

*Supporting Information for*

**HiTIC-Monthly: A High Spatial Resolution (1 km×1 km) Monthly Human Thermal Index Collection over China from 2003 to 2020**

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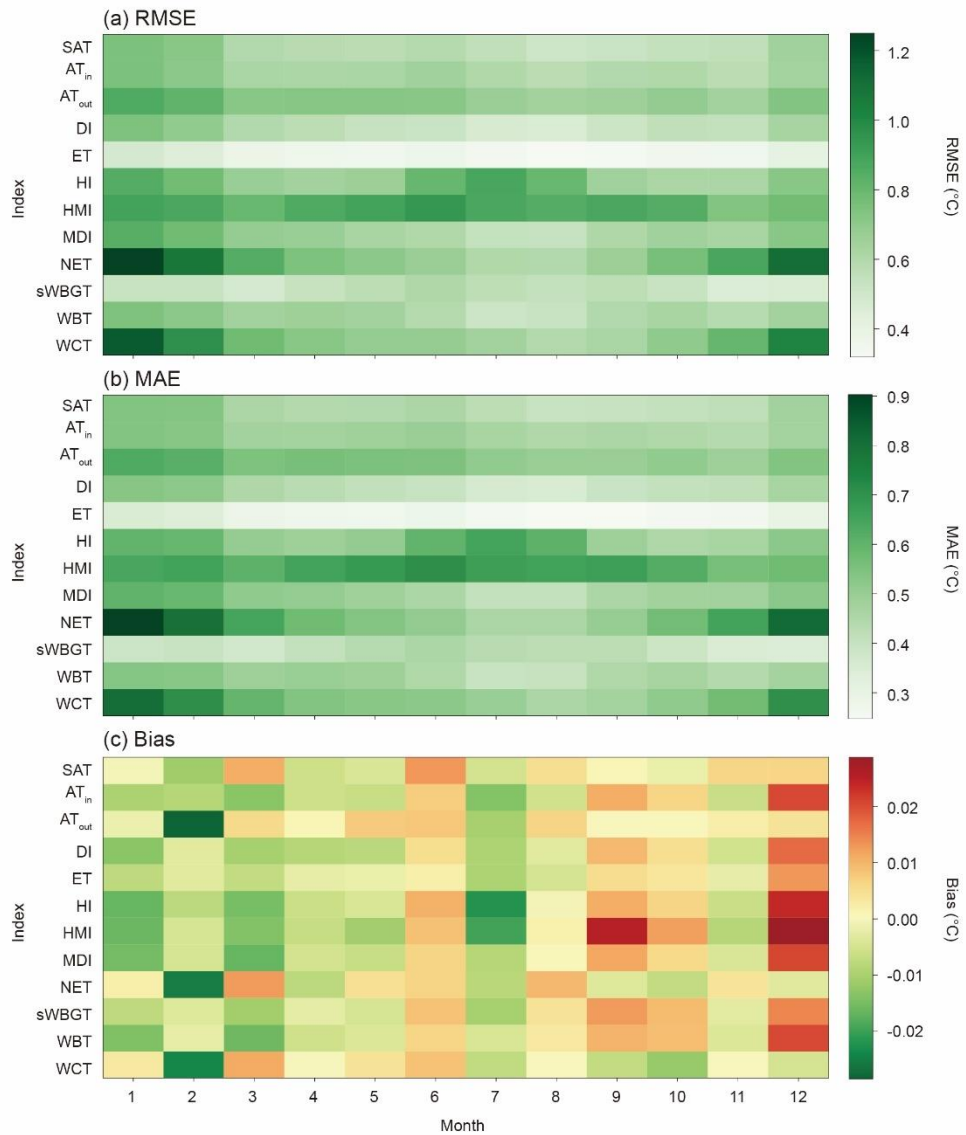
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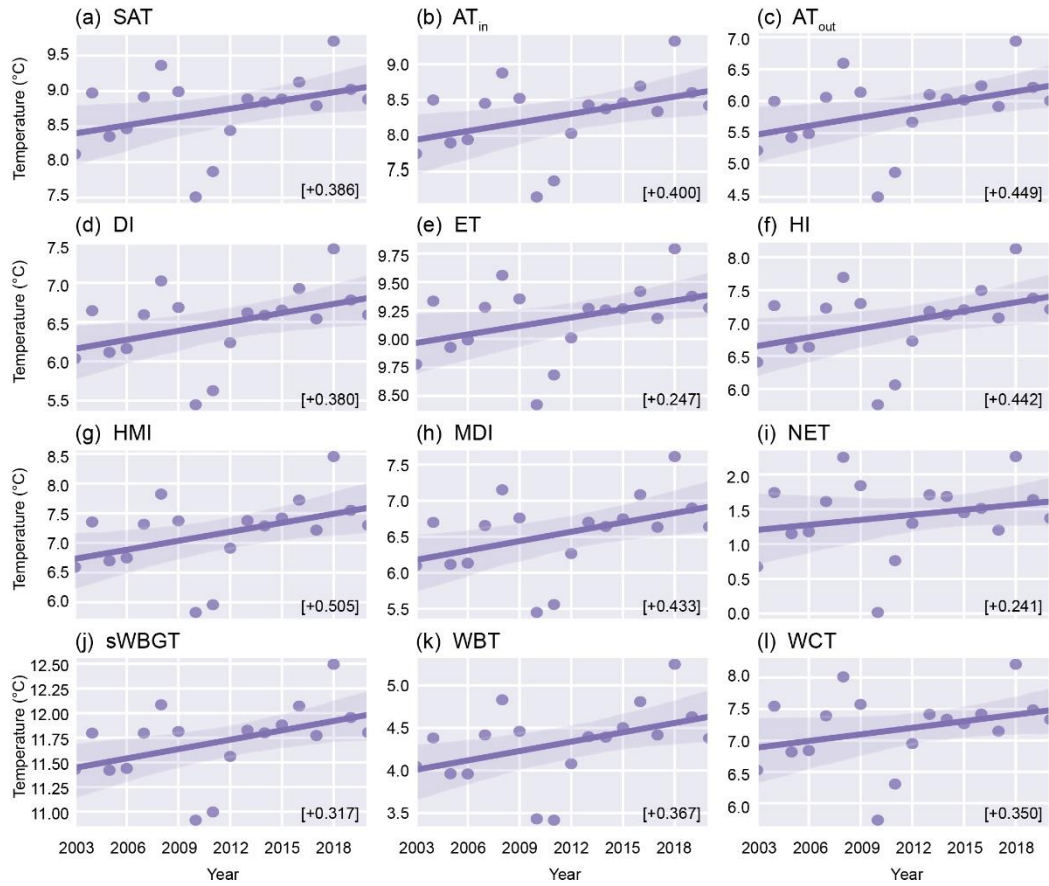
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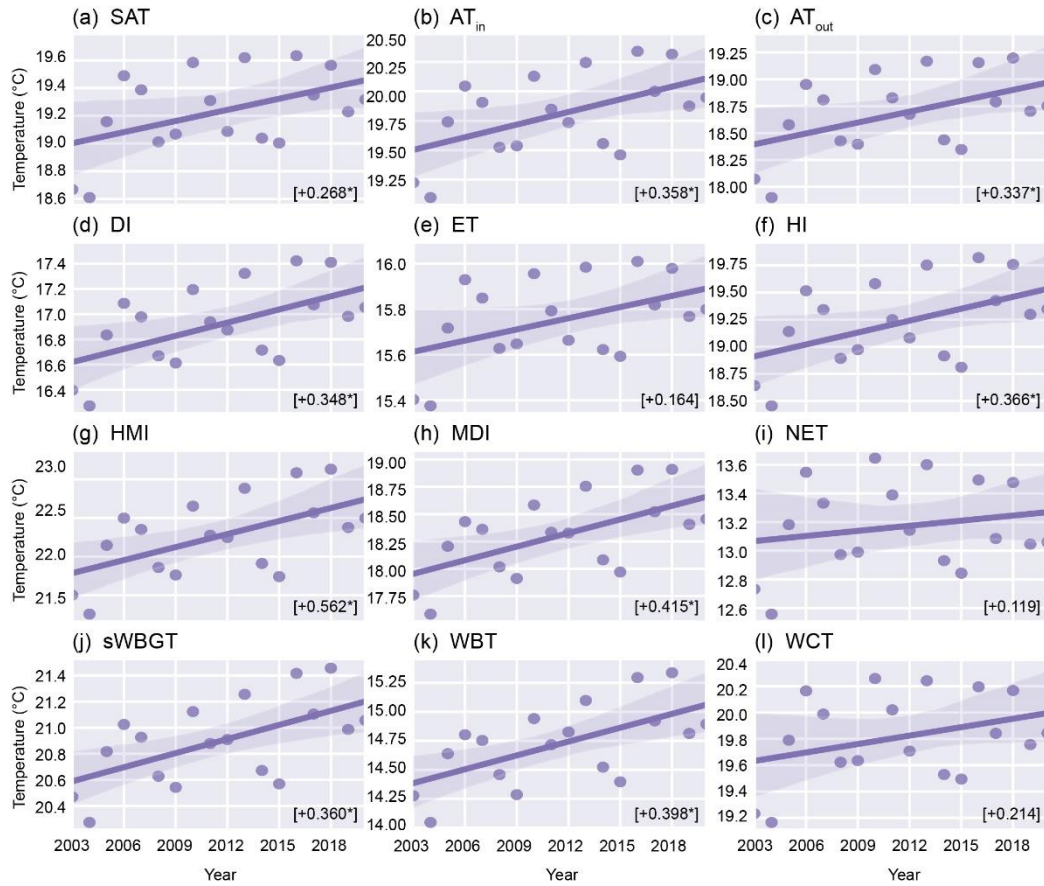
# Figures



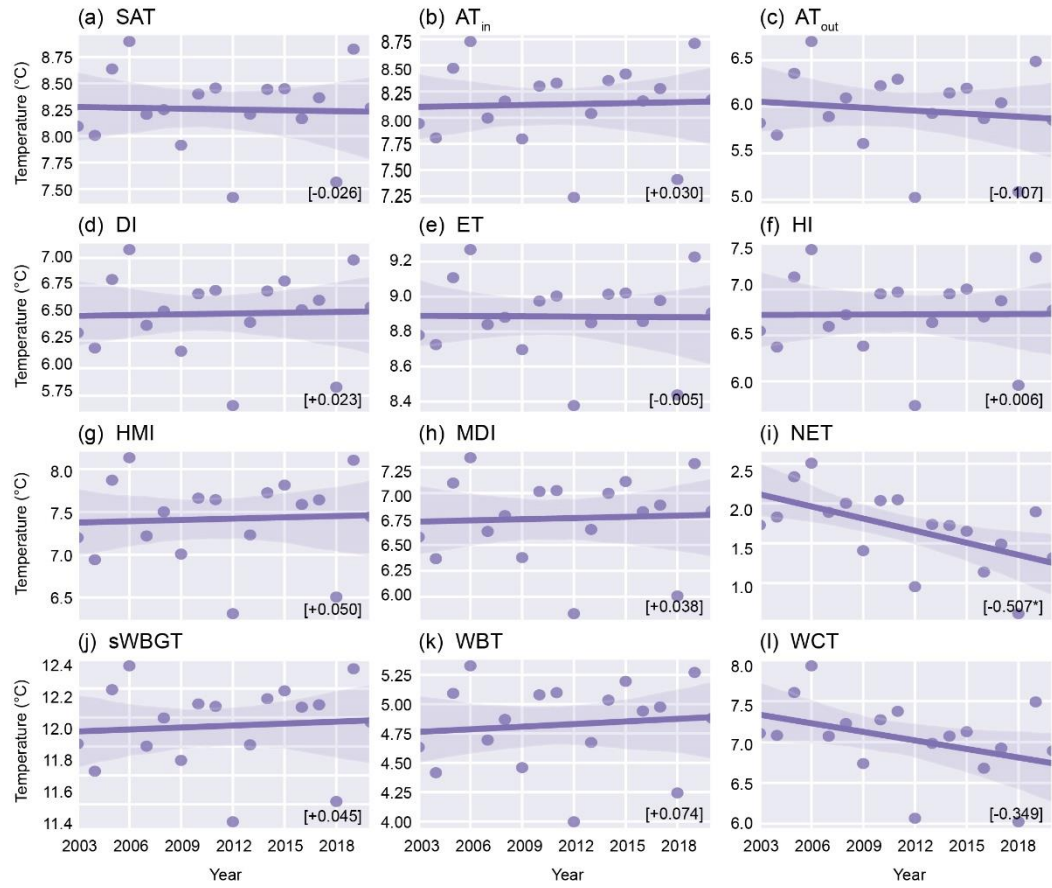
**Figure S1. Prediction accuracies of 12 human thermal indices in individual months over mainland China during 2003~2020.**



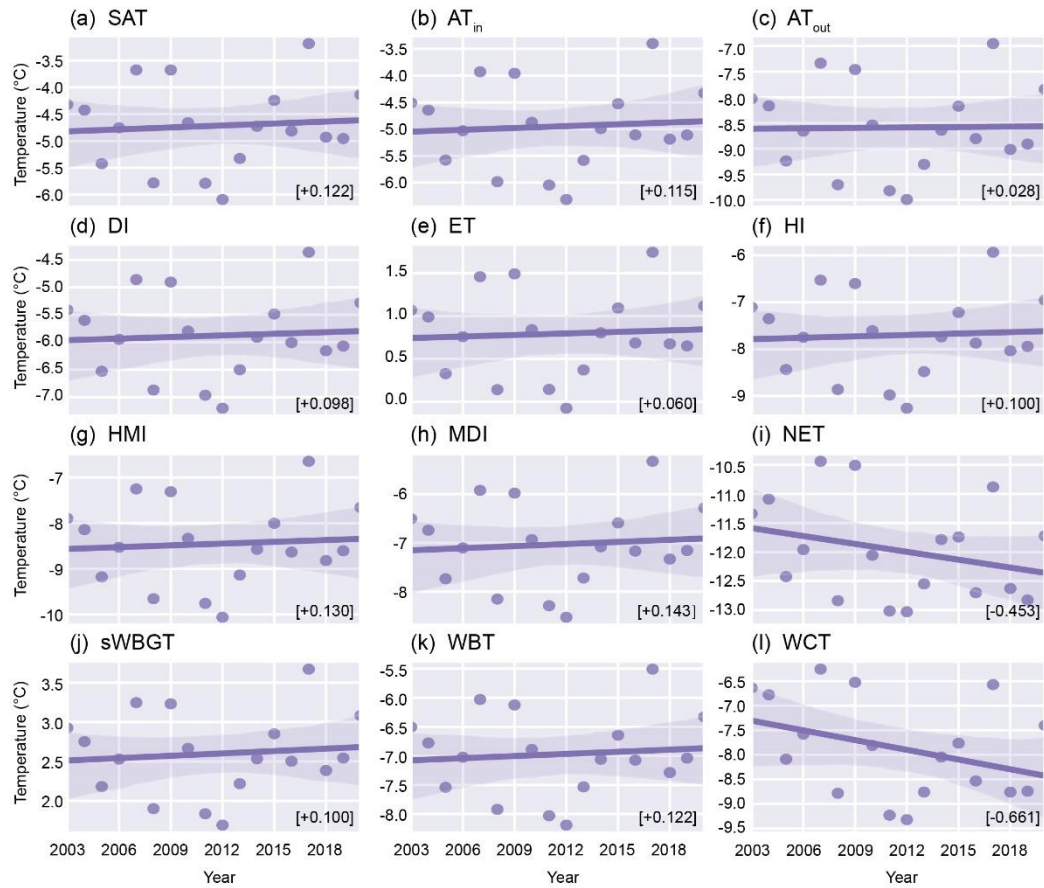
**Figure S2. Temporal variations of the national average of spring mean human thermal indices over mainland China during 2003~2020. The straight line illustrates the linear trend, and the number in square bracket means the corresponding trend per decade. The asterisk next to the number indicates that the trends are significant at the 0.05 level.**



**Figure S3. Temporal variations of the national average of summer mean human thermal indices over mainland China during 2003~2020. The straight line illustrates the linear trend, and the number in square bracket means the corresponding trend per decade. The asterisk next to the number indicates that the trends are significant at the 0.05 level.**

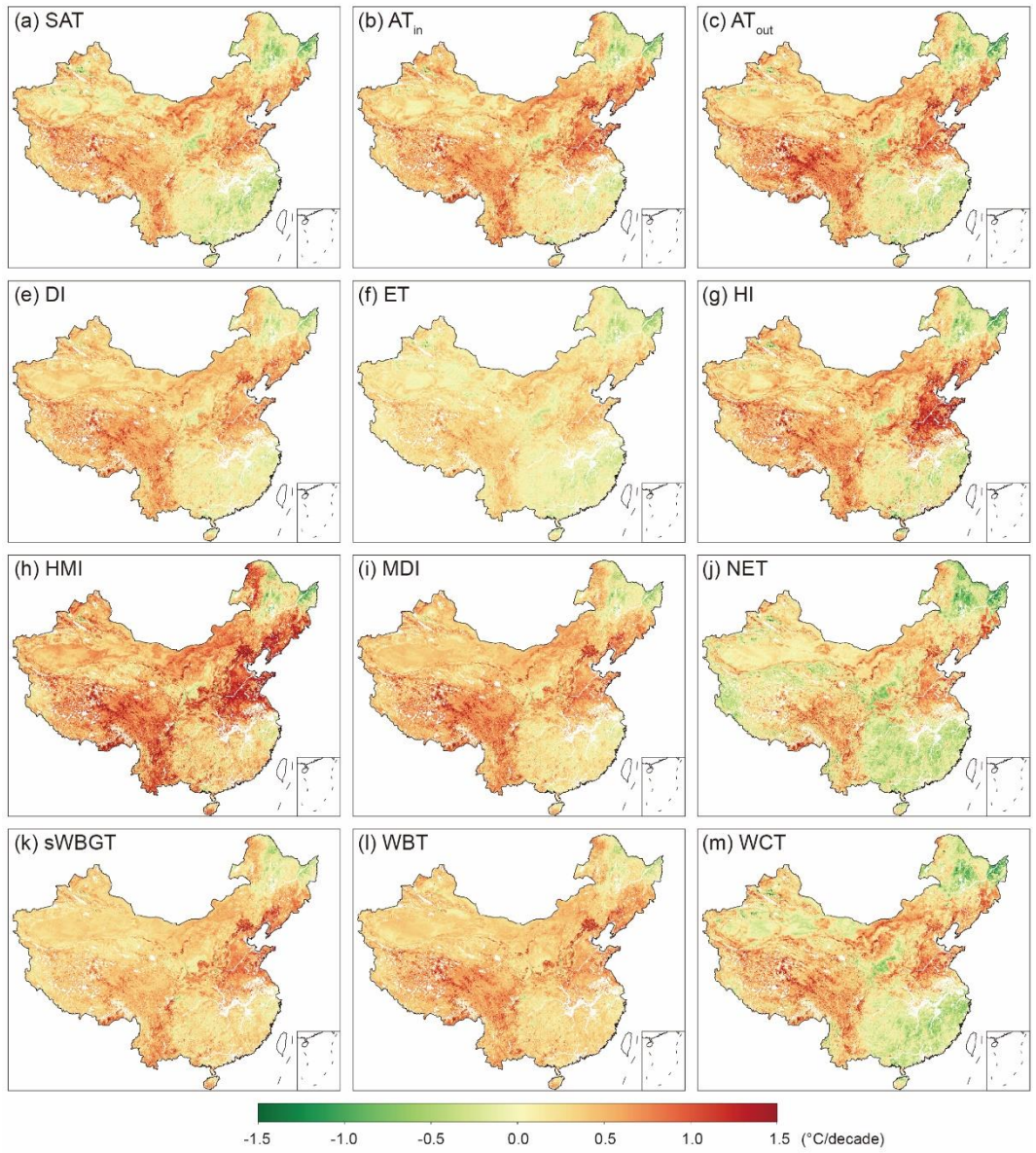


**Figure S4. Temporal variations of the national average of autumn mean human thermal indices over mainland China during 2003~2020. The straight line illustrates the linear trend, and the number in square bracket means the corresponding trend per decade. The asterisk next to the number indicates that the trends are significant at the 0.05 level.**

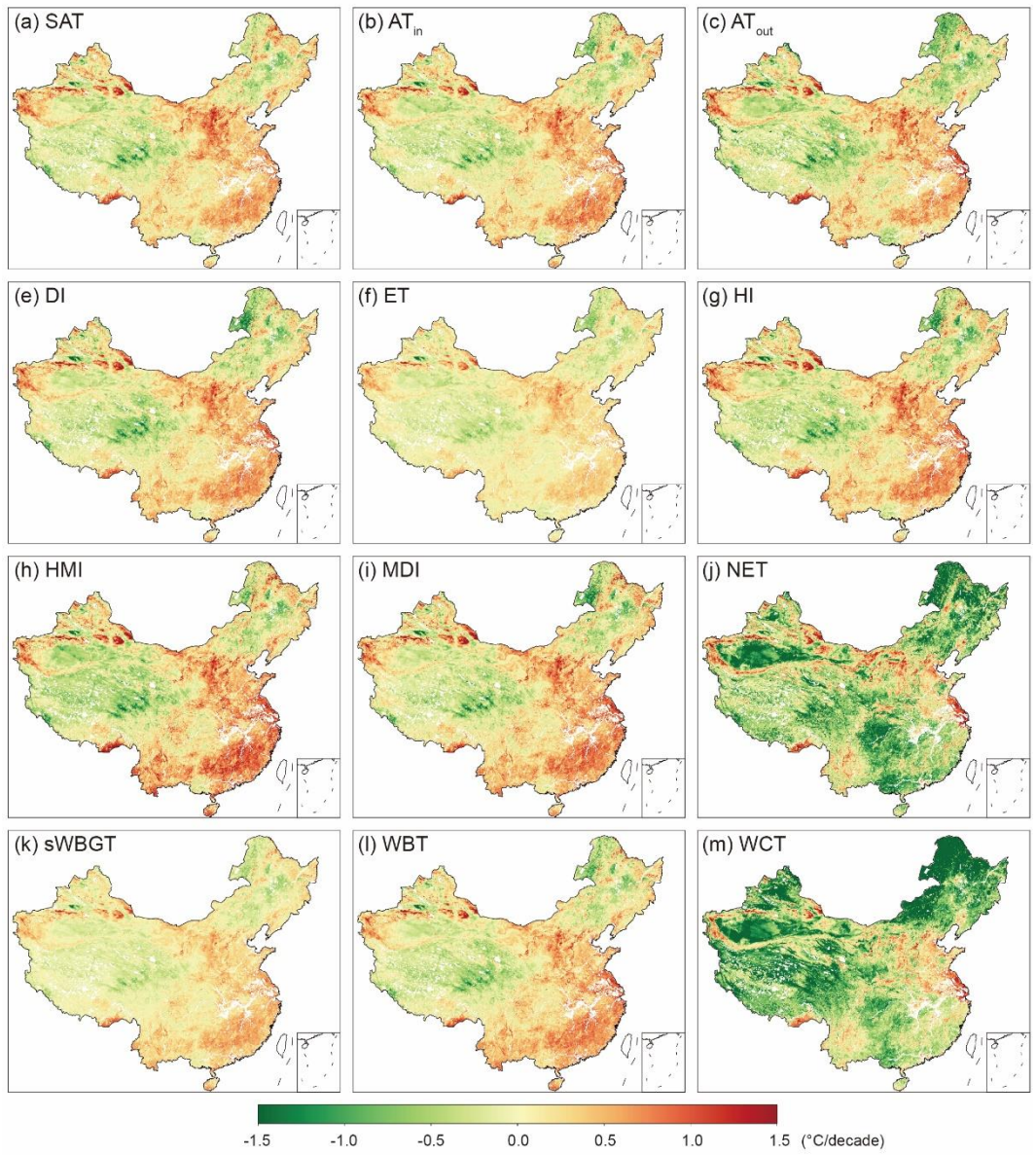


**Figure S5. Temporal variations of the national average of winter mean human thermal indices over mainland China during 2003–2020. The straight line illustrates the linear trend, and the number in square bracket means the corresponding trend per decade. The asterisk next to the number indicates that the trends are significant at the 0.05 level.**



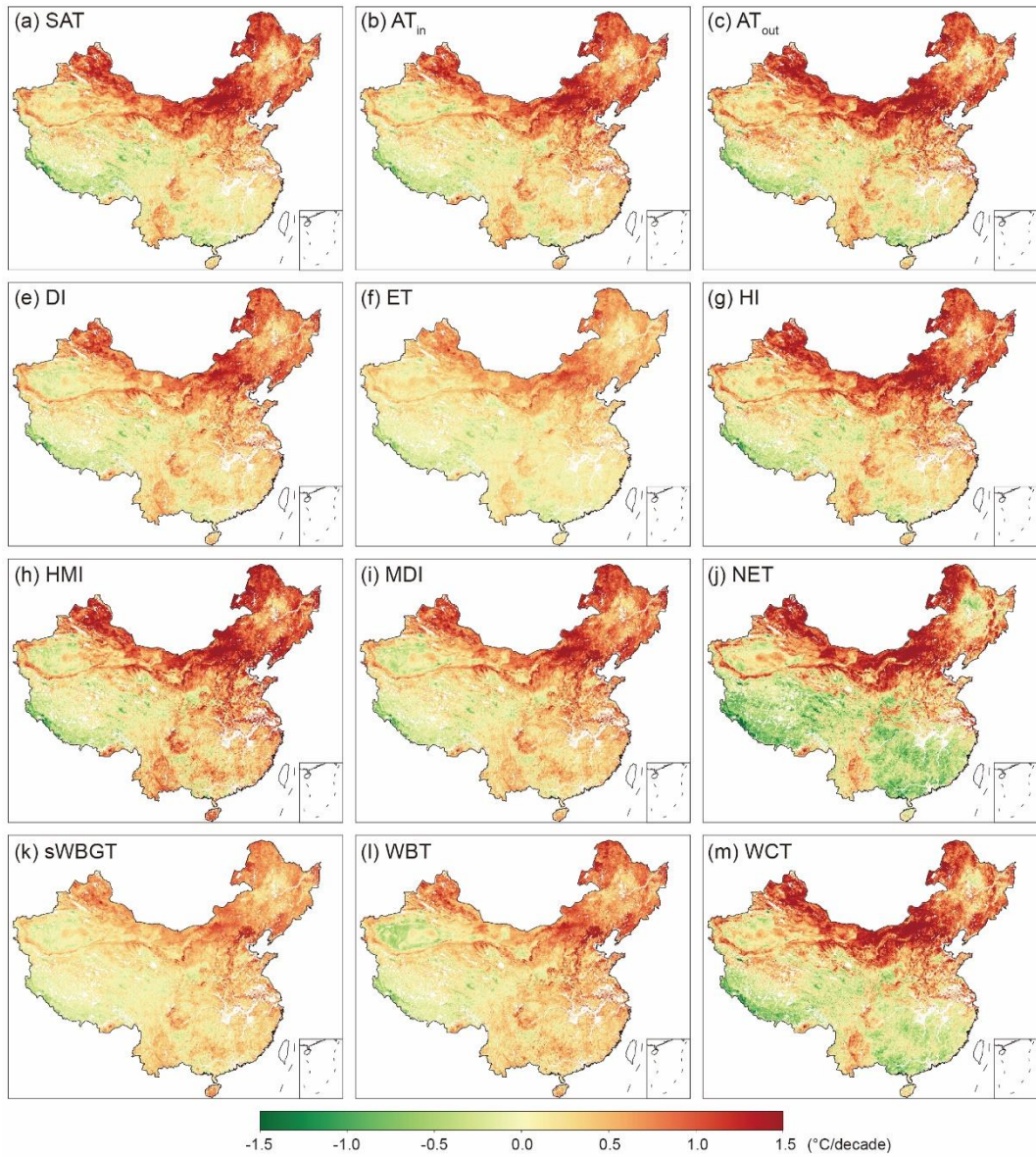


**Figure S6. Spatial distributions of the trends (unit:  $^{\circ}\text{C}/\text{decade}$ ) of summer mean human thermal indices over mainland China during 2003~2020.**

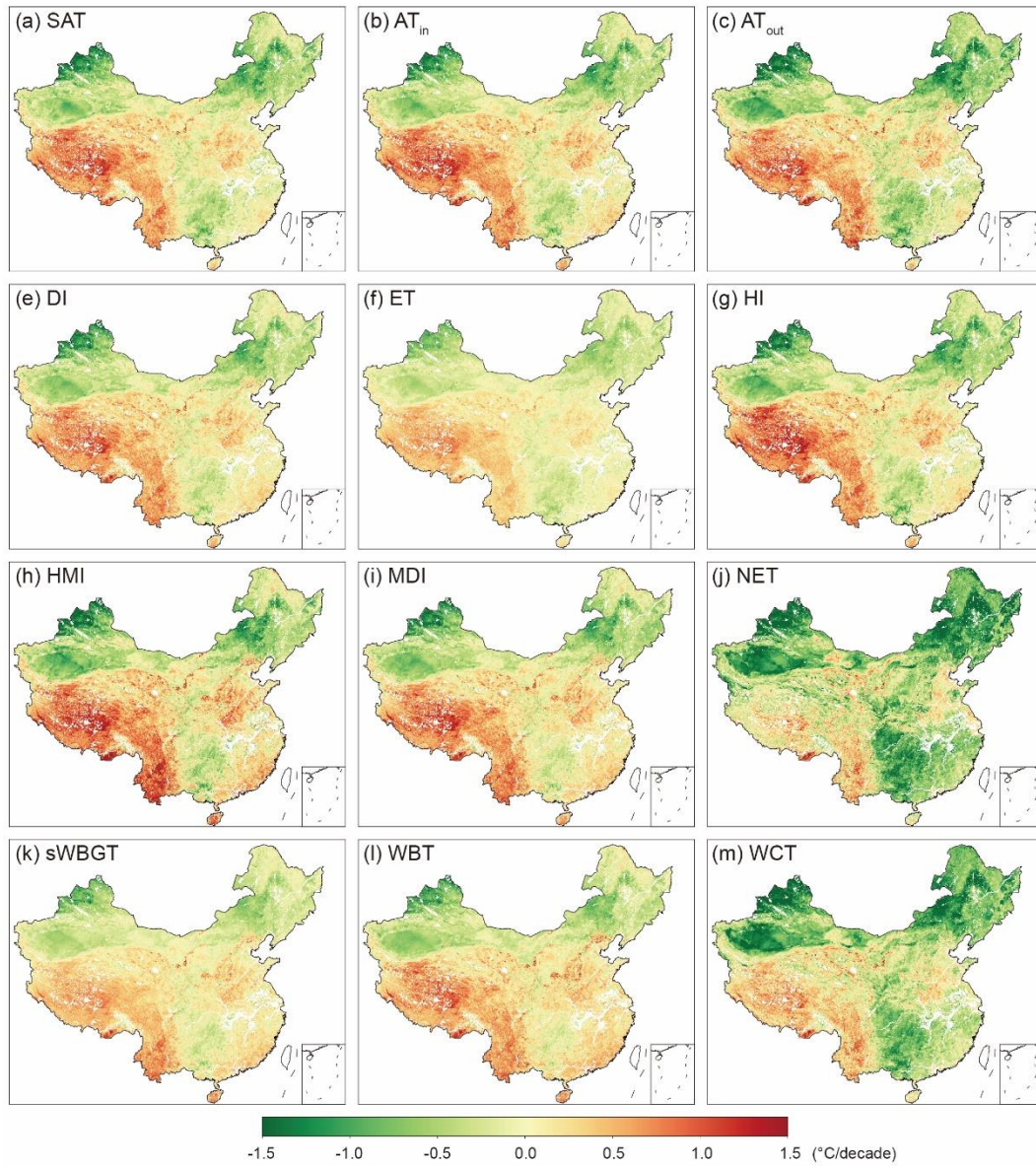


**Figure S7. Spatial distribution of the trend (unit:  $^{\circ}\text{C}/\text{decade}$ ) of winter mean human thermal indices over mainland China during 2003~2020.**





**Figure S8. Spatial distributions of the trends (unit:  $^{\circ}\text{C}/\text{decade}$ ) of spring mean human thermal indices over mainland China during 2003~2020.**



**Figure S9. Spatial distributions of the trends (unit:  $^{\circ}\text{C}/\text{decade}$ ) of autumn mean human thermal indices over mainland China during 2003~2020.**

## Tables

**Table S1. Comparison of four different thermal indices datasets.**

	<b>ERA5-HEAT</b>	<b>HDI</b>	<b>HiTiSEA</b>	<b>HiTiC-Monthly</b>
Spatial Resolution	0.25°×0.25°	0.25°×0.25°	0.1°×0.1°	1 km×1 km
Spatial Coverage	Global	Global	South and East Asia	Mainland China
Temporal Resolution	Hourly	Daily	Daily	Monthly
Temporal Coverage	1979~present	1970~2018	1981~2019	2003~2020
Thermal Indices	Mean Radiant Temperature (MRT), Universal Thermal Climate Index (UTCI)	Apparent Temperature indoors (ATind), two variants of Apparent Temperature outdoors in shade (ATot), Heat Index (HI), Humidex (HDEX), Wet Bulb Temperature (WBT), two variants of Wet Bulb Globe Temperature (WBGT), Thom Discomfort Index (DI), Windchill Temperature (WCT)	UTCI, indoor UTCI, outdoor shaded UTCI, MRT, Environment Stress Index (ESI), HI, Humidex, WBGT, WBT, WCT, AT, NET	SAT, AT <sub>in</sub> , AT <sub>out</sub> , DI, ET, HI, HMI, MDI, NET, sWBGT, WBT, WCT

**Table S2. Overall prediction accuracies of 12 human thermal indices over mainland China during 2003–2020.**

<b>Indices</b>	<b><math>R^2</math></b>	<b><math>RMSE</math> (°C)</b>	<b><math>MAE</math> (°C)</b>	<b><math>Bias</math> (°C)</b>
SAT	0.9969	0.603	0.451	-0.001
AT <sub>in</sub>	0.9971	0.635	0.478	0.002
AT <sub>out</sub>	0.9969	0.724	0.544	0.000
DI	0.9971	0.579	0.429	0.002
ET	0.9970	0.377	0.281	0.001
HI	0.9966	0.733	0.541	0.002
HMI	0.9968	0.859	0.645	0.000
MDI	0.9969	0.664	0.493	0.002
NET	0.9949	0.856	0.620	0.001
sWBGT	0.9967	0.535	0.401	-0.001
WBT	0.9964	0.629	0.469	0.000
WCT	0.9959	0.807	0.579	0.002

**Table S3.  $R^2$  of 12 predicted human thermal indices in 20 major urban agglomerations (UAs) over mainland China during 2003~2020.**

<b>UAs</b>	<b>SAT</b>	<b>AT<sub>in</sub></b>	<b>AT<sub>out</sub></b>	<b>DI</b>	<b>ET</b>	<b>HI</b>	<b>HMI</b>	<b>MDI</b>	<b>NET</b>	<b>sWBGT</b>	<b>WBT</b>	<b>WCT</b>
Beibu Gulf	0.9874	0.9884	0.9881	0.9886	0.9880	0.9851	0.9881	0.9883	0.9862	0.9871	0.9866	0.9872
Beijing-Tianjin-Hebei	0.9979	0.9979	0.9978	0.9977	0.9979	0.9974	0.9974	0.9975	0.9964	0.9972	0.9966	0.9974
Central Guizhou	0.9930	0.9931	0.9927	0.9929	0.9928	0.9928	0.9927	0.9926	0.9871	0.9923	0.9912	0.9899
Central Henan	0.9972	0.9973	0.9973	0.9973	0.9972	0.9967	0.9970	0.9971	0.9946	0.9968	0.9960	0.9957
Central Shanxi	0.9973	0.9974	0.9974	0.9973	0.9973	0.9972	0.9973	0.9971	0.9943	0.9971	0.9965	0.9955
Central Yunnan	0.9892	0.9912	0.9898	0.9912	0.9899	0.9904	0.9913	0.9915	0.9837	0.9913	0.9904	0.9876
Chengdu-Chongqing	0.9929	0.9936	0.9932	0.9931	0.9929	0.9921	0.9932	0.9926	0.9884	0.9931	0.9910	0.9897
Guanzhong	0.9959	0.9959	0.9958	0.9957	0.9958	0.9955	0.9957	0.9952	0.9925	0.9954	0.9943	0.9939
Harbin-Changchun	0.9983	0.9984	0.9983	0.9983	0.9983	0.9983	0.9983	0.9983	0.9961	0.9981	0.9980	0.9973
Hu-Bao-E-Yu	0.9977	0.9978	0.9976	0.9977	0.9976	0.9978	0.9977	0.9975	0.9942	0.9975	0.9968	0.9955
Jiang-Huai	0.9966	0.9970	0.9968	0.9968	0.9968	0.9955	0.9966	0.9967	0.9953	0.9964	0.9960	0.9962
Lanzhou-Xining	0.9964	0.9969	0.9968	0.9969	0.9968	0.9970	0.9969	0.9970	0.9939	0.9969	0.9966	0.9952
Mid-southern Liaoning	0.9974	0.9973	0.9971	0.9973	0.9975	0.9971	0.9969	0.9971	0.9949	0.9966	0.9966	0.9967
Middle Reaches of Yangtze River	0.9957	0.9959	0.9956	0.9958	0.9957	0.9943	0.9956	0.9955	0.9933	0.9955	0.9946	0.9946
Ningxia Yellow River	0.9974	0.9978	0.9975	0.9980	0.9978	0.9978	0.9978	0.9978	0.9948	0.9978	0.9972	0.9967
North Tianshan Mountain	0.9955	0.9949	0.9941	0.9942	0.9952	0.9947	0.9943	0.9938	0.9903	0.9938	0.9924	0.9905
Pearl River Delta	0.9893	0.9901	0.9907	0.9904	0.9899	0.9855	0.9893	0.9902	0.9896	0.9888	0.9889	0.9906
Shandong Peninsula	0.9975	0.9976	0.9973	0.9975	0.9976	0.9970	0.9972	0.9973	0.9960	0.9969	0.9965	0.9970
West Coast of Taiwan Strait	0.9925	0.9922	0.9928	0.9923	0.9923	0.9897	0.9916	0.9917	0.9904	0.9911	0.9905	0.9920
Yangtze River Delta	0.9972	0.9974	0.9971	0.9974	0.9972	0.9960	0.9972	0.9972	0.9961	0.9970	0.9966	0.9969



**Table S4. RMSE (°C) of 12 predicted human thermal indices in 20 major urban agglomerations (UAs) over mainland China during 2003~2020.**

UAs	SAT	AT <sub>in</sub>	AT <sub>out</sub>	DI	ET	HI	HMI	MDI	NET	sWBGT	WBT	WCT
Beibu Gulf	0.626	0.713	0.786	0.587	0.382	0.908	1.031	0.671	0.757	0.672	0.634	0.725
Beijing-Tianjin-Hebei	0.513	0.548	0.618	0.515	0.315	0.640	0.781	0.607	0.699	0.494	0.612	0.649
Central Guizhou	0.574	0.633	0.707	0.564	0.369	0.646	0.864	0.645	0.887	0.545	0.610	0.776
Central Henan	0.492	0.532	0.595	0.475	0.309	0.622	0.747	0.557	0.748	0.471	0.567	0.704
Central Shanxi	0.525	0.549	0.601	0.518	0.334	0.607	0.703	0.598	0.782	0.442	0.567	0.776
Central Yunnan	0.487	0.485	0.592	0.432	0.296	0.509	0.651	0.481	0.717	0.399	0.456	0.621
Chengdu-Chongqing	0.607	0.646	0.730	0.574	0.380	0.738	0.898	0.663	0.832	0.558	0.633	0.813
Guanzhong	0.581	0.630	0.705	0.582	0.370	0.690	0.837	0.685	0.826	0.528	0.656	0.813
Harbin-Changchun	0.590	0.591	0.661	0.563	0.371	0.650	0.749	0.642	0.991	0.463	0.591	0.855
Hu-Bao-E-Yu	0.589	0.566	0.664	0.545	0.371	0.631	0.703	0.619	0.967	0.434	0.587	0.952
Jiang-Huai	0.511	0.549	0.613	0.487	0.313	0.721	0.788	0.557	0.686	0.502	0.536	0.626
Lanzhou-Xining	0.553	0.532	0.591	0.502	0.332	0.574	0.655	0.554	0.729	0.392	0.505	0.723
Mid-southern Liaoning	0.604	0.650	0.746	0.604	0.374	0.717	0.891	0.699	0.932	0.560	0.670	0.806
Middle Reaches of Yangtze River	0.547	0.606	0.686	0.526	0.345	0.773	0.857	0.610	0.765	0.534	0.584	0.702
Ningxia Yellow River	0.541	0.509	0.612	0.449	0.313	0.552	0.627	0.527	0.786	0.373	0.501	0.706
North Tianshan Mountain	0.981	1.025	1.183	1.009	0.635	1.136	1.277	1.135	1.405	0.783	1.034	1.531
Pearl River Delta	0.557	0.660	0.683	0.537	0.346	0.922	0.988	0.614	0.648	0.635	0.585	0.615
Shandong Peninsula	0.498	0.533	0.627	0.490	0.303	0.630	0.764	0.569	0.709	0.486	0.571	0.640
West Coast of Taiwan Strait	0.551	0.652	0.679	0.542	0.346	0.833	0.956	0.634	0.696	0.612	0.599	0.650
Yangtze River Delta	0.453	0.505	0.575	0.436	0.288	0.668	0.706	0.504	0.617	0.451	0.487	0.554

**Table S5. MAE (°C) of 12 predicted human thermal indices in 20 major urban agglomerations (UAs) over mainland China during 2003~2020.**

<b>UAs</b>	<b>SAT</b>	<b>AT<sub>in</sub></b>	<b>AT<sub>out</sub></b>	<b>DI</b>	<b>ET</b>	<b>HI</b>	<b>HMI</b>	<b>MDI</b>	<b>NET</b>	<b>sWBGT</b>	<b>WBT</b>	<b>WCT</b>
Beibu Gulf	0.489	0.550	0.605	0.448	0.296	0.687	0.775	0.506	0.583	0.506	0.481	0.567
Beijing-Tianjin-Hebei	0.389	0.418	0.473	0.384	0.239	0.478	0.587	0.454	0.528	0.369	0.457	0.496
Central Guizhou	0.437	0.493	0.533	0.431	0.283	0.491	0.665	0.489	0.645	0.419	0.460	0.570
Central Henan	0.376	0.403	0.458	0.359	0.236	0.460	0.555	0.419	0.542	0.351	0.424	0.516
Central Shanxi	0.402	0.417	0.472	0.386	0.250	0.454	0.537	0.447	0.588	0.336	0.429	0.554
Central Yunnan	0.377	0.380	0.459	0.332	0.230	0.395	0.505	0.371	0.545	0.308	0.349	0.475
Chengdu-Chongqing	0.455	0.488	0.545	0.425	0.286	0.545	0.680	0.490	0.602	0.424	0.470	0.582
Guanzhong	0.439	0.472	0.530	0.432	0.279	0.513	0.634	0.507	0.611	0.397	0.494	0.596
Harbin-Changchun	0.435	0.442	0.494	0.415	0.276	0.485	0.556	0.475	0.666	0.341	0.438	0.569
Hu-Bao-E-Yu	0.458	0.434	0.517	0.407	0.281	0.485	0.538	0.466	0.689	0.332	0.448	0.629
Jiang-Huai	0.387	0.421	0.480	0.370	0.240	0.528	0.598	0.424	0.536	0.379	0.409	0.488
Lanzhou-Xining	0.432	0.408	0.462	0.386	0.261	0.446	0.503	0.429	0.571	0.302	0.393	0.553
Mid-southern Liaoning	0.465	0.495	0.577	0.458	0.286	0.541	0.671	0.530	0.692	0.423	0.512	0.610
Middle Reaches of Yangtze River	0.418	0.464	0.521	0.397	0.263	0.575	0.651	0.459	0.567	0.406	0.440	0.529
Ningxia Yellow River	0.422	0.400	0.486	0.343	0.242	0.423	0.483	0.409	0.592	0.291	0.372	0.535
North Tianshan Mountain	0.715	0.772	0.861	0.743	0.460	0.838	0.988	0.843	0.963	0.602	0.783	0.977
Pearl River Delta	0.428	0.492	0.522	0.399	0.261	0.663	0.715	0.455	0.495	0.459	0.427	0.470
Shandong Peninsula	0.379	0.408	0.477	0.372	0.234	0.475	0.577	0.432	0.522	0.364	0.433	0.482
West Coast of Taiwan Strait	0.427	0.509	0.530	0.425	0.269	0.623	0.748	0.492	0.530	0.474	0.464	0.501
Yangtze River Delta	0.346	0.378	0.438	0.324	0.217	0.476	0.525	0.373	0.470	0.331	0.360	0.425

**Table S6. Bias (°C) of 12 predicted human thermal indices in 20 major urban agglomerations over mainland China during 2003–2020.**

UAs	SAT	AT <sub>in</sub>	AT <sub>out</sub>	DI	ET	HI	HMI	MDI	NET	sWBGT	WBT	WCT
Beibu Gulf	-0.072	-0.089	-0.121	-0.079	-0.037	-0.094	-0.147	-0.082	-0.096	-0.098	-0.108	-0.106
Beijing-Tianjin-Hebei	0.052	0.073	0.073	0.069	0.034	0.080	0.119	0.086	0.024	0.096	0.059	0.079
Central Guizhou	0.008	-0.004	-0.020	-0.018	0.005	-0.008	-0.023	-0.029	-0.008	-0.037	0.010	-0.024
Central Henan	0.009	0.023	-0.009	0.026	0.005	0.024	0.051	0.035	-0.015	0.040	-0.020	0.037
Central Shanxi	0.037	0.027	0.031	0.031	0.016	0.036	0.047	0.034	0.041	0.037	0.038	0.028
Central Yunnan	-0.008	-0.019	-0.057	-0.018	-0.007	-0.011	-0.041	-0.023	-0.039	-0.029	-0.055	-0.020
Chengdu-Chongqing	-0.063	-0.053	-0.075	-0.054	-0.029	-0.056	-0.082	-0.071	-0.064	-0.063	-0.064	-0.043
Guanzhong	0.002	0.014	-0.009	0.012	0.013	0.015	0.022	0.017	0.001	0.013	0.022	0.014
Harbin-Changchun	0.008	0.011	0.014	0.009	0.001	0.010	0.028	0.011	0.007	0.012	0.006	0.017
Hu-Bao-E-Yu	0.027	0.007	0.051	0.003	0.003	0.008	0.022	0.011	0.021	0.012	0.003	0.014
Jiang-Huai	0.020	-0.022	-0.016	-0.035	-0.015	-0.020	-0.030	-0.029	-0.012	-0.035	-0.014	-0.023
Lanzhou-Xining	0.018	0.035	0.040	0.043	0.020	0.040	0.053	0.038	0.069	0.044	0.048	0.031
Mid-southern Liaoning	0.078	0.086	0.104	0.079	0.043	0.090	0.123	0.091	0.111	0.085	0.103	0.084
Middle Reaches of Yangtze River	-0.019	-0.028	-0.030	-0.023	-0.016	-0.028	-0.030	-0.030	-0.022	-0.029	-0.027	-0.017
Ningxia Yellow River	0.028	-0.017	0.006	-0.001	-0.001	-0.007	-0.003	0.000	0.003	0.025	0.056	-0.006
North Tianshan Mountain	-0.108	0.015	-0.004	-0.003	-0.017	-0.029	0.064	-0.014	-0.096	0.016	-0.145	0.048
Pearl River Delta	-0.089	-0.105	-0.083	-0.085	-0.061	-0.154	-0.160	-0.099	-0.065	-0.102	-0.069	-0.095
Shandong Peninsula	0.039	0.042	0.072	0.033	0.019	0.051	0.058	0.039	0.070	0.046	0.048	0.038
West Coast of Taiwan Strait	-0.029	-0.058	-0.040	-0.047	-0.023	-0.056	-0.091	-0.056	-0.039	-0.057	-0.036	-0.052
Yangtze River Delta	0.000	-0.020	-0.021	-0.021	-0.011	-0.024	-0.022	-0.023	-0.019	-0.018	-0.024	-0.020