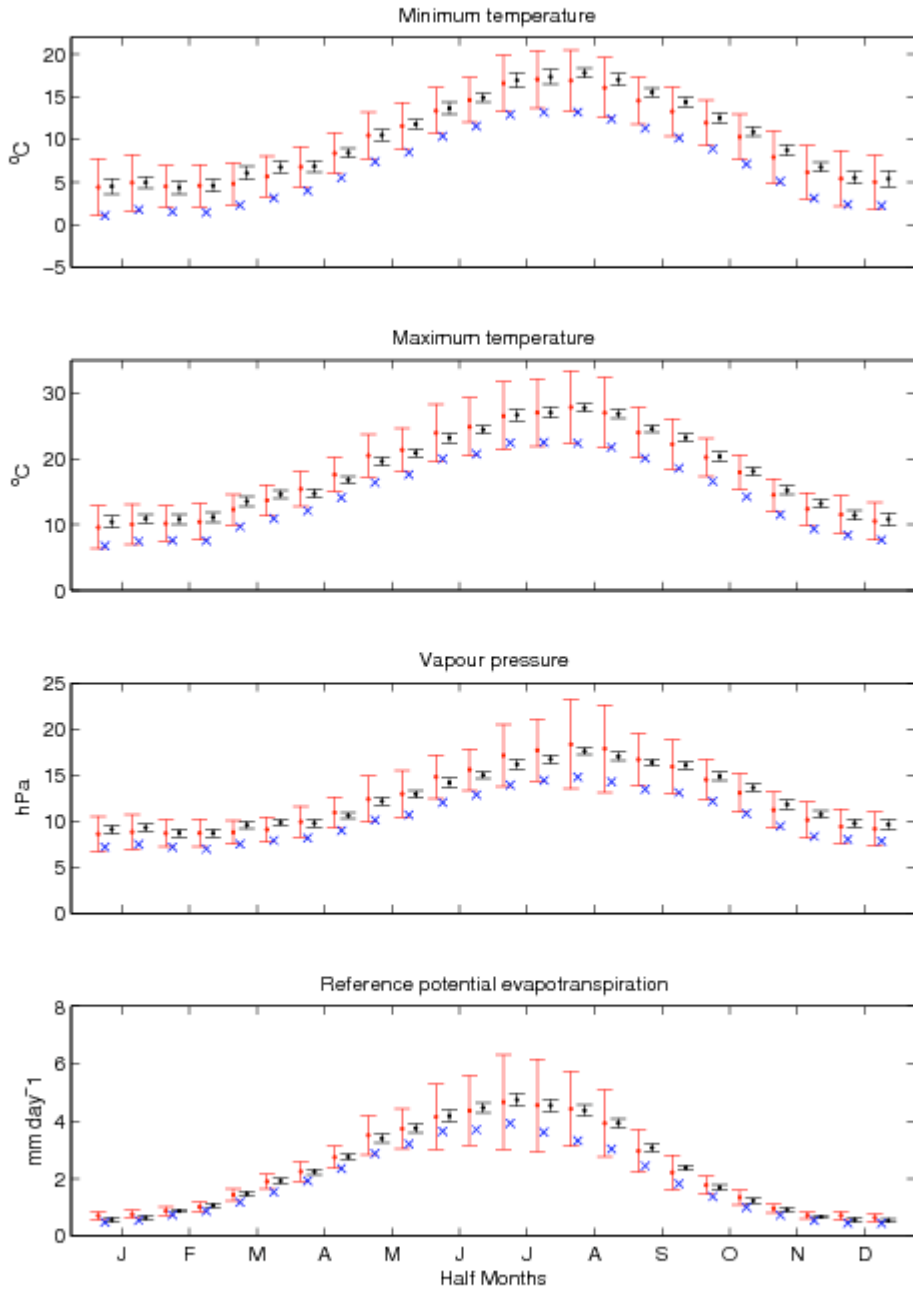
Eskeskmuir 2080s UKCP09 sampled (red) UKCP09 "normal" (black) Obs (blue)
(WG calibrated on observed data for "normal" RCM)



Heathrow 2080s UKCP09 sampled (red) UKCP09 "normal" (black) Obs (blue)
 (WG calibrated on observed data for "normal" RCM)

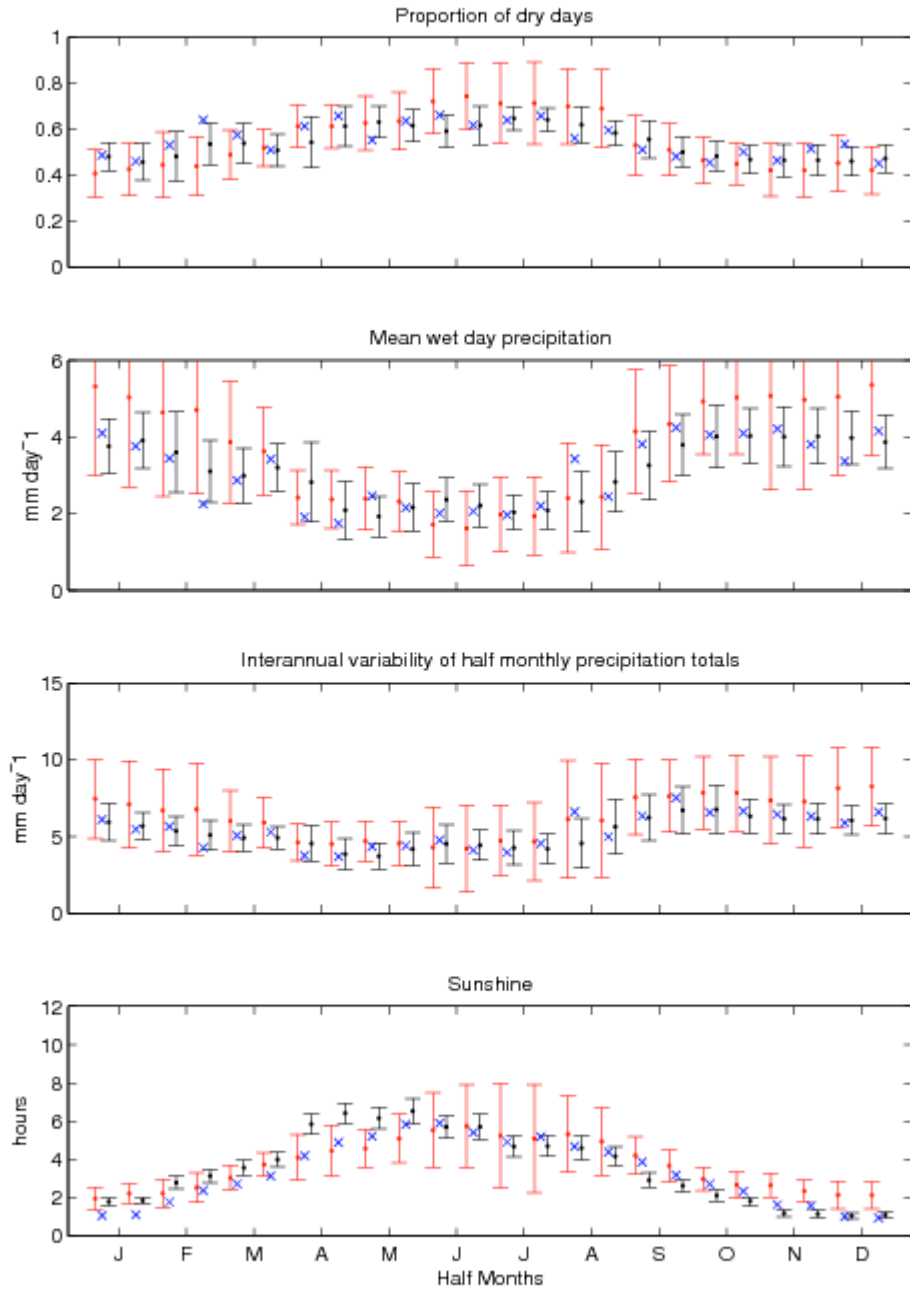


Heathrow 2080s UKCP09 sampled (red) UKCP09 "normal" (black) Obs (blue)
(WG calibrated on observed data for "normal" RCM)

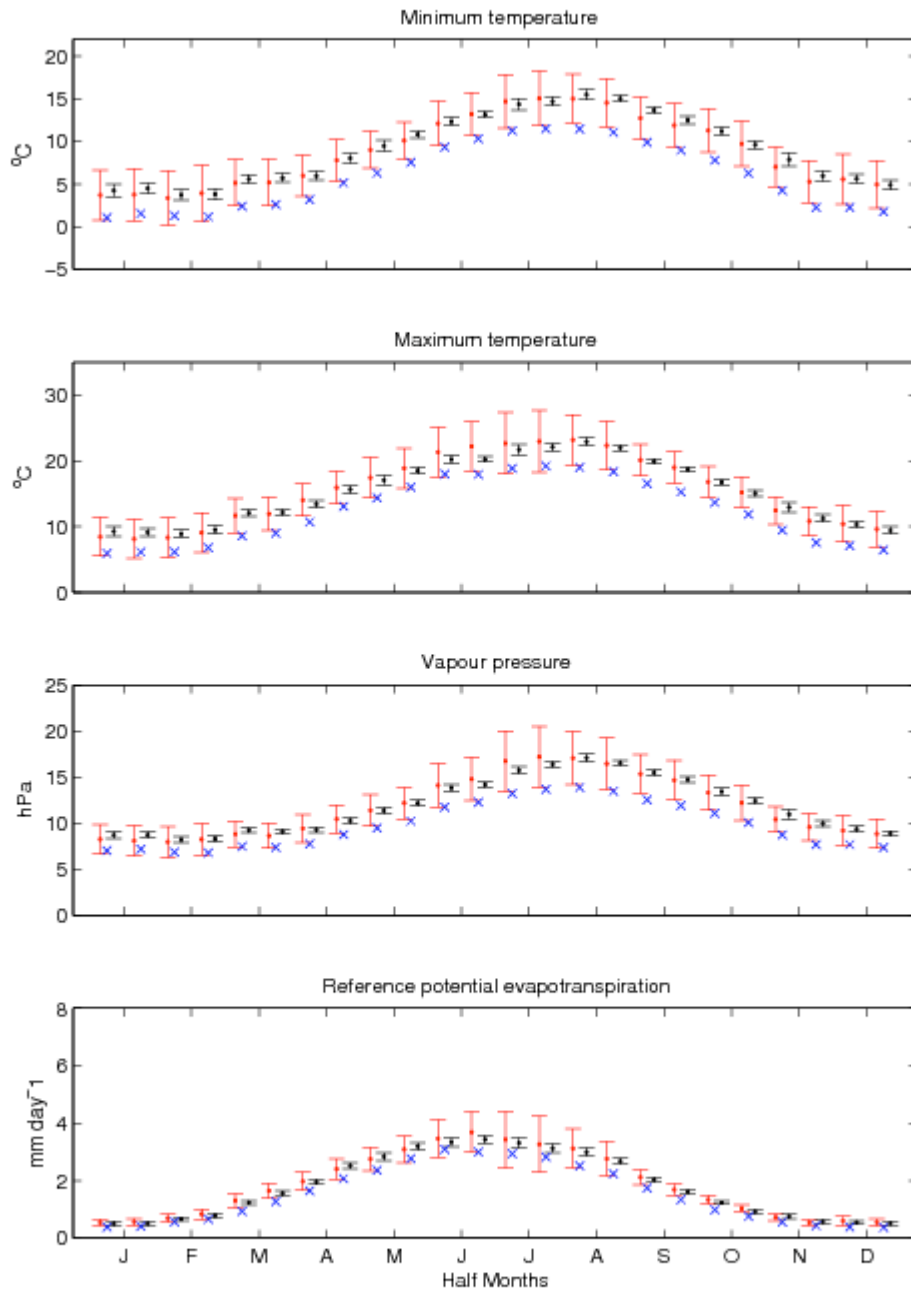


Paisley 2080s UKCP09 sampled (red) UKCP09 "normal" (black) Obs (blue)

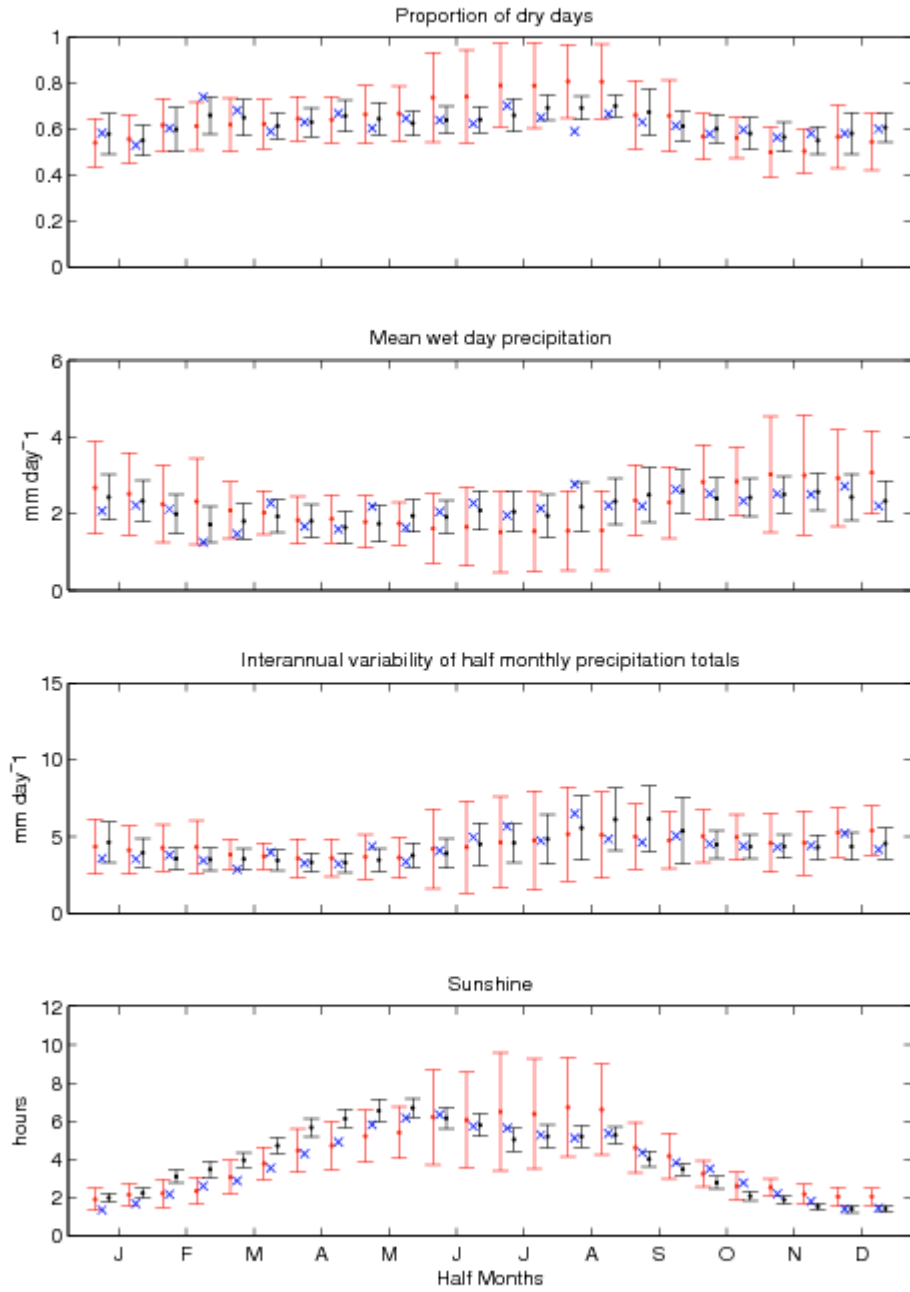
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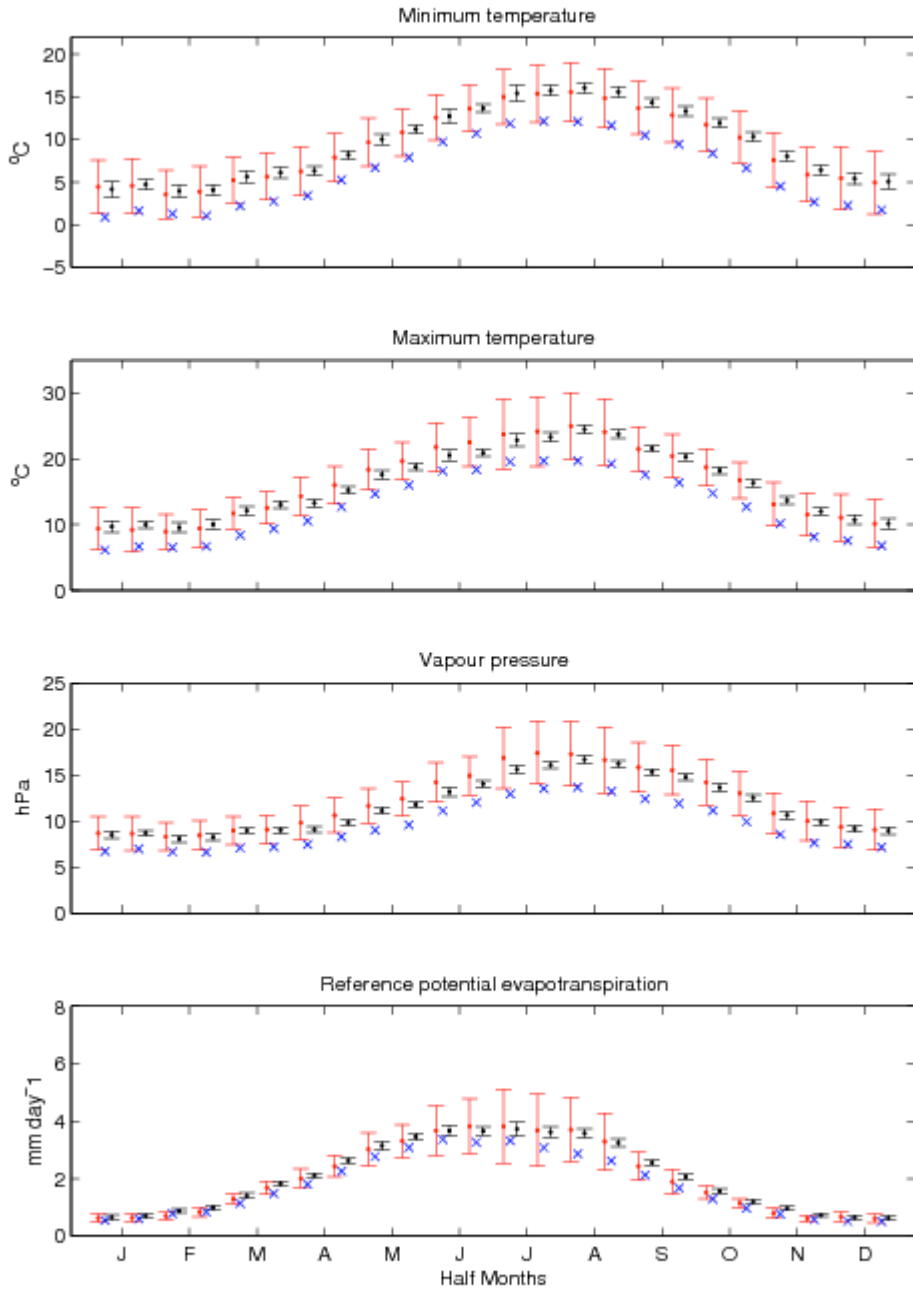
Paisley 2080s UKCP09 sampled (red) UKCP09 "normal" (black) Obs (blue)
(WG calibrated on observed data for "normal" RCM)



Ringway 2080s UKCP09 sampled (red) UKCP09 "normal" (black) Obs (blue)
 (WG calibrated on observed data for "normal" RCM)

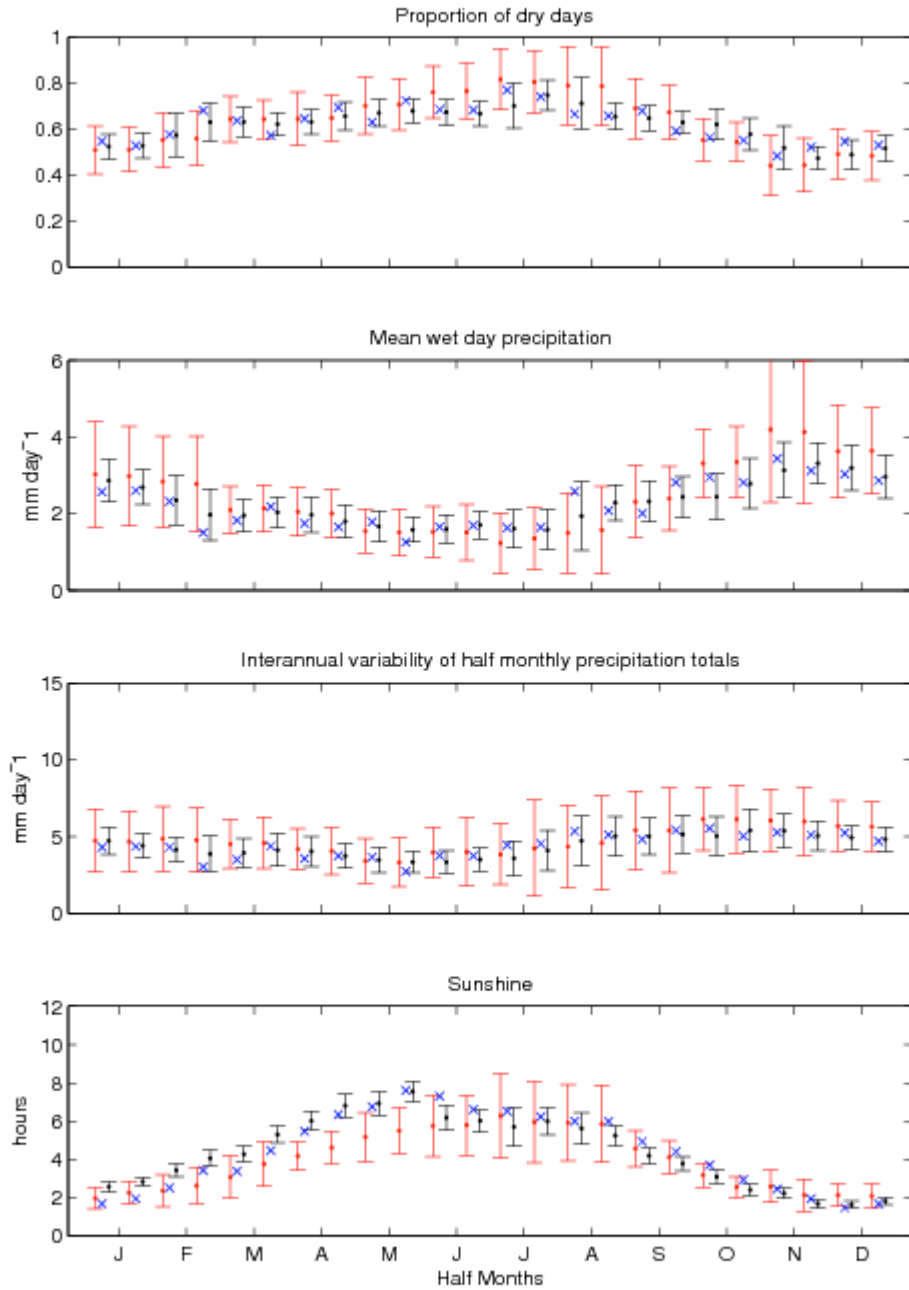


Ringway 2080s UKCP09 sampled (red) UKCP09 "normal" (black) Obs (blue)
 (WG calibrated on observed data for "normal" RCM)

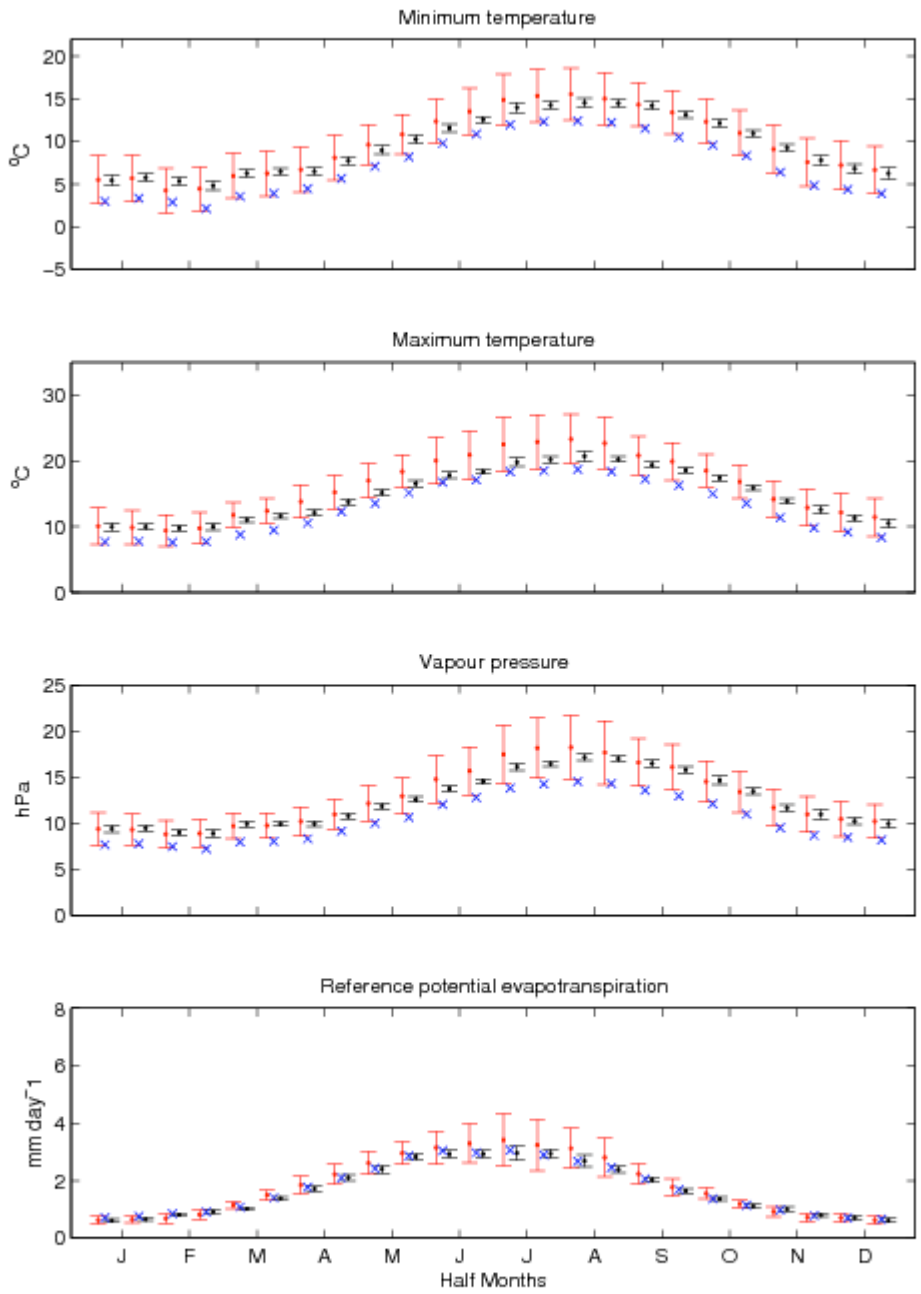


Valley 2080s UKCP09 sampled (red) UKCP09 "normal" (black) Obs (blue)

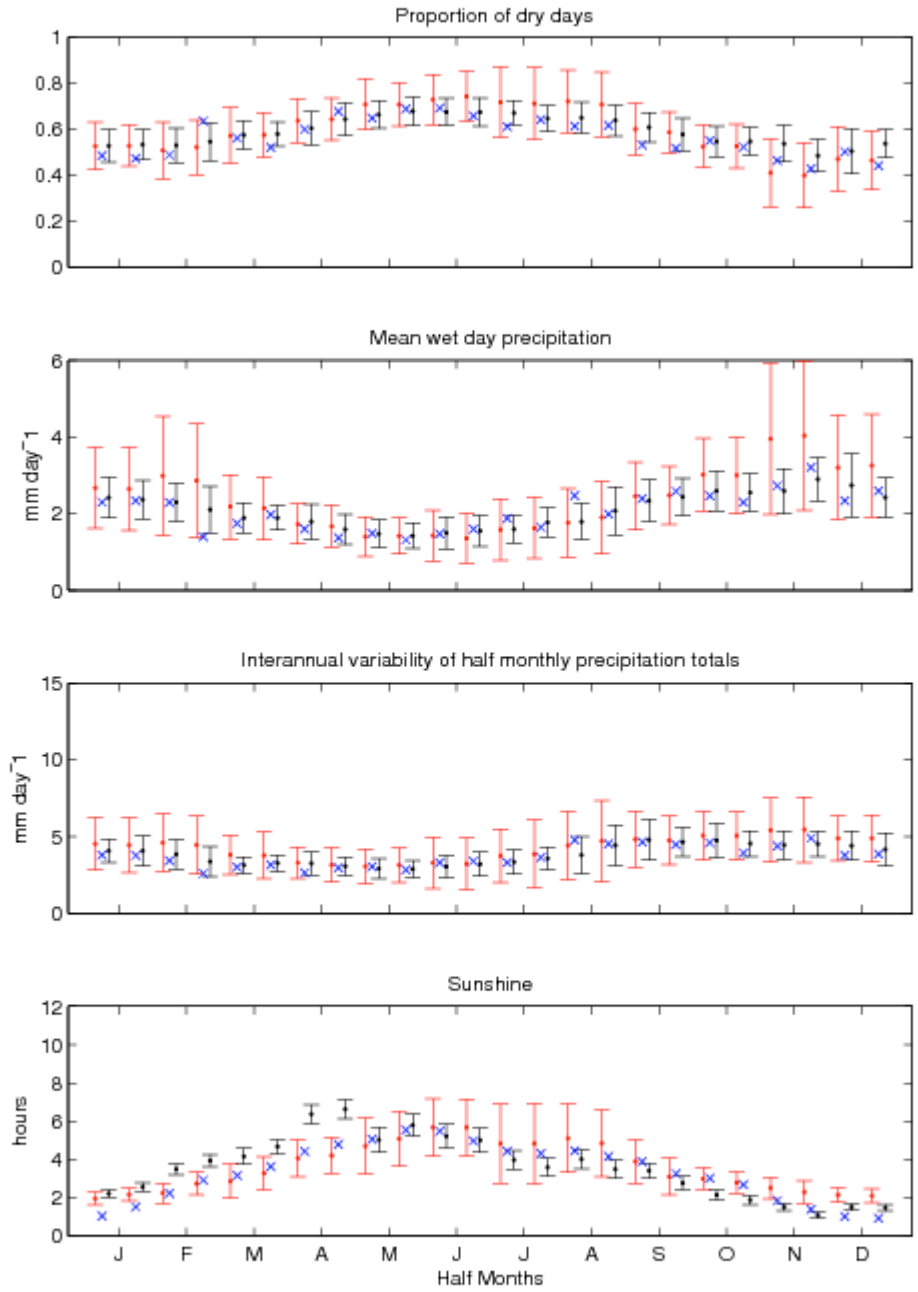
(WG calibrated on observed data for "normal" RCM)



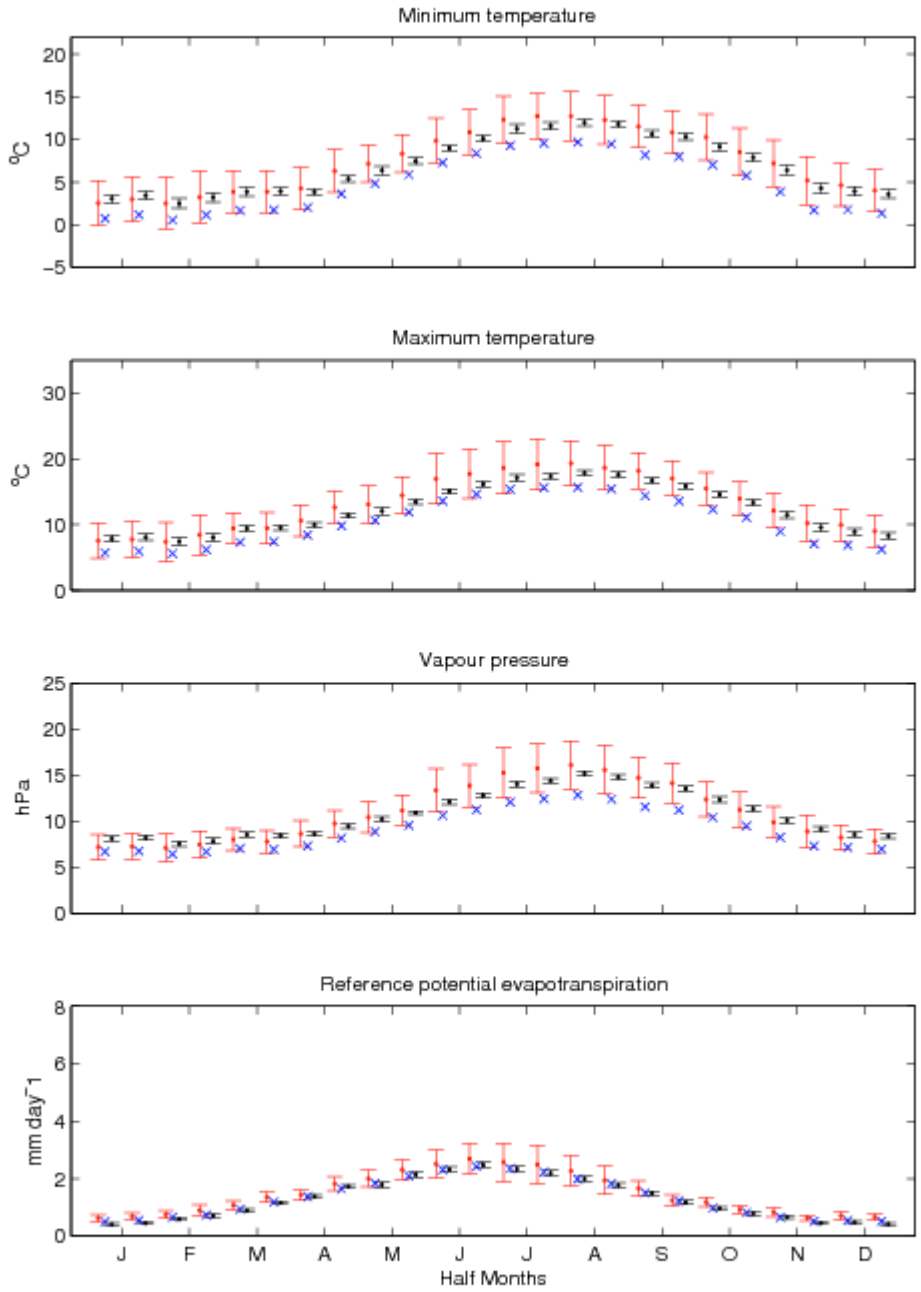
Valley 2080s UKCP09 sampled (red) UKCP09 "normal" (black) Obs (blue)
(WG calibrated on observed data for "normal" RCM)



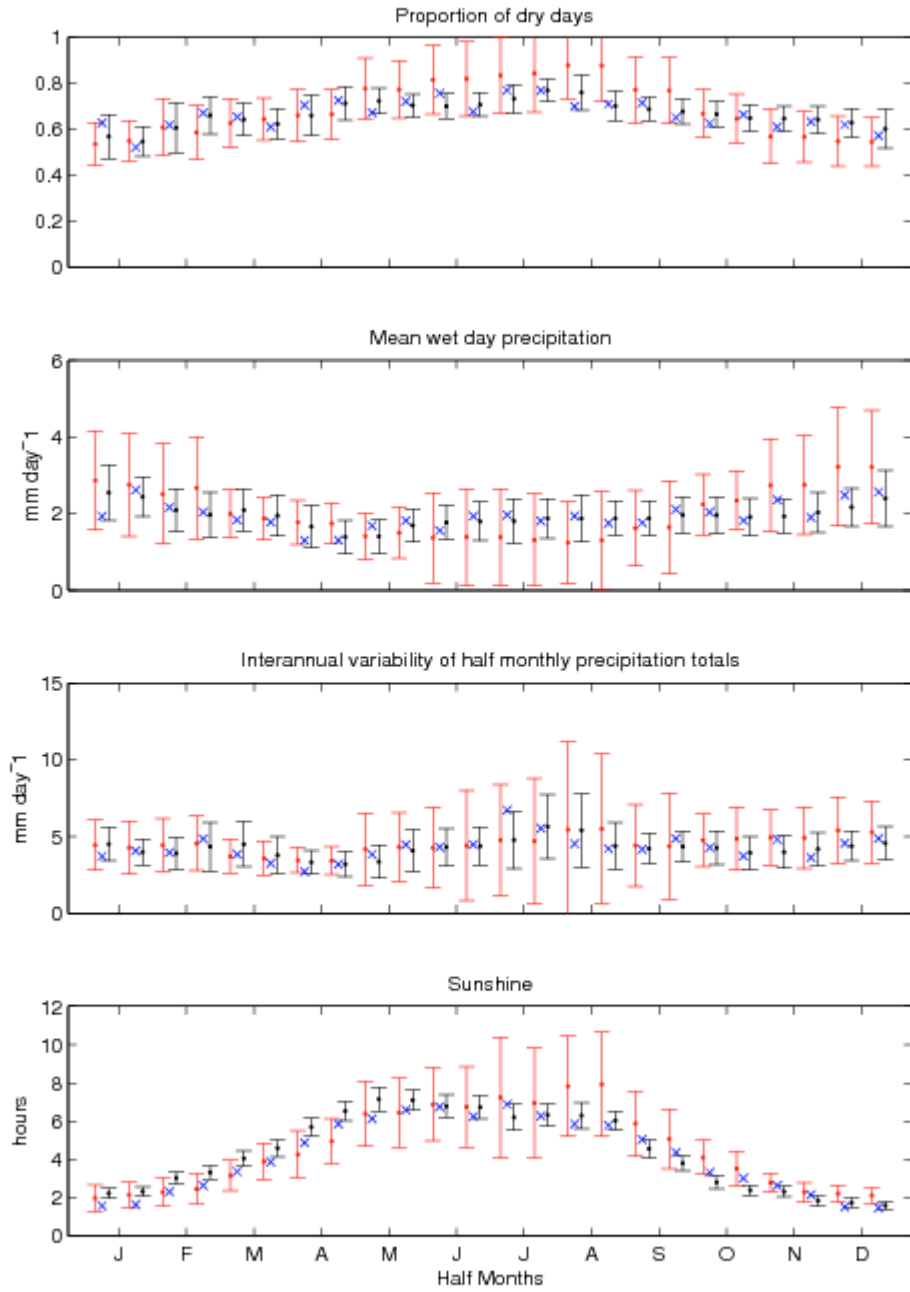
Wick 2080s UKCP09 sampled (red) UKCP09 "normal" (black) Obs (blue)
 (WG calibrated on observed data for "normal" RCM)



Wick 2080s UKCP09 sampled (red) UKCP09 "normal" (black) Obs (blue)
(WG calibrated on observed data for "normal" RCM)



Yeovilton 2080s UKCP09 sampled (red) UKCP09 "normal" (black) Obs (blue)
 (WG calibrated on observed data for "normal" RCM)



Yeovilton 2080s UKCP09 sampled (red) UKCP09 "normal" (black) Obs (blue)
(WG calibrated on observed data for "normal" RCM)

