Supplementary Material

Article Title: Quantifying the contribution of anthropogenic influence to the East Asian winter monsoon in 1960–2012

1. Assessment of the atmospheric circulation pattern by model in All-Hist runs

Taylor diagram (Figure 1S) shows the model can well reproduce the climatology of the EAWM-related circulation features in all 15 runs, ensemble average of all runs (referred to as "ensemble_all") and ensemble average of run1, run2, run5, run13, run14 and run15 (referred to as "ensemble_best"). The surface air temperature, Aleutian low, 500 hPa geopotential height and 300 hPa zonal wind show higher pattern correlations with observations. However, Table S1 shows the correlation between simulation and observation, and the trend coefficient, it suggests ensemble_best can better capture the variability of the EAWM indices and reliably reproduce the long-term trend (one is defined as the area-averaged surface air temperature and the other is defined as the area-averaged 500 hPa geopotential height) than others.
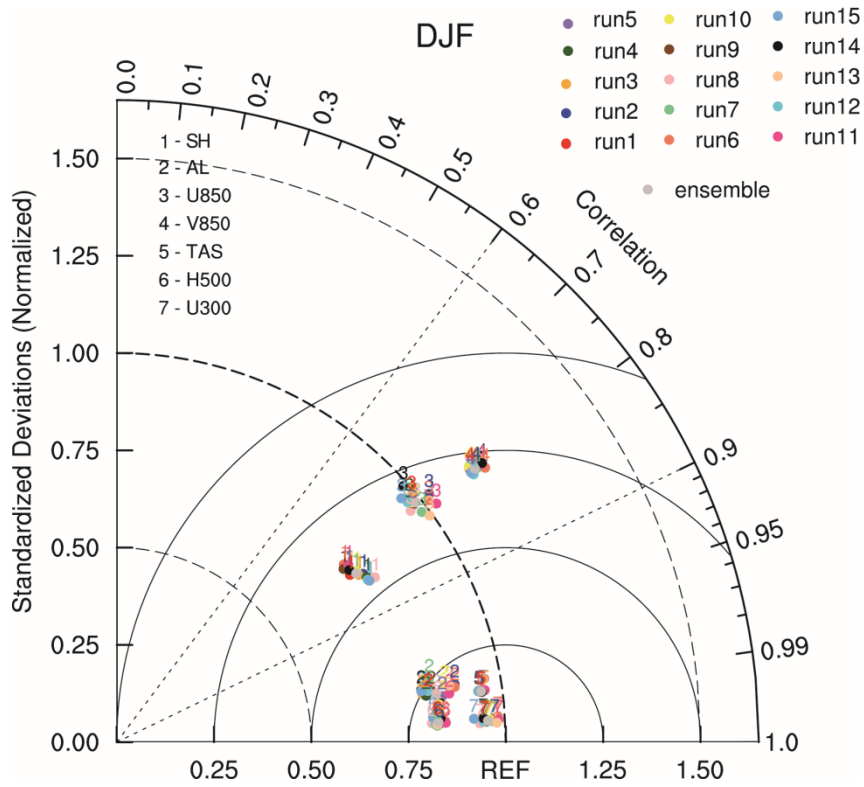
Figure 1S Taylor diagram of winter-mean climatology for Siberian high (SH; 40 °–60 °N, 70 °–120 °E), Aleutian low (AL; 40 °–70 °N, 110 °–160 °E), 850 hPa zonal wind (U850; 25 °–50 °N, 115 °–145 °E), 850 hPa meridional wind (V850; 25 °–50 °N, 115 °–145 °E), 850 hPa meridional wind (V850; 20 °–40 °N, 100 °–140 °E), surface air temperature (TAS; 25 °–45 °N, 105 °–145 °E), 500 hPa geopotential height (H500; 25 °–45 °N, 105 °–145 °E) and 300 hPa zonal wind (U300; (27.5 °–37.5 °N, 110 °–170 °E)−(50 °–60 °N, 80 °–140 °E)). The area of meteorological variable is selected to define the EAWM index.

Table 1 "tr" is an abbreviation for "linear trend coefficient" (EAWMI_HGT/EAWMI_SAT). "cor" is an abbreviation for "correlation coefficient between simulated EAWM index under All-Hist scenario and observed EAWM index" (EAWMI_HGT/EAWMI_SAT), "cor_dec" is an abbreviation for "correlation coefficient in decadal time-scale". As a reference, the linear trend coefficient of EAWM_HGT/EAWM_SAT is -0.02/-0.023. The red numbers are significant at the 90% confidence level.

	run 1	run 2	run 3	run 4	run 5	run 6	run 7	run 8
Cor	0.23/0.21	0.21/0.09	-0.19/-0.17	0/0.16	0.24/0.14	0.17/0.05	0.08/0.22	0.02/0.21
Cor_dec	0.64/0.44	0.63/0.81	-0.16/0.04	0.64/0.52	0.6/0.53	0.25/0.4	0.3/0.78	-0.31/0.37
tr	-0.032/-0.016	-0.018/-0.023	-0.003/-0.011	-0.016/-0.012	-0.016/-0.018	-0.016/-0.014	0/-0.017	0/-0.013
	run 9	run 10	run 11	run 12	run 13	run 14	run 15	ensemble_all
Cor	0.1/0.05	0.24/0.02	0.18/0.13	0.027/-0.055	0.23/0.3	0.11/0.18	0.07/-0.06	0.26/0.23
Cor_dec	0.27/0.6	0.57/0.38	0.54/0.14	0.12/0.42	0.67/0.63	0.76/0.64	0.67/0.49	0.67/0.57
tr	0/-0.014	-0.011/-0.015	-0.019/-0.017	-0.006/-0.023	-0.02/-0.018	-0.016/-0.013	-0.02/-0.023	-0.03/-0.04
	ensemble_best							
Cor	0.31/0.3							
Cor_dec	0.76/0.7							
tr	-0.038/-0.044							