Supplementary Material

Model output variables

The weather@home Australia-New Zealand project outputs a number of variables on the global (HadAM3P) and regional (HadRM3P) model domains. An overview of the model output is provided in Table S1.

Table S1: Output variables from the weather@home global model (HadAM3P) and nested regional model (HadRM3P).

Variable	HadAM3P monthly mean (height)	HadRM3P monthly mean (height)	HadRM3P daily mean (height)
Surface net downward shortwave flux (W m-2)	surface	surface	
Outgoing shortwave flux (W m-2)	top of atmosphere	top of atmosphere	
Outgoing shortwave flux assuming clear sky (W m-2)	top of atmosphere	top of atmosphere	
Surface net downward longwave flux (W m-2)	surface	surface	
Net upward longwave flux (W m-2)	top of atmosphere	top of atmosphere	
Net upward longwave flux assuming clear sky (W m-2)	top of atmosphere	top of atmosphere	
Surface upward sensible heat flux (W m-2)	surface	surface	
Eastward wind (m s-1)	10 m, 850 hPa, 500 hPa, 200 hPa	10 m, 850 hPa, 500 hPa, 200 hPa	
Northward wind (m s-1)	10 m, 850 hPa, 500 hPa, 200 hPa	10 m, 850 hPa, 500 hPa, 200 hPa	
Windspeed (m s-1)			10 m (land only)
Surface upward latent heat flux	surface	surface	
Maximum air temperature (K)	1.5 m	1.5 m	1.5 m (land only)
Minimum air temperature (K)	1.5 m	1.5 m	1.5 m (land only)
Mean air temperature (K)	500 hPa	500 hPa	
Relative humidity (%)	1.5 m, 500 hPa	1.5 m, 500 hPa	1.5 m (land only)
Dew point temperature (K)	1.5 m	1.5 m	
Precipitation flux (kg m-2 s-1	surface	surface	surface
Liquid water content of soil layer (kg m-2)	surface	surface	
Geopotential height (m)	500 hPa	500 hPa	
Air pressure at sea level (Pa)	surface	surface	surface
Surface temperature (K)	surface	surface	

1 Constructing counterfactual climate scenarios

2 This study constructs ten possible representations of hypothetical "natural" climates

3 without the effect of human influences. These are constructed using CMIP5 models,

4 as outlined in Table S2.

Table S2: CMIP5 models used for estimating patterns of SST warming due to anthropogenic emissions.

Model	Ensemble members
CCSM4	r1i1p1, r2i1p1, r4i1p1, r6i1p1
CNRM-CM5	r1i1p1, r2i1p1, r3i1p1, r4i1p1, r5i1p1, r8i1p1
CanESM2	r1i1p1, r2i1p1, r3i1p1, r4i1p1, r5i1p1
GFDL-CM3	r1i1p1, r3i1p1, r5i1p1
GISS-E2-H	r1i1p1, r2i1p1, r3i1p1, r4i1p1, r5i1p1
GISS-E2-R	r1i1p1, r2i1p1, r3i1p1, r4i1p1, r5i1p1
HadGEM2-ES	r1i1p1, r2i1p1, r3i1p1, r4i1p1
IPSL-CM5A-LR	r1i1p1, r2i1p1, r3i1p1
IPSL-CM5A-MR	r1i1p1, r2i1p1, r3i1p1
MIROC-ESM	r1i1p1, r2i1p1, r3i1p1

1 Model evaluation
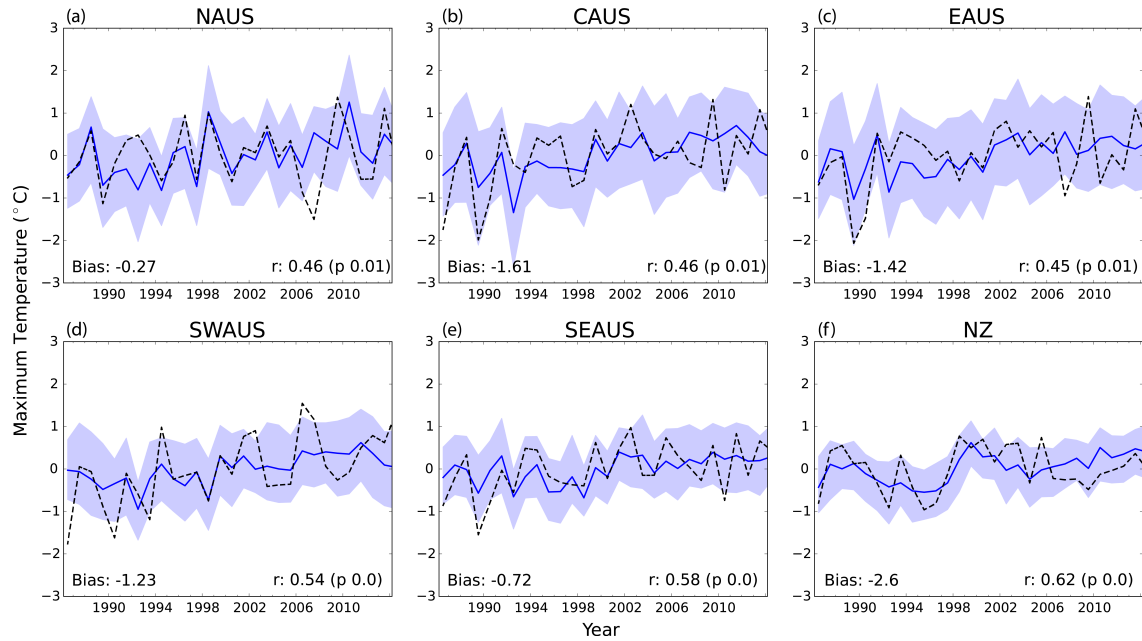
Figure S1: Time series of summertime (June–August) average maximum temperature for the respective study regions (as labelled) for 1986–2014. Values from weather@home simulations are shown by the solid line (5th–95th percentile shaded envelope) while the observations (AWAP over Australia and VCSN over New Zealand) are shown by the dashed line. The time series are given as anomalies relative to the mean of the entire period. The bias between the model and observations is indicated, along with the Pearson correlation coefficient (r) and p-value for testing non-correlation.
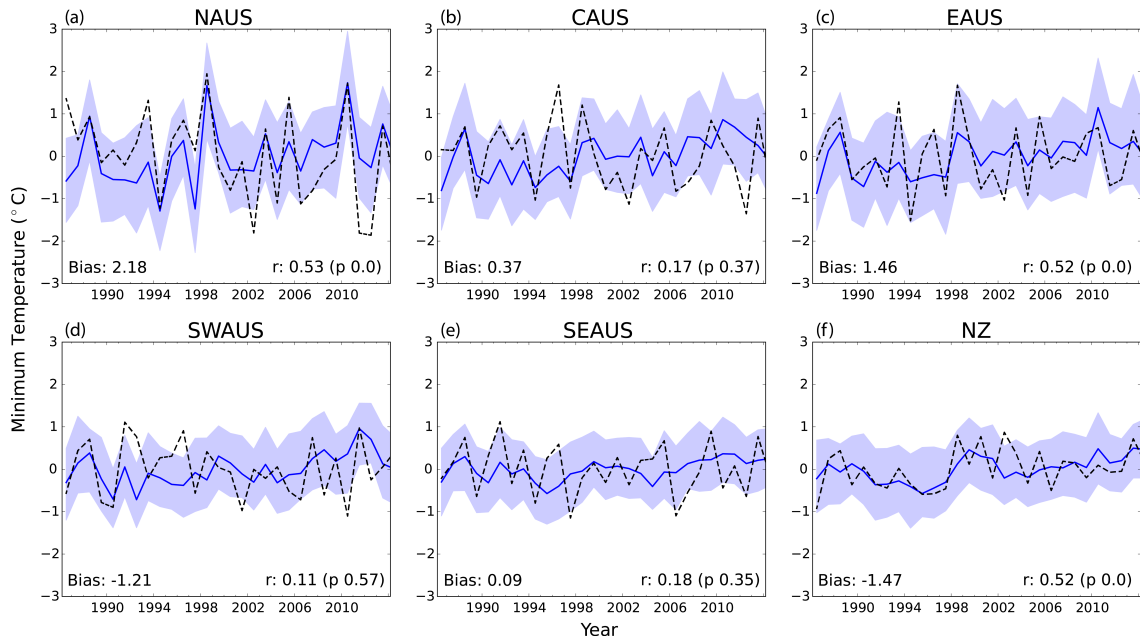
Figure S2: As in Figure S1, but showing average minimum temperature.
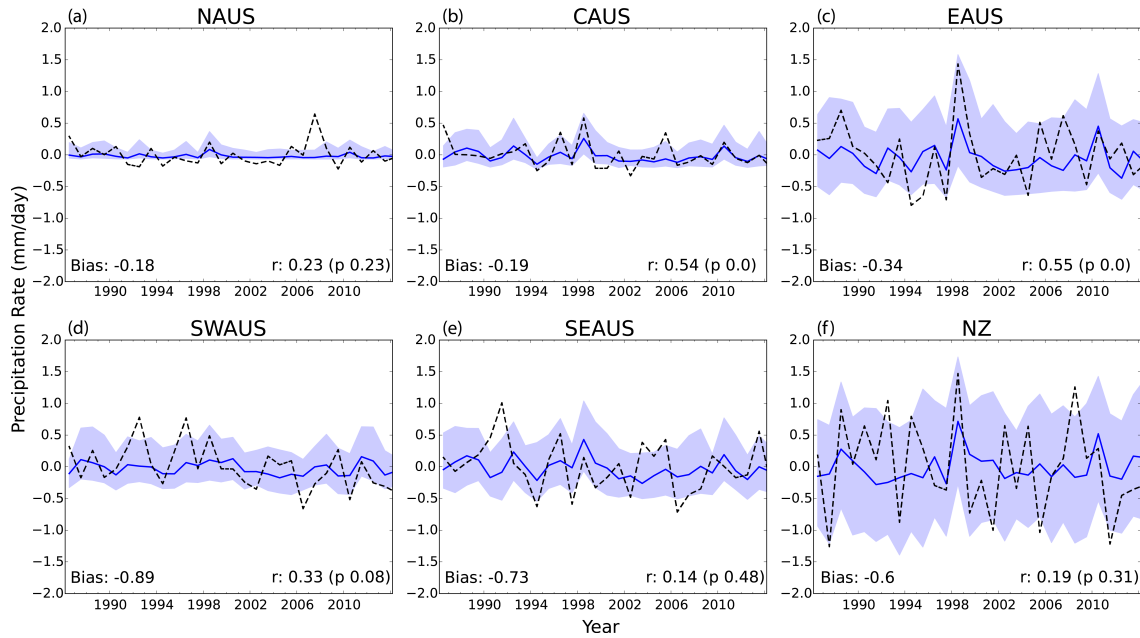
Figure S3: As in Figure S1, but showing average precipitation.
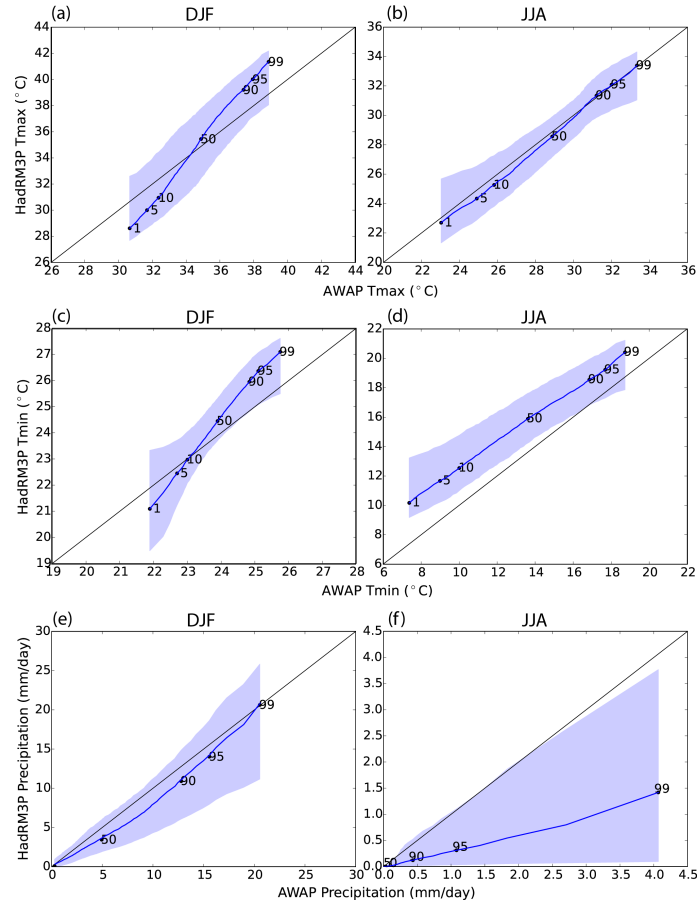
Figure S4: Quantile-quantile plots showing distributions of daily maximum temperature (a, b), minimum temperature (c, d) and precipication (e, f), averaged over northern Australia. Distributions are shown for December–February (a,c,e) and June–August (b, d, f). The solid blue line shows the precentile values for the entire ensemble of model simulations, while the blue envelope shows the 5th to 95th percentile range of values for individual ensemble members.
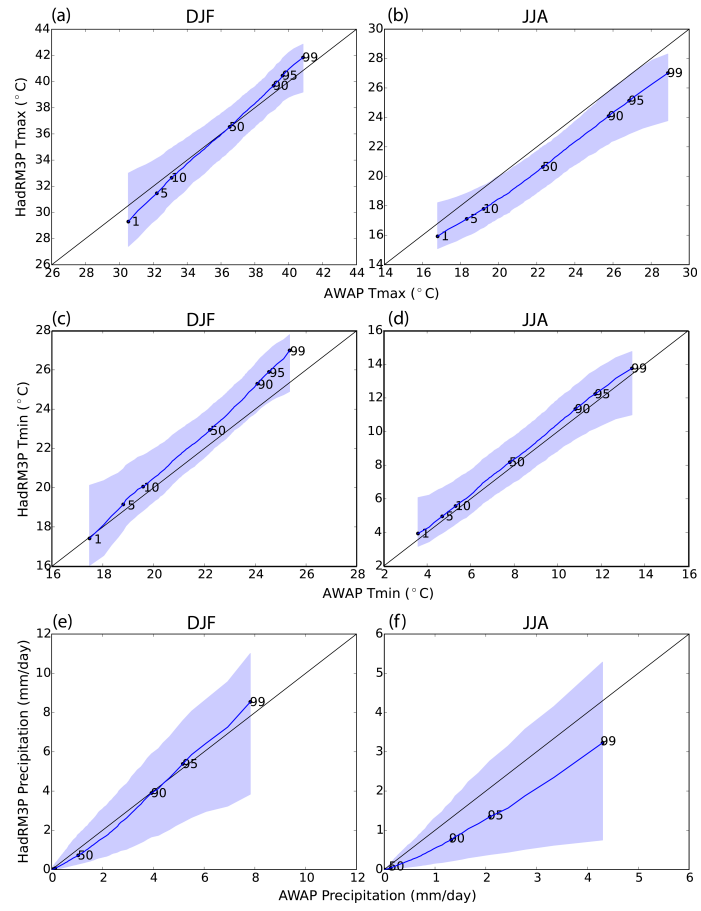
Figure S5: As in Figure S4, but for central Australia.
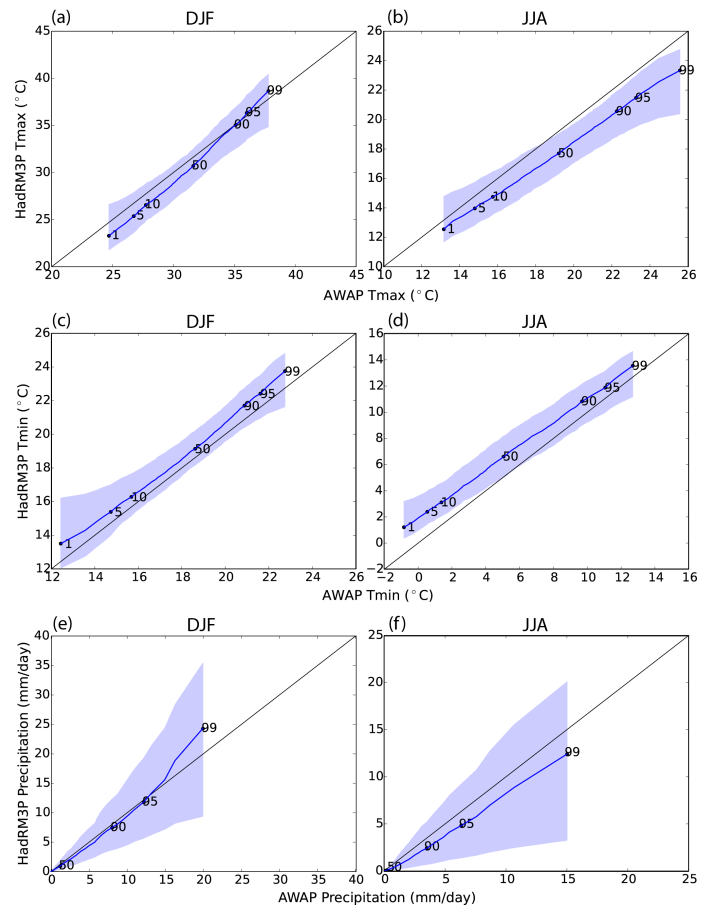
Figure S6: As in Figure S4, but for eastern Australia.
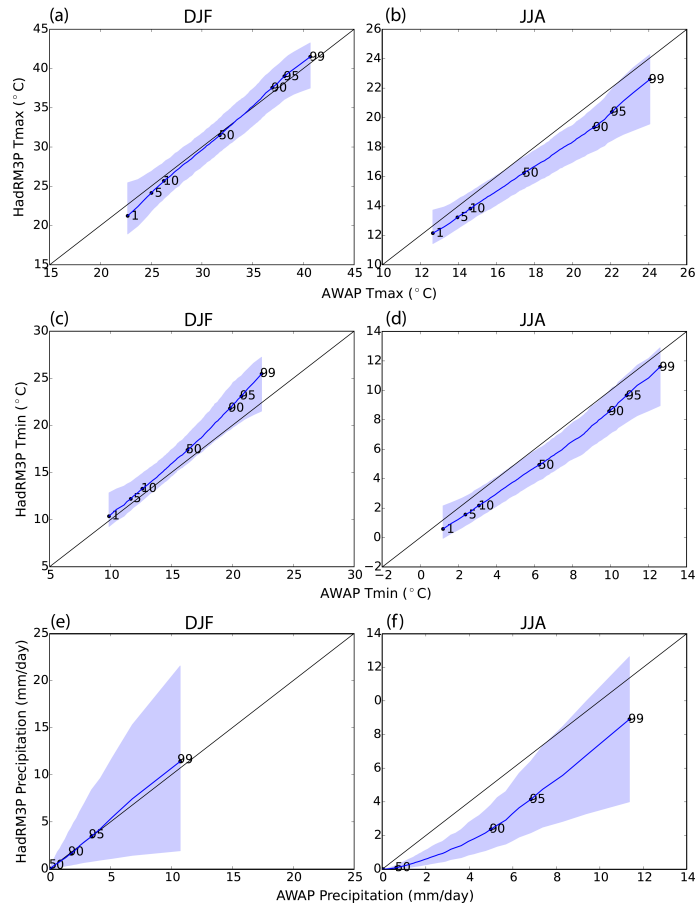
Figure S7: As in Figure S4, but for southwest Australia.
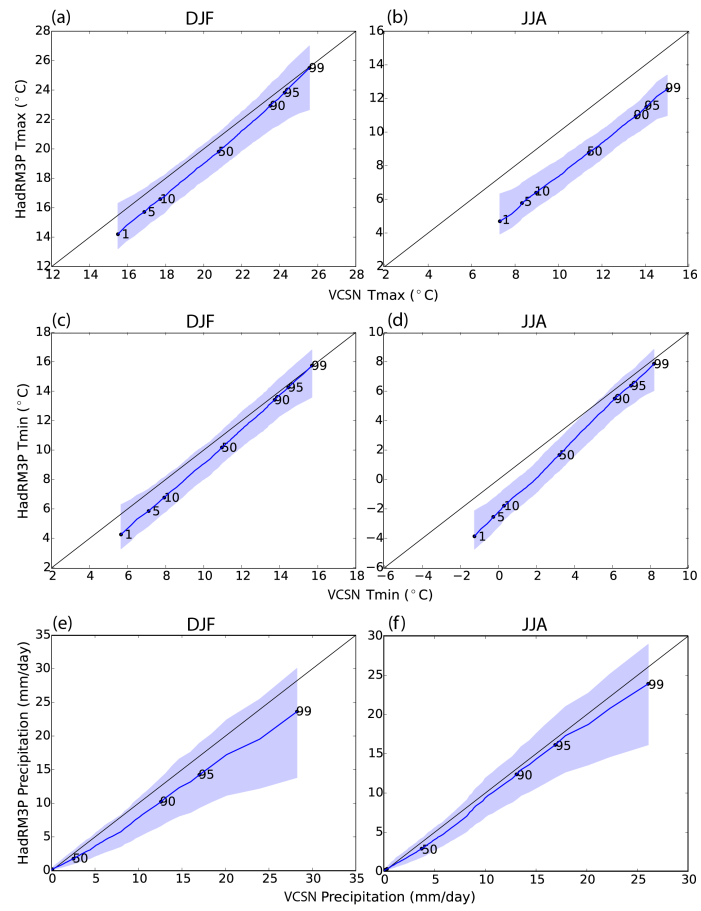
Figure S8: As in Figure S4, but for New Zealand.
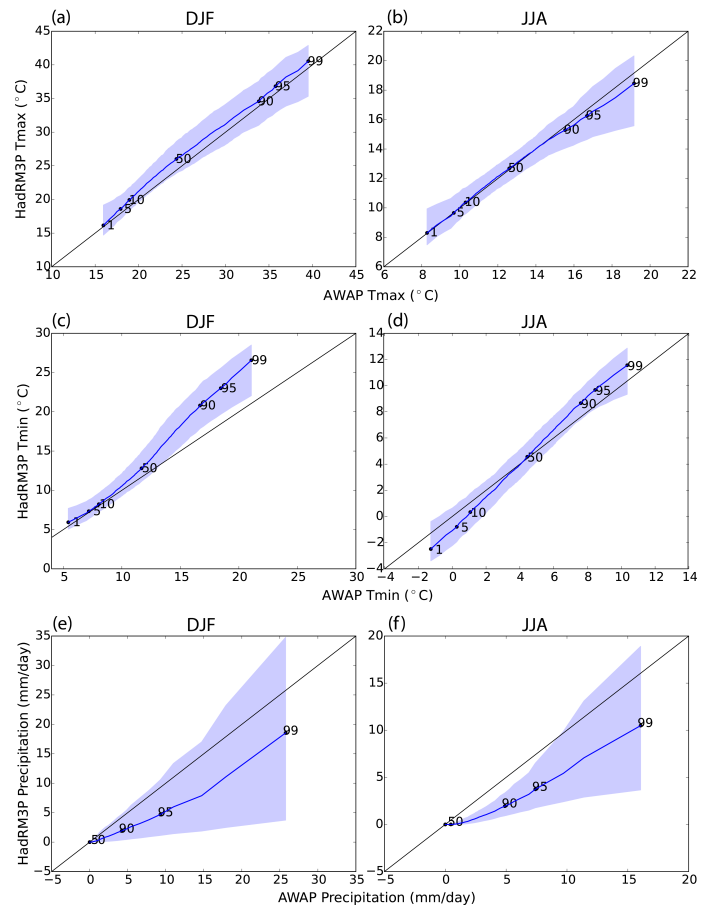
Figure S9: As in Figure S4, but for Melbourne.
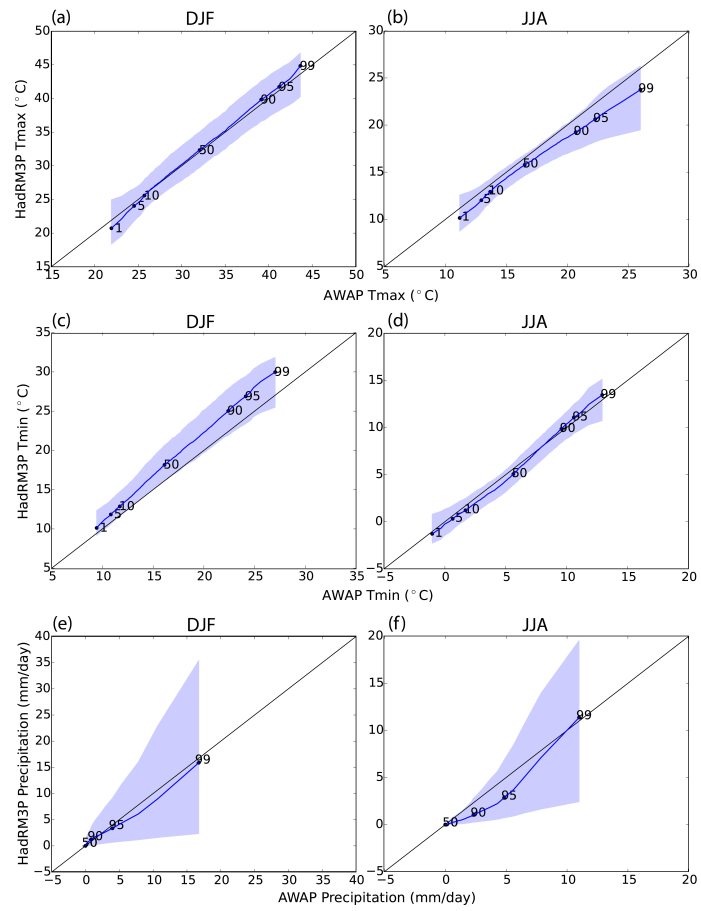
Figure S10: As in Figure S4, but for Mildura.