

Supporting Information for

Projections of actual and potential evapotranspiration from downscaled high-resolution CMIP6 climate simulations in Australia

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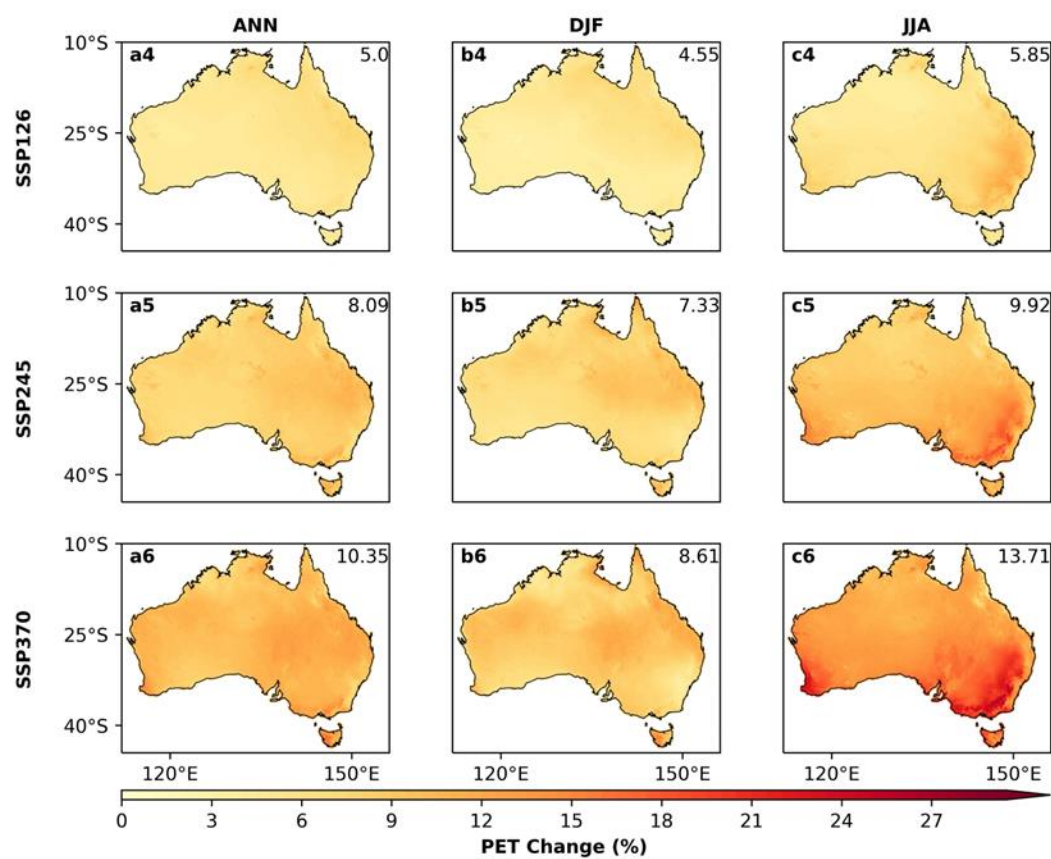
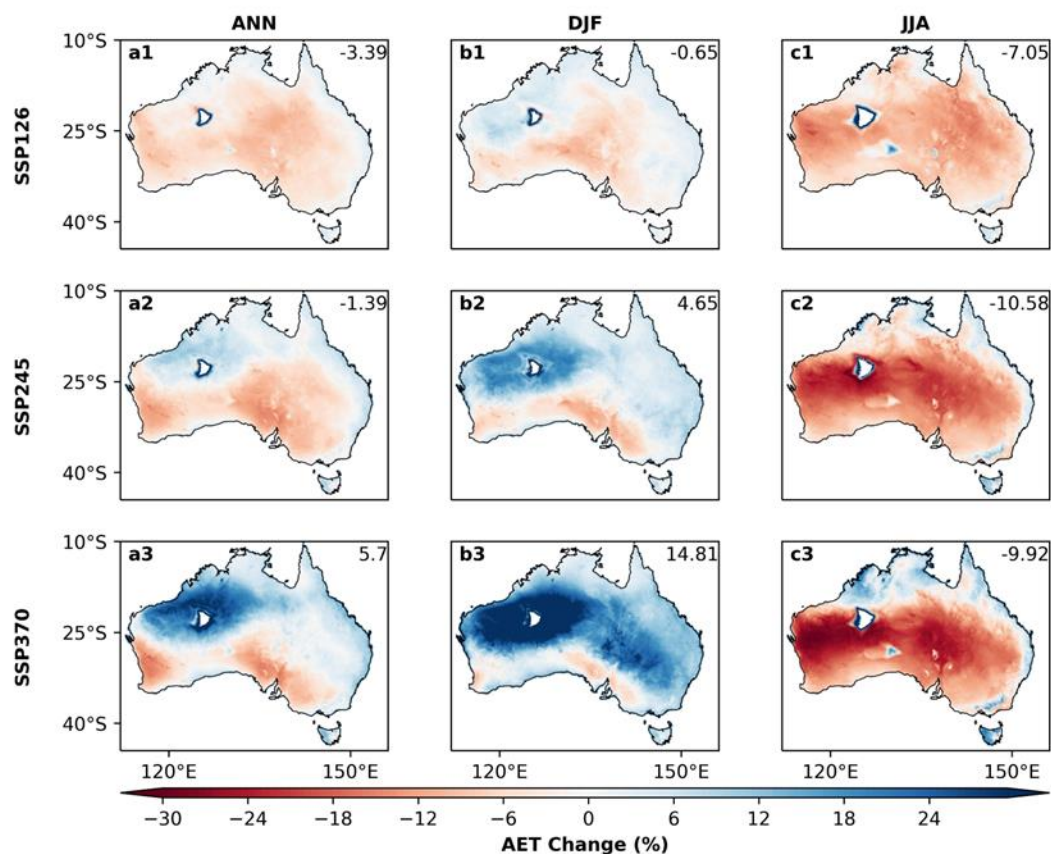


Figure S1: Bias corrected climate change patterns for AET and PET across annual (ANN), summer (DJF), winter (JJA) seasons in Australia. Projected climate change patterns are shown for 2080-2099 with respect to 1995-2014. Results are shown for 11-model ensemble mean under emissions scenarios (SSP126, SSP245 and SSP370). Bias correction used AWO datasets as reference.

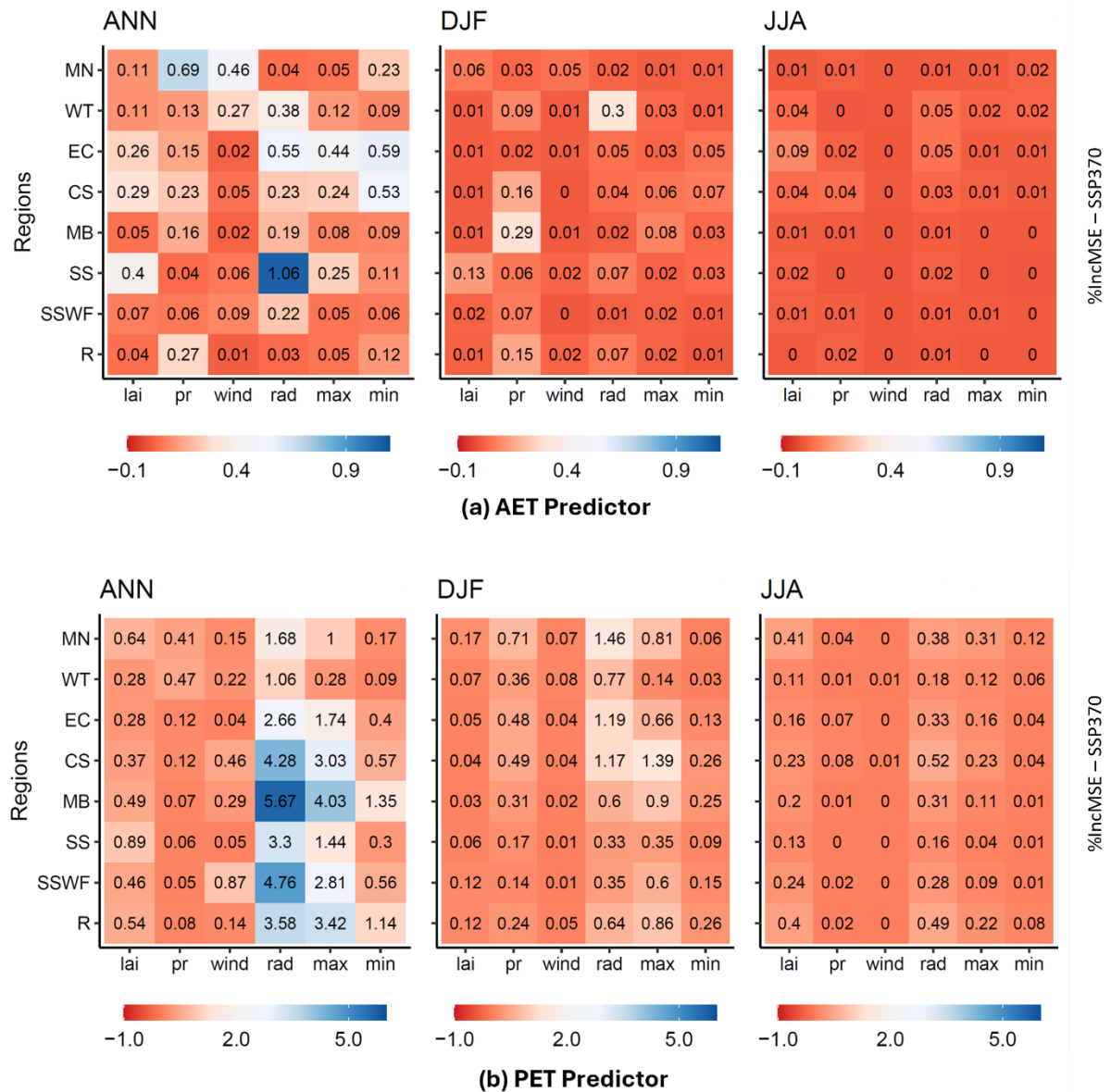


Figure S2: heatmaps showing the variable importance (%IncMSE) for AET in (a) and PET in (b) across annual (ANN), summer (DJF), winter (JJA) seasons. Predictor variables considered are leaf area index (lai), precipitation (pr), wind speed (wind), solar radiation (rad), maximum temperature (max) and minimum temperature (min). The random forest model is applied to 8 NMR regions for one scenario (SSP370) and one model (EC-Earth3) only.

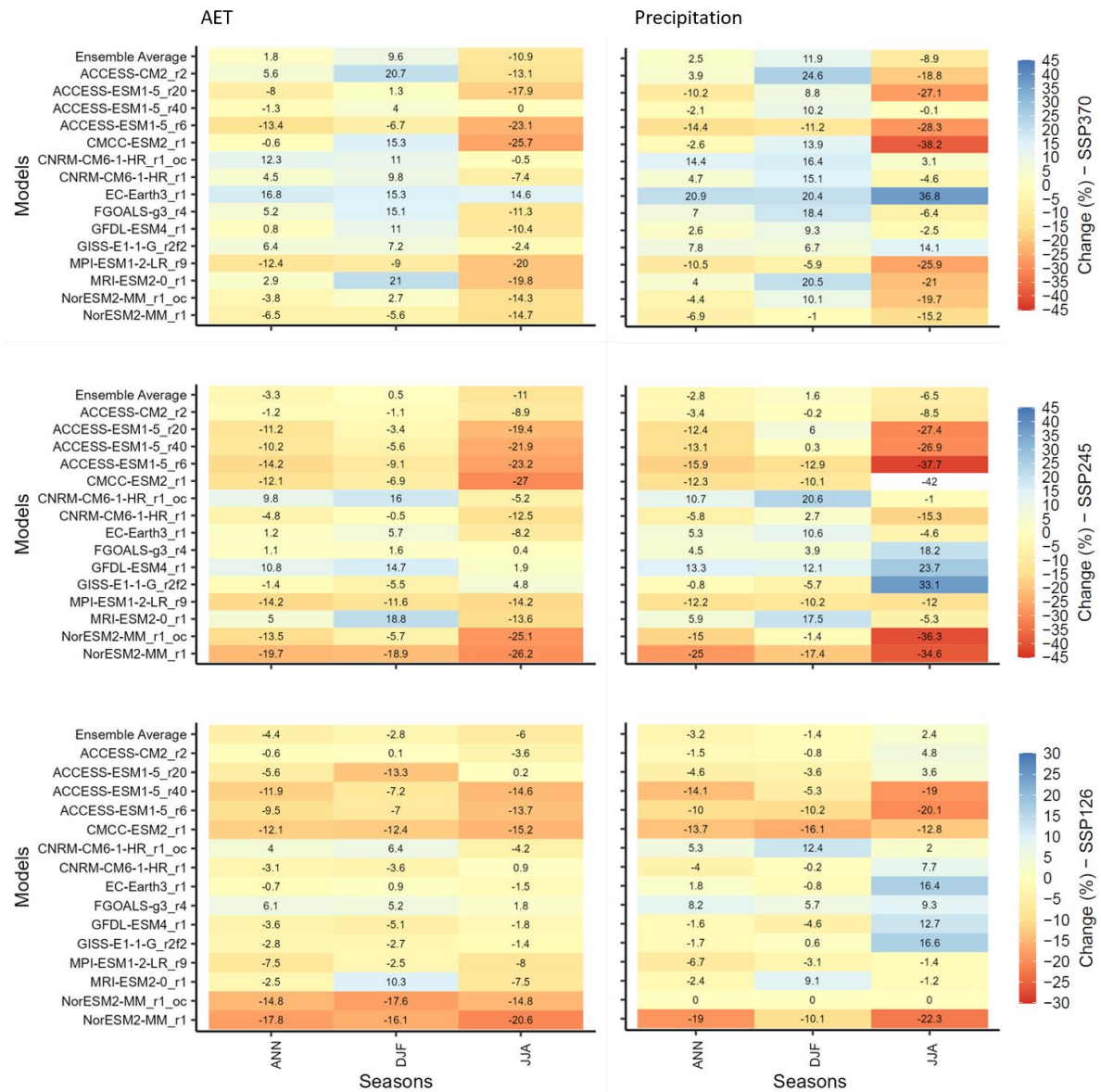


Figure S3: Comparison about the seasonal climate change signal (1995-2014 to 2080-2099) in Australia for precipitation and AET for individual models and ensemble average. Results are shown for three scenarios (SSP126, SSP245 and SSP370).

Table S1: Site-averaged AET data for OzFlux towers (Beringer et al., 2016) in Australia (Column 3), together with percentage errors (PE, %) for QldFCP-2 AET data (Column 7, 11 model average), SILO AET data (Column 8), AWO AET data (Column 9), ERA5-Land AET data (Column 10), Copernicuss AET data (Column 11), GLEAM AET data (Column 12), DOLCE AET data (Column 13) and CMRSET (Column 14) for comparison. The last column shows PE for bias corrected QldFCP-2 AET data (11 model average) using QDM bias correction method.

Site name	Date range	OzFlux towers AET (mm/year)	Lat (S)	Long (E)	World ecoregion	PE (%) (QldFCP-2)	PE (%) (SILO)	PE (%) (AWO)	PE (%) (ERA5-Land)	PE (%) Copernicuss)	PE (%) (GLEAM)	PE (%) (DOLCE)	PE (%) (CMRSET)	PE (%) (BC-QldFCP-2)
Adelaide River	2007–2009	1120.8	-13.0769	131.1178	Tropical savannas	3.87	23.75	9.46	27.73	1.51	31.34	31.69	25.69	8.58
Alice Springs	2010–2014	263.9	-22.2830	133.2490	Deserts and xeric shrublands	26.72	38.31	76.07	33.77	32.03	27.31	7.25	11.20	30.45
Arcturus	2011–2013	398.9	-23.8587	148.4746	Tropical grassland	85.72	147.05	49.66	53.59	16.89	65.69	50.38	NA	26.94
Calperum	2010–2014	300.4	-34.0027	140.5877	Mediterranean woodlands	12.41	70.11	7.54	1.10	0.37	5.23	8.89	10.04	16.28
Cow Bay	2009–2014	1087.1	-16.1032	145.4469	Tropical and sub-tropical moist broadleaf forests	17.62	34.30	14.46	7.59	NA	39.07	30.25	54.62	12.39
Cumberland	2013–2014	550.1	-33.6153	150.7236	Temperate woodlands	13.53	59.24	22.51	54.04	NA	47.31	32.39	8.91	27.65
Daly River pasture	2007–2013	740.7	-14.1331	131.3856	Tropical pasture	20.12	67.54	43.88	7.85	37.01	0.51	2.73	45.50	33.33
Daly River uncleared	2007–2014	869.6	-14.1592	131.3881	Tropical savannas	2.21	38.51	11.24	4.81	15.78	14.93	17.59	3.33	4.89
Dargo	2007–2014	551.4	-37.1334	147.1709	Montane grasslands	34.44	52.25	71.71	40.18	48.92	81.66	44.26	8.94	68.49
Dry River	2008–2014	805.4	-15.2588	132.3706	Tropical savannas	3.96	22.36	1.68	2.22	0.34	17.97	22.91	2.21	7.98
Fogg Dam	2006–2008	1355.3	-12.5452	131.3072	Tropical wetland	14.30	7.73	20.05	37.11	12.32	38.37	41.19	6.54	22.22
Gingin	2011–2014	601.1	-31.3764	115.7139	Mediterranean woodlands	6.18	51.81	7.15	18.65	6.78	15.29	1.18	3.95	8.60
Great Western Woodland	2013–2014	261.7	-30.1913	120.6541	Mediterranean woodlands	7.00	39.47	31.91	16.21	31.85	0.57	6.88	0.56	37.75
Howard Springs	2001–2014	1135.1	-12.4943	131.1523	Tropical savannas	4.83	35.05	2.98	19.60	16.15	17.17	21.66	5.29	3.42
Nimmo	2007–2014	637.0	-36.2159	148.5528	Montane grasslands	3.55	37.52	21.63	6.73	NA	23.72	18.52	12.70	20.01
Riggs Creek	2010–2014	462.7	-36.6499	145.5760	Pasture	2.85	73.55	49.25	54.31	34.23	32.10	27.28	12.04	31.13
Robson Creek	2013–2015	1185.8	-17.1175	145.6301	WET Tropical and sub-tropical moist broadleaf forests	11.04	13.89	14.56	27.54	NA	7.22	0.45	13.10	6.28
Samford	2010–2014	564.2	-27.3881	152.8778	SEQ Pasture	99.53	87.61	61.82	55.49	NA	65.68	44.65	60.58	53.28
Sturt Plains	2008–2014	549.6	-17.1507	133.3502	Tropical grasslands	17.63	19.54	11.71	3.19	19.23	0.07	18.24	1.46	2.68
Ti Tree East	2012–2014	214.0	-22.2870	133.6400	Deserts and xeric shrublands	16.50	2.34	50.37	5.07	64.05	4.41	25.17	32.98	58.01

Tumbarumba	2001–2014	850.7	-35.6566	148.1517	Temperate broadleaf and mixed forest	7.91	2.97	2.63	5.70	16.68	7.94	12.15	18.89	1.46
Wallaby Creek	2005–2013	911.3	-37.4259	145.1878	Temperate broadleaf and mixed forest	19.81	15.89	17.44	28.84	15.57	20.44	27.33	22.86	17.33
Warra	2013–2014	643.2	-43.0950	146.6545	Temperate broadleaf and mixed forest	3.39	7.82	23.34	8.93	38.02	62.27	26.18	18.77	23.09
Whroo	2011–2014	494.9	-36.6732	145.0294	Temperate woodlands	3.17	54.88	6.49	17.80	8.25	19.00	11.81	4.82	0.57
Wombat	2010–2014	724.2	-37.4222	144.0944	Temperate broadleaf forest	2.20	0.80	3.20	9.83	21.96	2.39	9.95	0.33	0.06
Yanco_JAXA	2012–2014	266.5	-34.9893	146.2907	Temperate grasslands	3.16	146.53	39.51	65.07	12.57	48.00	38.17	22.93	56.89
Mean PE (%)	NA	NA	NA	NA	NA	17.00	44.00	26.00	24.00	22.00	27.00	21.45	15.7	22.3

Table S2: List of annual average evapotranspiration data, bias (against OzFlux), absolute error (against OzFlux) and percent error (against OzFlux) for two selected OzFlux towers in a) Adelaide River and in b) Samford. QldFCP-2 value refers to 11 model average. BC QldFCP-2 value refers to 11 model average after QDM bias correction.

A) Adelaide River

DATA TYPE	AET VALUE (MM/YEAR)	BIAS	ABSOLUTE ERROR	PERCENT ERROR (%)
OZFLUX	1120.8	0.0	0.0	0.0
QLDFCP-2	1077.38	-43.42	43.41	3.87
SILO	1387.00	266.20	266.20	23.75
AWO	1014.79	-106.01	106.00	9.46
ERA5-LAND	810.03	-310.77	310.76	27.73
COPERNICUSS AET	1103.91	-16.89	16.88	1.51
GLEAM	769.51	-351.29	351.28	31.34
DOLCE	765.64	-355.16	355.15	31.69
CMRSET	832.89	-287.91	287.91	25.69
BC QLDFCP-2	1024.58	-96.22	96.21	8.58

B) Samford

DATA TYPE	AET VALUE (MM/YEAR)	ERROR	ABS ERROR	PERCENT ERROR (%)
OZFLUX	564.2	0.0	0.0	0.0
QLDFCP-2	1125.77	561.57	561.56	99.53
SILO	1058.50	494.30	494.30	87.61
AWO	913.01	348.81	348.80	61.82
ERA5-LAND	877.27	313.07	313.06	55.49
COPERNICUSS AET	NA	NA	NA	NA
GLEAM	934.79	370.59	370.58	65.68
DOLCE	816.15	251.95	251.94	44.65
CMRSET	905.997	341.797	341.797	60.58
BC QLDFCP-2	864.823	300.62	300.62	53.28