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Supplement of

GSDM-WBT: global station-based daily maximum wet-bulb temperature data for 1981–2020

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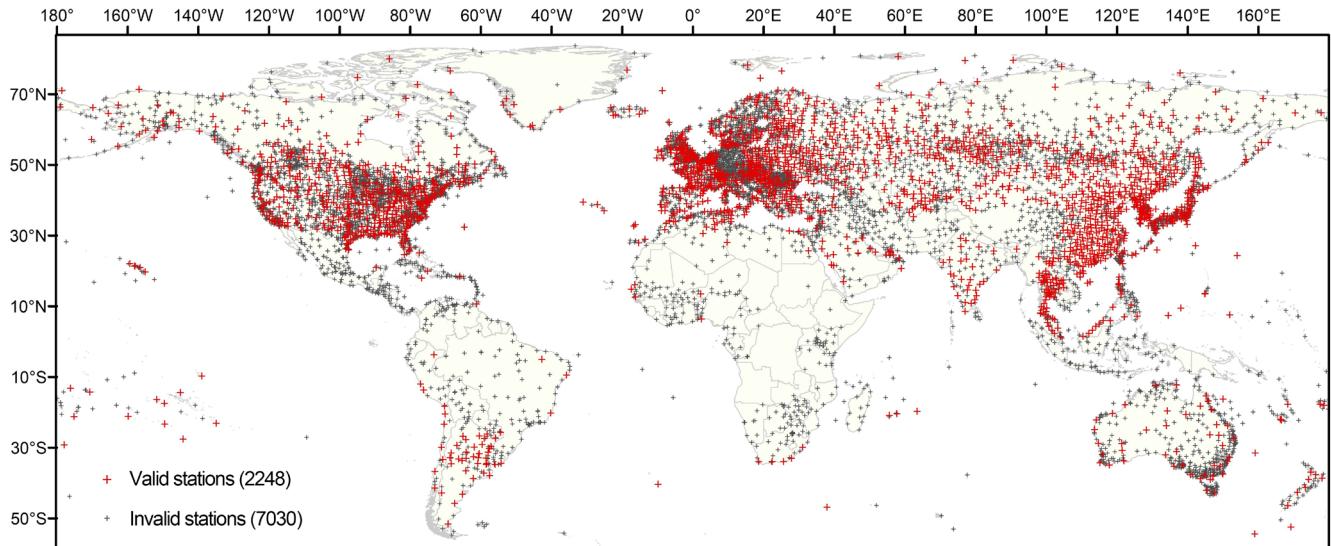
Figure S1. Spatial patterns of valid and invalid stations screened from the data quality control.
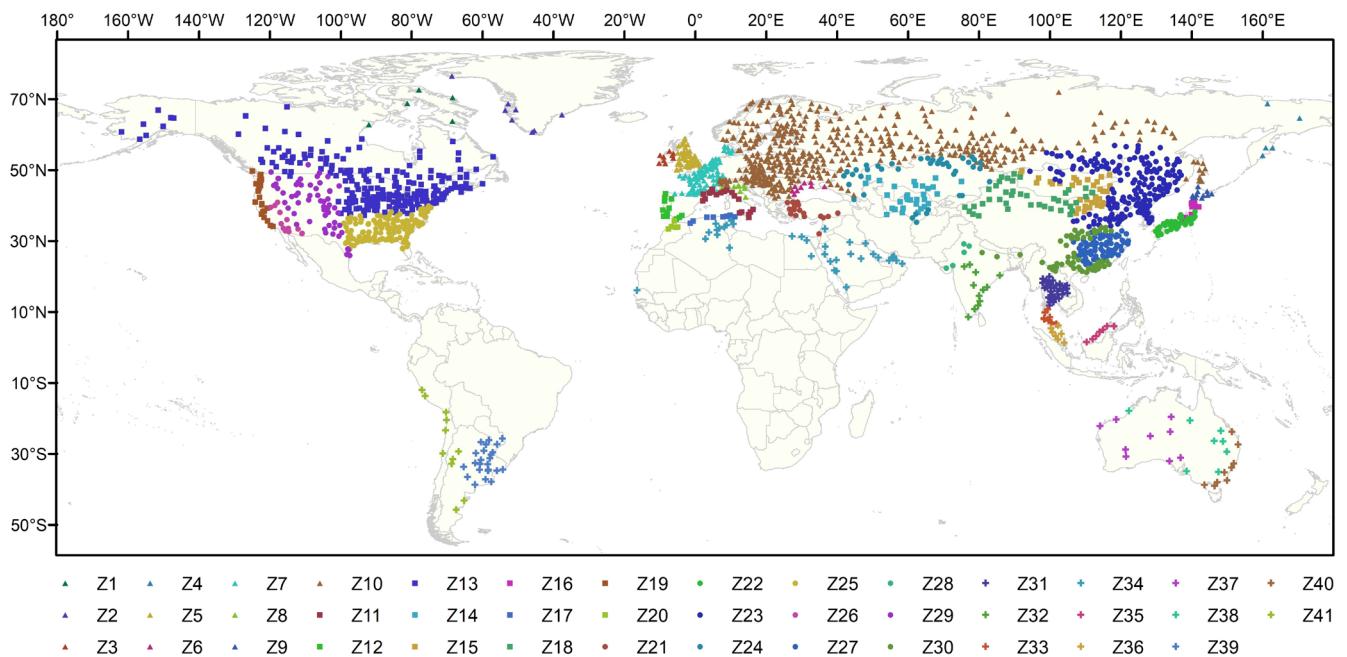
Figure S2. Spatial patterns of 41 station zones (including total 1834 stations) based on Koppen-Geiger climate classifications. Each station zone contains at least 5 stations for better homogenization.
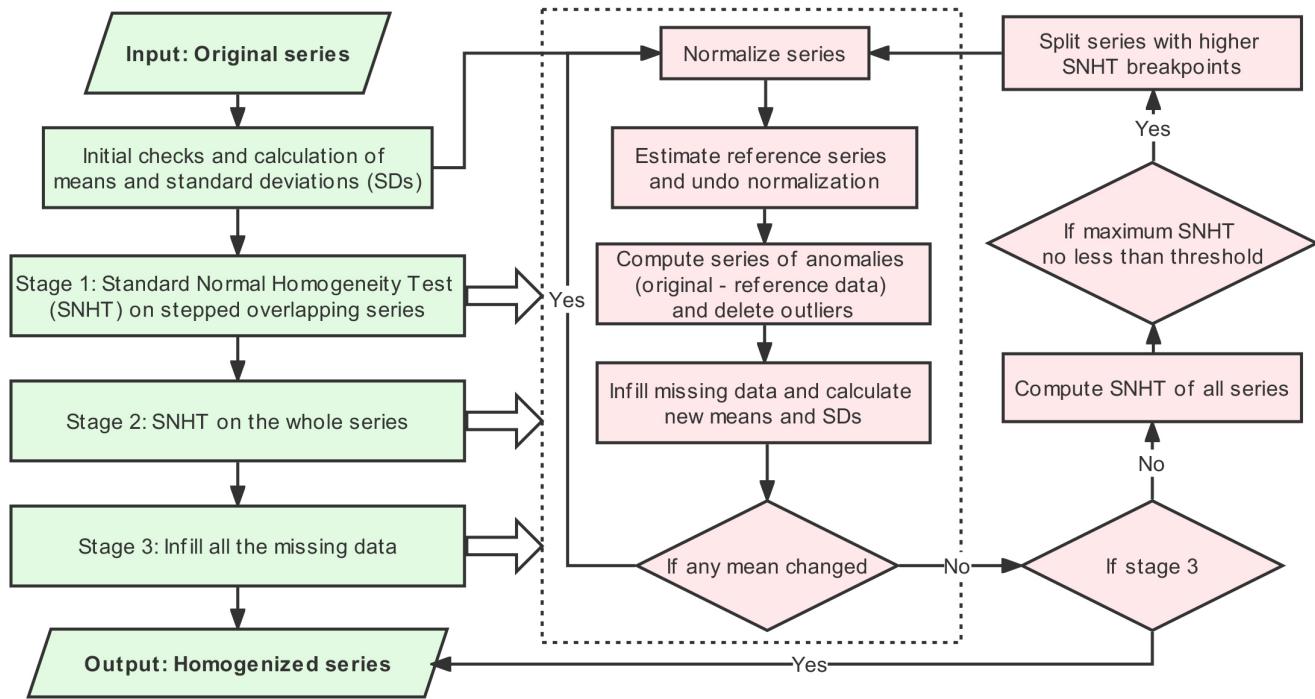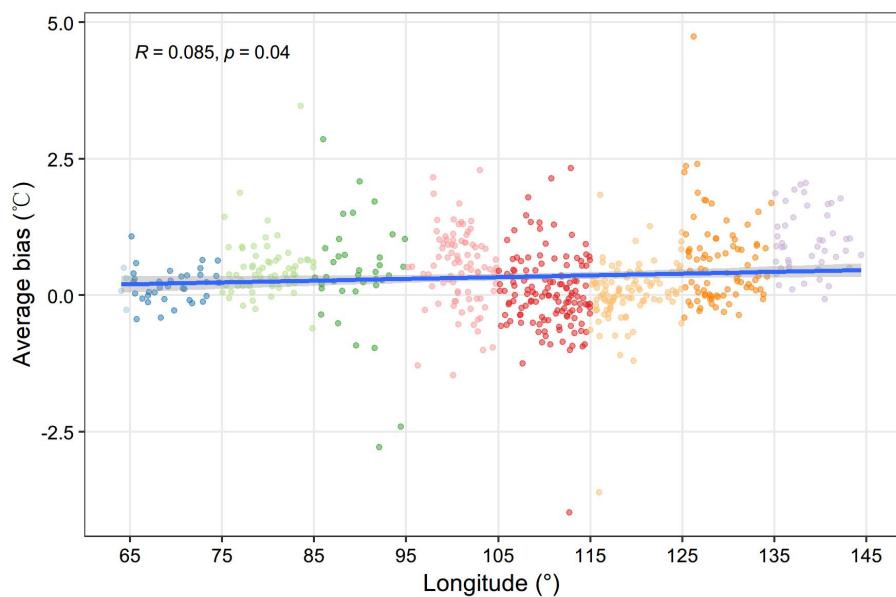
Figure S3. Procedures of Climatol (Modified based on the manual of Climatol package from https://www.climatol.eu/)

Figure S4. Correlation between longitude and average bias derived from daily maximum wet-bulb temperature of GSDM-WBT and that of the nearest grid points in HiTiSEA.

Table S1. Detailed parameters for Climatol in different station zones

Station zone	Maximum number of referenced data in SNHT test	Distance (in km) where referenced data weighs half in stage 3	Threshold of SNHT for stage 1	Threshold of SNHT for stage 2	Threshold of outlier for monthly series, in standard deviations	Threshold of outlier for daily series, in standard deviations
Z1	8	426.15	10	20	5	9
Z2	8	301.12	23	40	6	8
Z3	8	87.05	22	45	5	10
Z4	8	235.40	17	20	4	8
Z5	8	41.96	50	110	8	18
Z6	8	132.94	25	30	5	9
Z7	8	61.16	65	100	8	15
Z8	8	74.44	30	80	4.5	7
Z9	8	85.89	30	40	4.5	10
Z10	8	95.60	75	130	10	16
Z11	8	86.38	50	100	6	8
Z12	8	102.01	30	45	4.5	9
Z13	8	119.90	60	110	9	20
Z14	8	152.53	40	50	7	10
Z15	8	113.26	36	100	7	11
Z16	8	94.72	30	35	4.5	8
Z17	8	90.34	70	100	6	9
Z18	8	137.93	50	70	5.5	11
Z19	8	81.89	60	90	6	11
Z20	8	75.51	35	45	3.5	8
Z21	8	127.08	45	60	5	8
Z22	8	69.41	55	120	4.5	16
Z23	8	90.18	65	110	7	11
Z24	8	137.22	35	60	7	11
Z25	8	63.71	75	120	9	18
Z26	8	118.39	32	55	6	13
Z27	8	103.46	70	120	7	14
Z28	8	161.96	20	50	6	8
Z29	8	136.36	60	90	7	13
Z30	8	124.00	70	100	6	11
Z31	8	79.89	60	80	8	13
Z32	5	185.09	38	40	6	10
Z33	5	99.27	42	80	6	9
Z34	8	260.02	50	90	6	10
Z35	6	145.44	42	60	5	8
Z36	6	146.90	54	90	6	9
Z37	8	347.93	20	45	4.5	14
Z38	8	639.65	22	40	5	14
Z39	8	162.99	32	75	5	9
Z40	8	224.57	40	45	4.5	12
Z41	5	229.13	70	80	7	9

Table S2. Detailed information of the typical station in each station zone

Station zone	Station code	Station name	Longitude (+ East, - West)	Latitude (+ North, - South)	Selected criteria (value)		
					The most break points	Higher SNHT values	More missing data
Z1	710810-99999	HALL BEACH	-81.244	+68.776	√ (4)	—	—
Z2	042310-99999	SONDRE STROMFJORD	-50.689	+67.017	—	√ (35.9)	—
Z3	039760-99999	BELMULLET	-10	+54.233	√ (2)	√ (78.1)	—
Z4	324080-99999	UST'-KAMCHATSK	+162.717	+56.217	—	—	√ (1893)
Z5	034620-99999	WITTERING	-0.476	+52.613	√ (2)	—	—
Z6	154800-99999	CONSTANTA	+28.65	+44.217	√ (2)	—	—
Z7	064000-99999	KOKSIJDE	+2.653	+51.09	√ (2)	—	—
Z8	161490-99999	RIMINI	+12.612	+44.02	√ (3)	√ (47.4)	—
Z9	474280-99999	ESASHI	+140.117	+41.867	√ (3)	—	—
Z10	154500-99999	CRAIOVA	+23.889	+44.318	—	√ (168.8)	—
Z11	164200-99999	MESSINA	+15.55	+38.2	√ (2)	—	—
Z12	085620-99999	BEJA	-7.932	+38.079	√ (3)	√ (79.1)	—
Z13	727575-94925	GRAND FORKS AFB AIRPORT	-97.4	+47.967	√ (2)	—	—
Z14	382620-99999	CHIMBAJ	+59.817	+42.95	√ (2)	√ (110)	—
Z15	442980-99999	CHOIR	+108.217	+46.45	√ (2)	√ (53.2)	—
Z16	475740-99999	FUKAURA	+139.933	+40.65	√ (3)	—	—
Z17	607140-99999	SIDI AHMED AIR BASE	+9.791	+37.245	√ (2)	—	—
Z18	443470-99999	TSOGT-OVOO	+105.317	+44.417	√ (3)	—	—
Z19	742060-24207	MCCHORD AFB AIRPORT	-122.483	+47.15	—	√ (162.9)	—
Z20	601350-99999	SALE	-6.752	+34.051	√ (3)	—	—
Z21	171500-99999	BALIKESIR	+27.926	+39.619	√ (4)	—	—
Z22	477550-99999	HAMADA	+132.067	+34.9	√ (2)	√ (170.9)	—
Z23	539750-99999	YANGCHENG	+112.4	+35.483	√ (2)	√ (129.9)	—
Z24	389110-99999	KERKI	+65.2	+37.833	√ (3)	—	—
Z25	724243-03849	LDON-CRBN APT-MGEE FLD APT	-84.077	+37.087	√ (2)	—	—
Z26	699604-03145	YUMA MCAS	-114.617	+32.65	√ (2)	√ (36.1)	—
Z27	579930-99999	GANZHOU	+114.95	+25.85	√ (2)	√ (196.2)	—
Z28	421820-99999	SAFDARJUNG	+77.206	+28.585	√ (3)	√ (41.2)	—
Z29	724645-23070	PERRY STOKES AIRPORT	-104.338	+37.262	—	√ (195.4)	—

Z30	573280-99999	DA XIAN	+107.5	+31.2	√ (2)	√ (139)	—
Z31	484750-99999	HUA HIN	+99.952	+12.636	√ (2)	√ (92.6)	—
Z32	433440-99999	TIRUCHIRAPPALLI	+78.71	+10.765	√ (2)	—	—
Z33	485520-99999	CHA IAN	+99.956	+8.471	√ (3)	—	—
Z34	403750-99999	TABUK	+36.619	+28.365	√ (2)	√ (85.2)	—
Z35	963150-99999	BRUNEI INTL	+114.928	+4.944	√ (4)	—	—
Z36	486980-99999	SINGAPORE CHANGI INTL	+103.994	+1.35	√ (2)	√ (82.7)	—
Z37	944480-99999	LEONORA	+121.333	-28.883	√ (2)	√ (62)	—
Z38	945150-99999	ROMA AIRPORT	+148.783	-26.55	—	√ (46.9)	—
Z39	865800-99999	CARRASCO INTL	-56.031	-34.838	√ (4)	—	—
Z40	943800-99999	GLADSTONE RADAR	+151.267	-23.85	√ (2)	—	—
Z41	878600-99999	COMODORO RIVADAVIA	-67.466	-45.785	—	√ (177.3)	—

25

Table S3. The effect of complementary series in different station zones.

Station zone	Number of complementary series	Number of all stations	Number of void time steps in all stations	Percentage of void time steps in all stations (%)
Z1	1	5	27	0.18
Z2	1	8	8	0.05
Z3	1	9	14	0.10
Z4	1	5	36	0.25
Z5	5	54	12	0.08
Z6	1	9	10	0.07
Z7	9	87	5	0.03
Z8	1	11	8	0.05
Z9	1	12	378	2.59
Z10	45	451	6	0.04
Z11	2	20	8	0.05
Z12	1	12	6	0.04
Z14	3	31	15	0.10
Z15	4	35	12	0.08
Z16	1	8	24	0.16
Z17	1	9	27	0.18
Z18	4	41	7	0.05
Z20	1	5	169	1.16
Z21	2	18	9	0.06
Z22	3	34	13	0.09
Z23	19	187	6	0.04
Z24	4	41	7	0.05
Z27	6	64	12	0.08
Z28	1	5	67	0.46
Z30	6	56	7	0.05
Z31	4	38	35	0.24
Z32	1	12	46	0.31
Z33	1	8	41	0.28
Z34	4	36	5	0.03
Z35	1	7	145	0.99
Z36	1	7	123	0.84
Z37	1	9	21	0.14
Z38	1	8	21	0.14
Z39	2	24	41	0.28
Z40	1	9	32	0.22
Z41	1	11	17	0.12