Supplementary Materials: Global Climate Responses to Land Use and Land Cover Changes Over the Past Two Millennia

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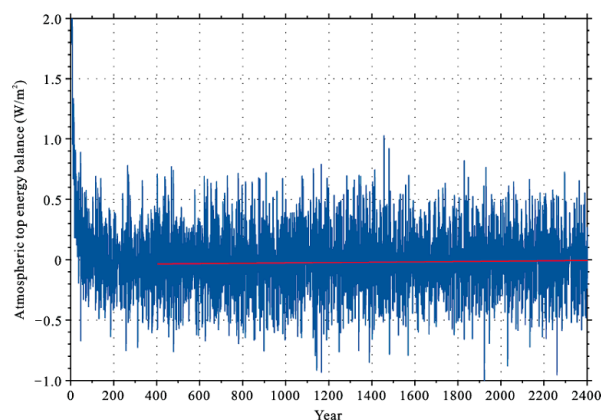

Figure S1. Time series of energy balance (W/m^2) at the top of atmosphere (TOA) from CTRL run. The blue line represents annual mean TOA, the red line represents its linear trend in the last 2000 years.
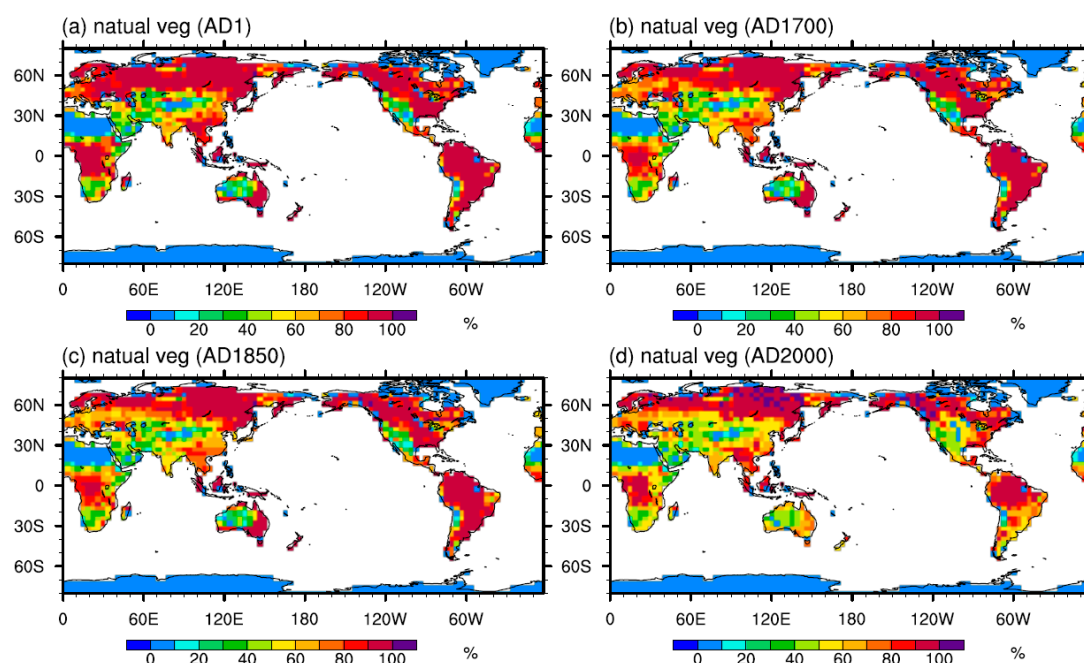

Figure S2. Spatial distributions of fractions of natural vegetation types during four periods. (**a**)–(**d**) represent 1AD, 1700AD, 1850AD and 2000AD respectively, used in the LU run.
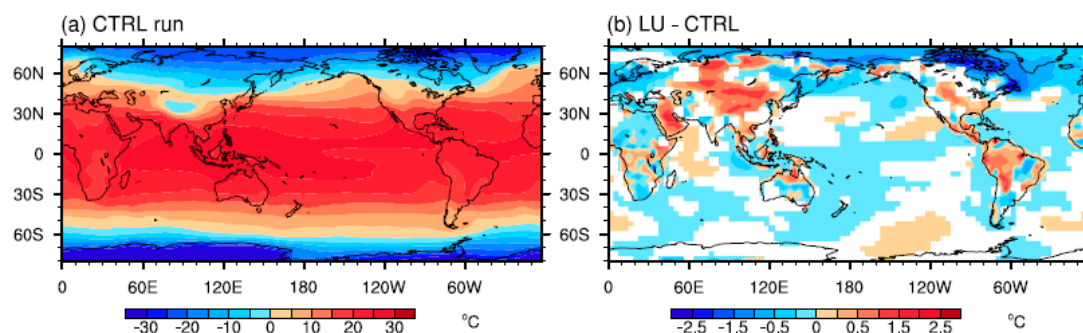
Figure S3. Spatial distributions of the annual mean surface temperature (°C) derived from the CTRL run (**a**) and the temperature difference (°C) between the LU run and CTRL run (**b**). Only those areas exceed the 95% confidence level are shown in (**b**).
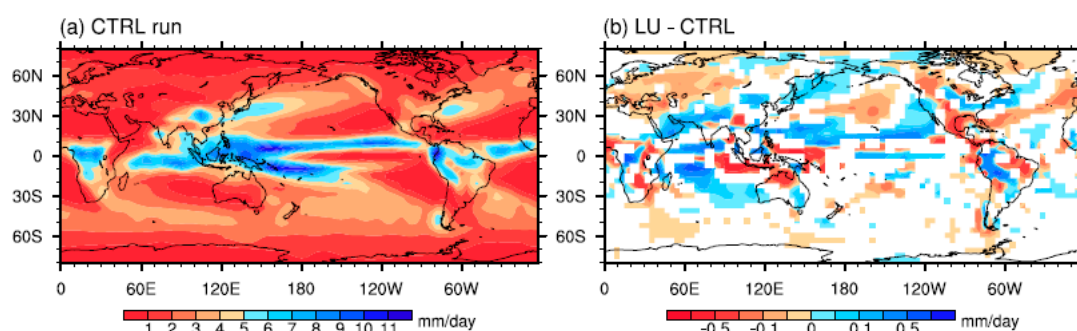

Figure S4. Spatial distributions of the annual mean precipitation rate (mm/day) derived from the CTRL run (**a**) and the precipitation difference (mm/day) between the LU run and CTRL run (**b**). Only those areas exceed the 95% confidence level are shown in (**b**).
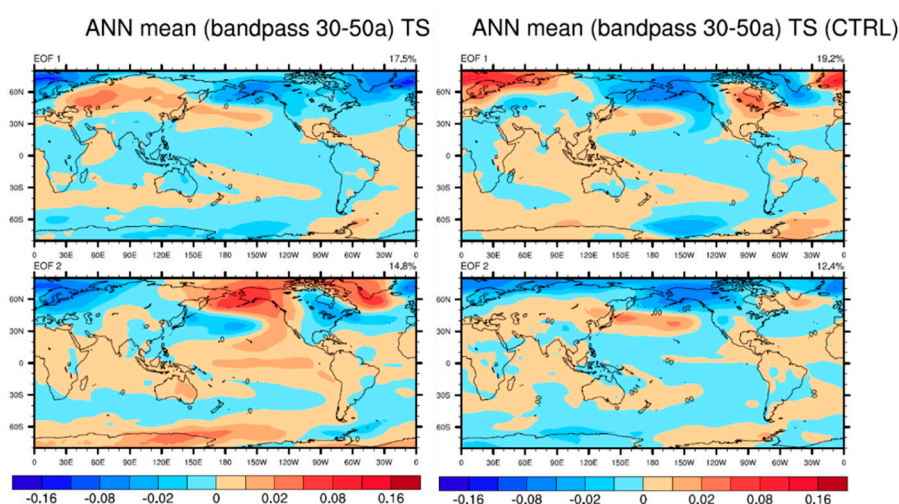

Figure S5. Spatial pattern of the leading EOF modes (EOF1 and EOF2) of annual surface temperature, after 30–50 years' band-pass filter. Left panels are derived from the LU run, right panels are derived from the CTRL run.

Table S1. Vegetation types' ID in CESM land component and in Kaplan's classification.

CLM4's ID	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Kaplan's ID	5 (50%)	5 (50%)	6	1	3	2	4 (50%)	4 (50%)	11 (50%)	8 (50%)	8 (50%)	11 (50%)	9	10	12	/

Table S2. The climatology of temperature and precipitation derived from CTRL and LU run and the difference for every 100 years during the last 1800 years.

Time Step	CTRL		LU		Difference	
	temp(degC)	precp(mm/day)	temp(degC)	precp(mm/day)	temp(degC)	precp(mm/day)
1	12.377	2.673	12.411	2.673	0.033 *	−2.79E-05
2	12.412	2.677	12.393	2.673	−0.019	−0.005 *
3	12.426	2.678	12.423	2.673	−0.004	−0.005 *
4	12.408	2.677	12.397	2.673	−0.012	−0.003 *
5	12.390	2.675	12.428	2.676	0.038 *	0.001
6	12.405	2.677	12.379	2.673	−0.026	−0.004 *
7	12.420	2.677	12.379	2.672	−0.041 *	−0.005 *
8	12.441	2.678	12.421	2.674	−0.020	−0.004 *
9	12.443	2.679	12.380	2.672	−0.063 *	−0.008 *
10	12.421	2.678	12.359	2.671	−0.061 *	−0.006 *
11	12.426	2.678	12.367	2.671	−0.060 *	−0.007 *
12	12.462	2.679	12.357	2.670	−0.106 *	−0.009 *
13	12.452	2.679	12.360	2.671	−0.092 *	−0.008 *
14	12.509	2.682	12.360	2.670	−0.149 *	−0.011 *
15	12.471	2.680	12.360	2.671	−0.111 *	−0.009 *
16	12.481	2.681	12.383	2.671	−0.098 *	−0.009 *
17	12.418	2.677	12.340	2.669	−0.079 *	−0.008 *
18	12.458	2.679	12.324	2.668	−0.134 *	−0.012 *

* denotes the value passed the t-test at 95% confidence level.