Term Project
The Science of Climate Change
Class of December 2013

Regional Differences

The motive:

This project uses the Climate Time Series Browser to see if any insightful information can be obtained by looking at the data region by region. After seeing how the individual station data varied so much from station to station, I was also interested in comparing the official record to the data I collected from the browser. I was wondering if any clue could be obtained about the recent 'pause' in warming shown in the record.

The data collection:

I started by collecting ocean data. I figured with 70% oceans, this was very vital information, and important in understanding the trend. I selected for water, but did not use stations on the edge of a large land mass, because I did not want the data influenced by land. All of the stations were all on islands. There were not a lot of stations, so I tried to select data that started by 1950, and ended after 2000. Sometimes I cheated a bit if the record looked good but missed these dates slightly. It would have been nice to select with a formula, because it seemed difficult not to be biased in favor of selecting what looked 'good'. At this time, I entered the station name, latitude, and the slope summary (start of record, end of record, line fit start temperature, and line fit end temperature). Later I came back and filled in the elevations.

After collecting all the island stations summary data, I turned to the land masses. My initial thought was that perhaps stations inland would show a different trend from the oceans. There didn't seem to be any easy way to do this selection. I started with the assumption, that if I selected for high elevations, the stations would likely be inland. Although that was true, it turns out that 90% of the stations above a mere 1600 meters were located in the western United States. Therefore, selecting for elevation turned out to be a tedious waste of time. Too bad the browser didn't have an elevation filter.

But, it was a learning experience. First it is amazing that 7000 stations have been doing this recording of temperature all around the world, for such a long time. I wonder what the motive was 150 years ago before global warming was an issue. It is not surprising that little data was collected where no one lived.

So following that failure, I expanded the map, and went through the regions, section by section. Again, the station selection was rather subjective. How much data was sufficient? Should I reject a station based on the noise level shown? What the gaps in the record would be excluded? Again, I listed the station names, latitudes, and this time also altitudes on the spread sheet, as well as the linear regression start and end data. I ended up with 15 different regions, excluding both polar regions because they lacked data.

Finally, it seemed to be insufficient to have data only for temperature and slope for each region. I figured that I would also need to record the time series data for each region. To do this, I used the method from the homework problem. For each region, I selected the relevant stations that I had listed in the spread sheet. Then they were normalized and combined. Finally the normalized and combined data was transferred to the spreadsheet using the text mode, and separated into year and temperature anomaly for each year. That completed the data acquisition phase of the project.

Region by Region Data:

Each of the following data sets has some things in common. T1 and T2 are the temperatures of the browser line fit at the first data point and last data point recorded by the station. The station latitude and elevation are recorded. T2(formula) is my predicted T2 temperature based on a cosine formula using only the latitude and elevation data. Start and end are the time of the stations first data point, and the stations last data point. The error is the difference between T2 and my T2(formula). The formula used will be discussed in more detail later. Above the data is the Average of all stations for the region shown. The slope and error numbers are in bold and used in later discussion. The earliest and latest start times are shown in bold. The earliest end time was shown in bold. The latest end time was always 2011. I tried to keep the start time before 1950, but sometimes went a little beyond that. I tried to keep the end point data after 2000, but sometimes went before that. The slope numbers shown were computed from the browser line fit data end points. This provided a little more accuracy than the number shown in the browser.

The browser temperature shift and averaging function and text mode was used to obtain the time series plot for the region. The text mode data was cut and pasted to the spreadsheet. This time series data was not transferred from the spreadsheet to here, because it seemed to be useless detail.

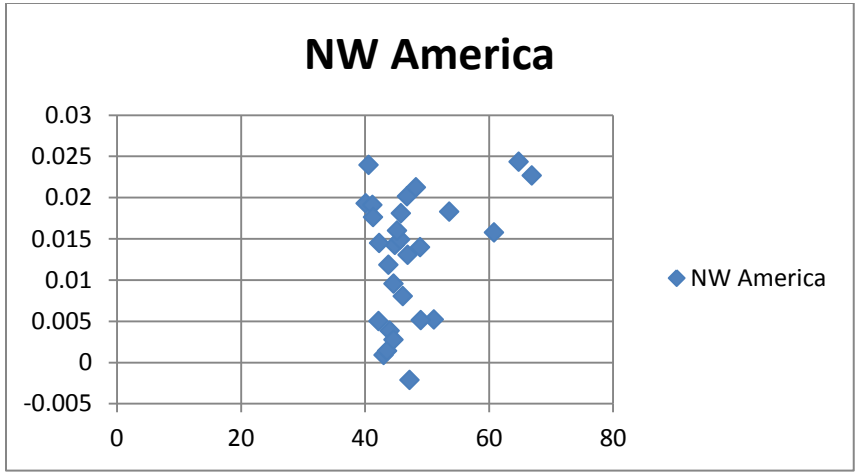
In the time series plot, a moving average is also shown. This moving average was: AVERAGE(Year-10:Year+10).

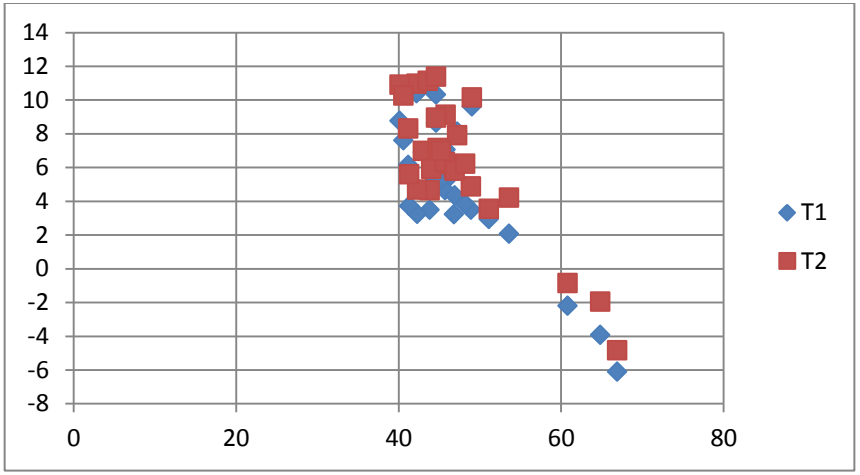
The upper left plots are the slope plotted against the latitude.
The upper right plots are of T1 and T2 against latitude.
The bottom left plots are of T1 and T2 (formula) plotted against elevation.
The Bottom Right plots are the browser data shifted and summed yearly data of all the above station data for the region, and the +/- 10 year moving average of this data.

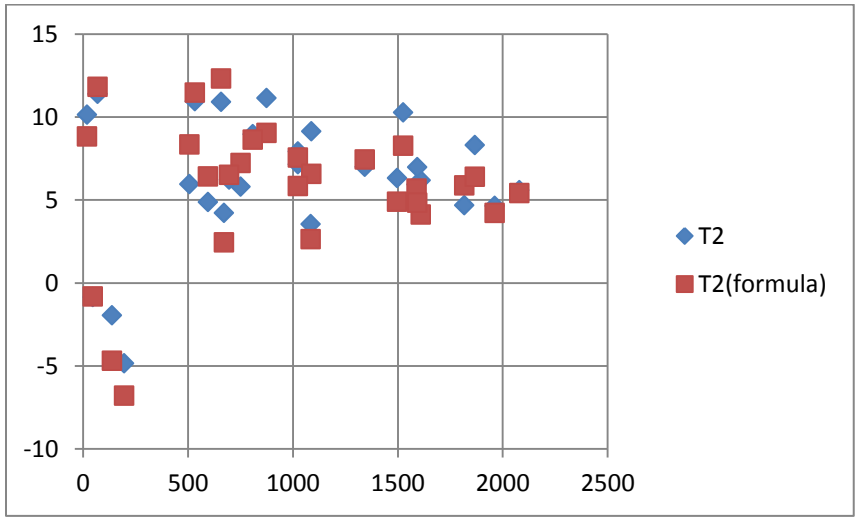
North Western North America: Here I used 28 random 'good data' stations. More stations were available.

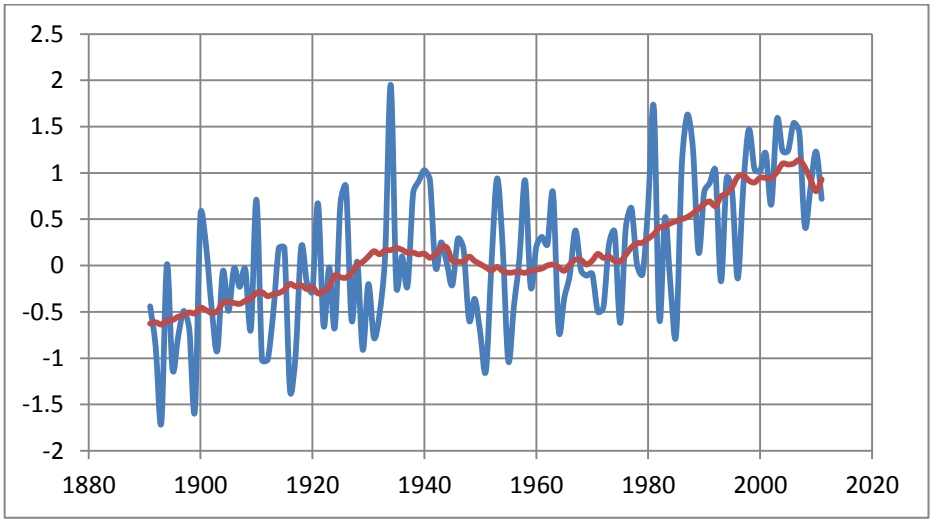
Average	47.25	**0.0128**	47.25	4.97	6.31	1901	2007	987.82	6.31	5.74	**0.57**

Station	Latitude	NW America	Latitude	T1	T2	start	end	Elevation	T2	T2(formula)	error
Aberdeen Exp Stn	43	0.000909	43	6.91	6.99	1915	2003	1342	6.99	7.45	-0.46
Alta 1 Nnw	43.8	0.011856	43.8	3.5	4.65	1910	2007	1962	4.65	4.23	0.42
Anaconda	46.1	0.008039	46.1	5.37	6.19	1906	2008	1609	6.19	4.12	2.07
Ashland	42.2	0.005	42.2	10.4	10.96	1895	2007	532	10.96	11.47	-0.51
Ashton 1N	44	0.003838	44	5.55	5.93	1903	2002	1589	5.93	5.69	0.24
Baker City Ap	44.8	0.014234	44.8	5.58	7.16	1895	2006	1024	7.16	7.56	-0.40
Beaver City	40.1	0.019279	40.1	8.77	10.91	1896	2007	658	10.91	12.32	-1.41
Bern	42.3	0.0145	42.3	3.24	4.69	1903	2003	1817	4.69	5.88	-1.19
Bethel/Bethel	60.8	0.015765	60.8	-2.19	-0.85	1924	2009	46	-0.85	-0.82	-0.03
Bettles	66.9	0.022679	66.9	-6.11	-4.84	**1945**	2001	196	-4.84	-6.79	1.95
Billings/Loga	45.8	0.018087	45.8	7.05	9.13	1896	2011	1088	9.13	6.58	2.55
Bismarck/Mun	46.8	0.020147	46.8	3.22	5.96	**1875**	2011	506	5.96	8.36	-2.40
Boise/Mun., Id	43.6	0.001408	43.6	10.94	11.14	1868	2010	874	11.14	9.05	2.09
Bozeman Montana St	45.7	0.014911	45.7	4.65	6.32	1896	2008	1497	6.32	4.89	1.43
Calgary Int'L	51.1	0.005217	51.1	2.95	3.55	1885	**2000**	1084	3.55	2.64	0.91
Cambridge	44.6	0.002768	44.6	8.65	8.96	1895	2007	808	8.96	8.63	0.33
Cascade 5S	47.2	-0.00212	47.2	8.13	7.92	1908	2007	1024	7.92	5.84	2.08
Cheyenne Wsfo Ap	41.2	0.019115	41.2	6.15	8.31	1895	2008	1868	8.31	6.40	1.91
Clearbrook	49	0.005146	49	9.62	10.15	1904	2007	19	10.15	8.82	1.33
Corvallis State Univ	44.6	0.00955	44.6	10.33	11.39	1896	2007	68	11.39	11.82	-0.43
Crosby	48.9	0.01398	48.9	3.5	4.87	1910	2008	595	4.87	6.42	-1.55
Dickinson Exp Stn	46.9	0.013036	46.9	4.35	5.81	1896	2008	750	5.81	7.23	-1.42
Dillon Wmce	45.2	0.016	45.2	5.3	6.98	1902	2007	1593	6.98	4.83	2.15
Edmonton Muni	53.6	0.018291	53.6	2.08	4.22	1883	2000	671	4.22	2.45	1.77
Evanston 1E	41.3	0.017642	41.3	3.72	5.59	1899	2005	2080	5.59	5.42	0.17
Fairbanks/Int	64.8	0.024321	64.8	-3.92	-1.95	1930	2011	138	-1.95	-4.69	2.74
Ft Collins	40.6	0.023964	40.6	7.61	10.27	1895	2006	1525	10.27	8.27	2.00
Glasgow Intl Ap	48.2	0.021239	48.2	3.83	6.23	1895	2008	696	6.23	6.51	-0.28







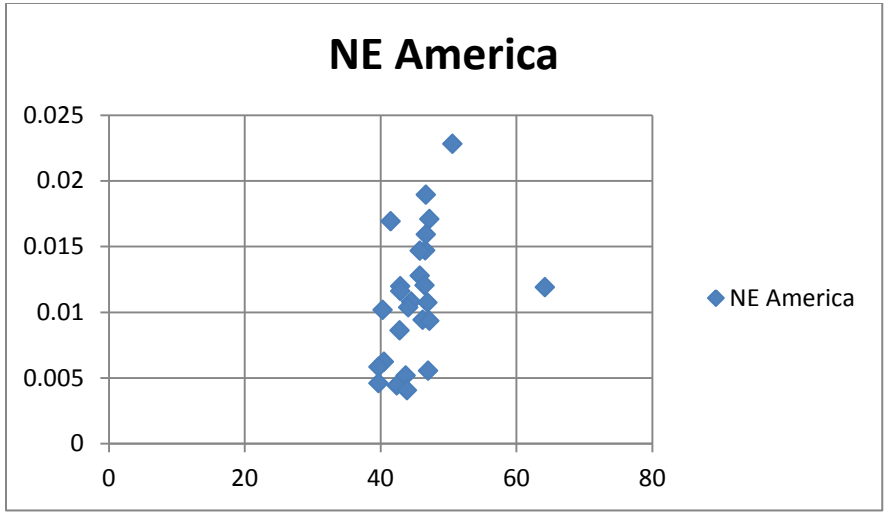


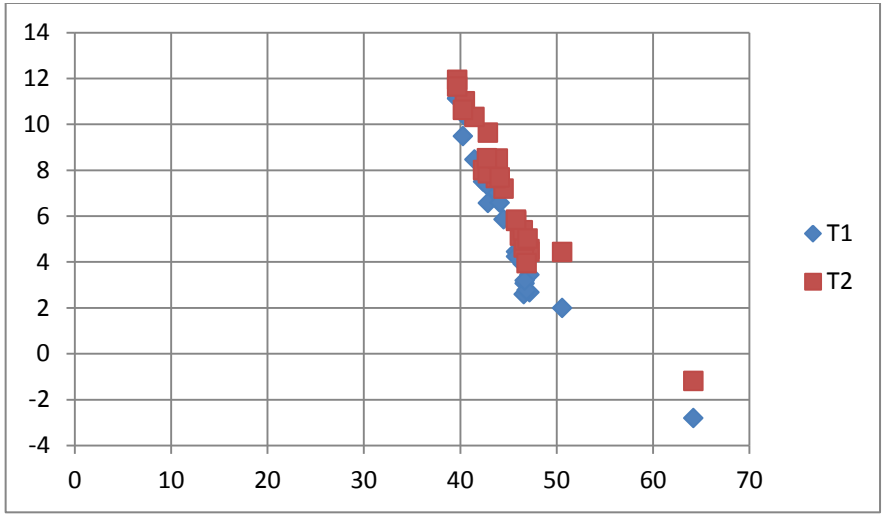
North-Eastern North America: Here I used 26 random 'good data' stations. More stations were available.

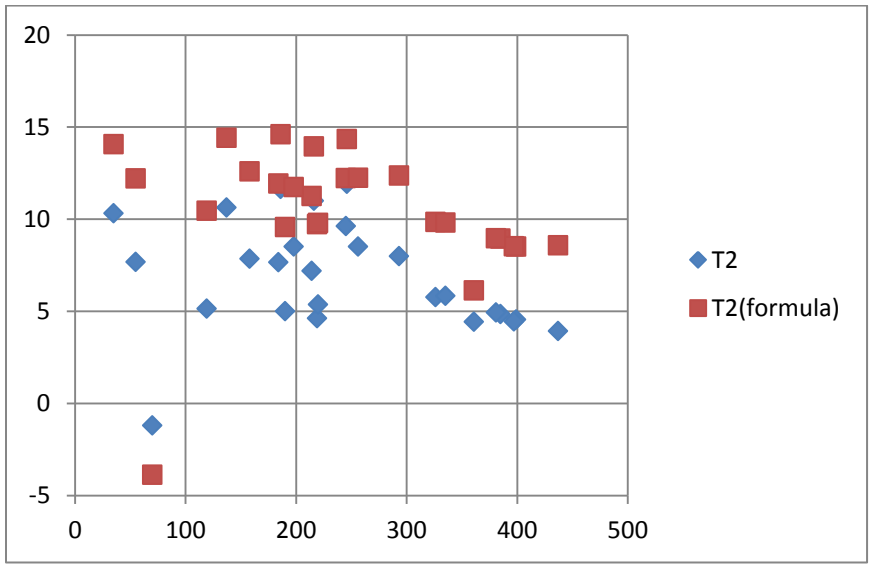
average	45.24	**0.0110**	45.24	5.60	6.86	1892	2007	240.85	6.86	10.50	**-3.65**

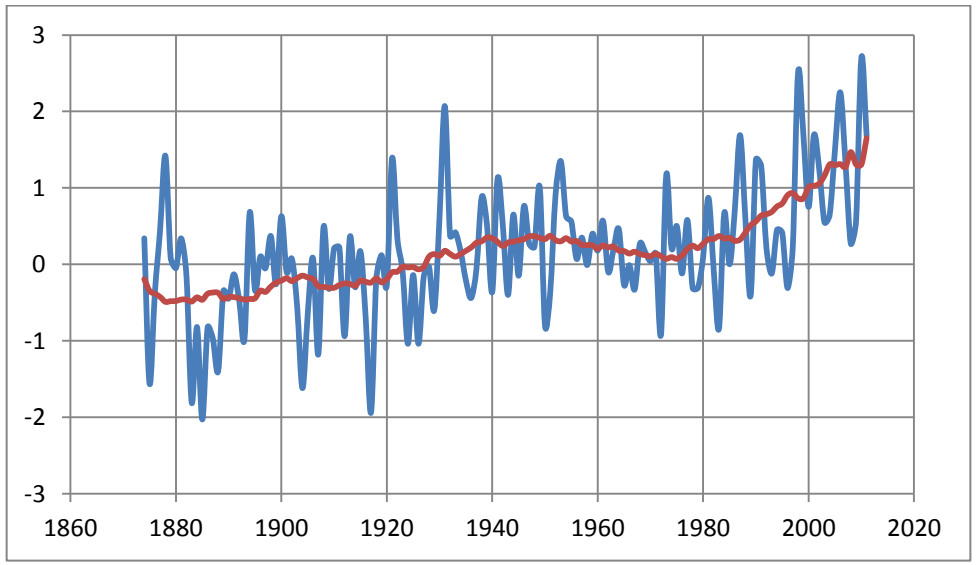
Station	Latitude	NE America	Latitude	T1	T2	start	end	Elevation	T2	T2(formula)	error
Grand Rapids/	42.9	0.0119672	42.9	8.17	9.63	1889	2011	245	9.63	12.23	-2.60

Green Bay/	44.5	0.0108065	44.5	5.85	7.19	1887	2011	214	7.19	11.26	-4.07
Hoopeston 1 Ne	40.5	0.0062136	40.5	10.36	11	1905	2008	216	11	13.96	-2.96
Houlton 5N	46.2	0.0094175	46.2	4.17	5.14	1904	2007	119	5.14	10.46	-5.32
Indianapolis/	39.7	0.0058273	39.7	11.12	11.93	**1872**	2011	246	11.93	14.35	-2.42
Iron Mt Kingsford Ws	45.8	0.0127885	45.8	4.45	5.78	1902	2006	326	5.78	9.85	-4.07
Ithaca Cornell Univ	42.4	0.0044248	42.4	7.5	8	1895	2008	293	8	12.37	-4.37
Jacksonville 2E	39.7	0.0045946	39.7	11.13	11.64	1896	2007	186	11.64	14.61	-2.97
Cloquet	46.7	0.0189474	46.7	3.06	4.86	**1912**	2007	385	4.86	8.95	-4.09
Duluth/Int., M	50.6	0.0228037	50.6	1.99	4.43	1904	2011	361	4.43	6.14	-1.71
Godthab Nuuk GL	64.2	0.0119118	64.2	-2.81	-1.19	1866	2002	70	-1.19	-3.87	2.68
Grand Rpds Forest Lab	47.2	0.0170909	47.2	2.68	4.56	1898	2008	399	4.56	8.52	-3.96
Leech Lake	47.2	0.0093519	47.2	3.44	4.45	1898	2006	397	4.45	8.53	-4.08
Marquette US	46.6	0.0147101	46.6	2.59	4.62	1873	2011	219	4.62	9.74	-5.12
Park Rapids 2S	46.9	0.0107339	46.9	2.77	3.94	1896	2005	437	3.94	8.58	-4.64
Pine River Dam	46.7	0.0159091	46.7	3.19	4.94	1898	2008	381	4.94	8.97	-4.03
Sault Ste Marie	46.5	0.0120492	46.5	3.91	5.38	1889	2011	220	5.38	9.80	-4.42
Spooner Ag Res Stn	45.8	0.0146789	45.8	4.24	5.84	1898	2007	335	5.84	9.81	-3.97
Two Harbors	47	0.0055357	47	4.39	5.01	1895	2007	190	5.01	9.57	-4.56
Hanover	43.7	0.0051786	43.7	7.08	7.66	1895	2007	184	7.66	11.94	-4.28
Keene	42.9	0.0116071	42.9	6.56	7.86	1895	2007	158	7.86	12.61	-4.75
Kingston	41.5	0.0169091	41.5	8.46	10.32	1897	2007	35	10.32	14.08	-3.76
La Crosse	43.9	0.0040625	43.9	7.99	8.51	1873	**2001**	198	8.51	11.75	-3.24
Lansing	42.8	0.0086131	42.8	7.34	8.52	1864	**2001**	256	8.52	12.25	-3.73
Lebanon 2 W	40.3	0.010177	40.3	9.48	10.63	1895	2008	137	10.63	14.43	-3.80
Lewiston	44.1	0.0103774	44.1	6.58	7.68	1895	**2001**	55	7.68	12.22	-4.54







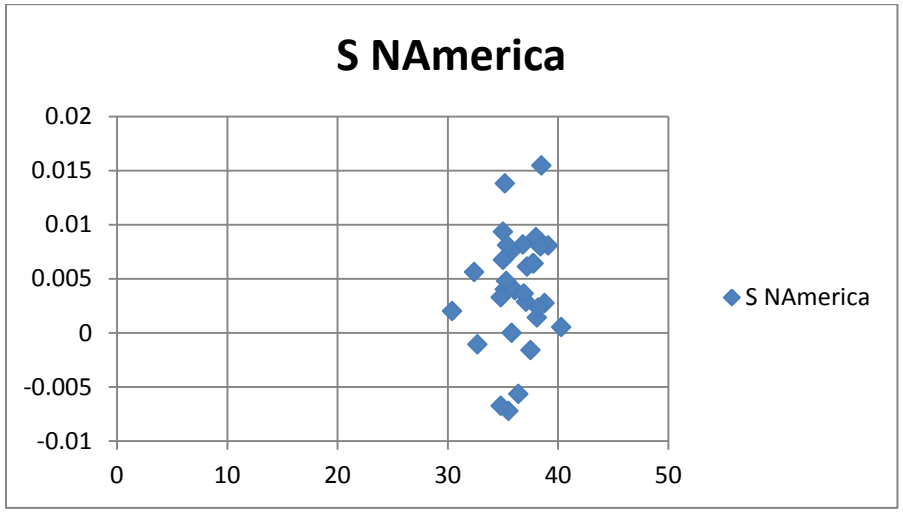


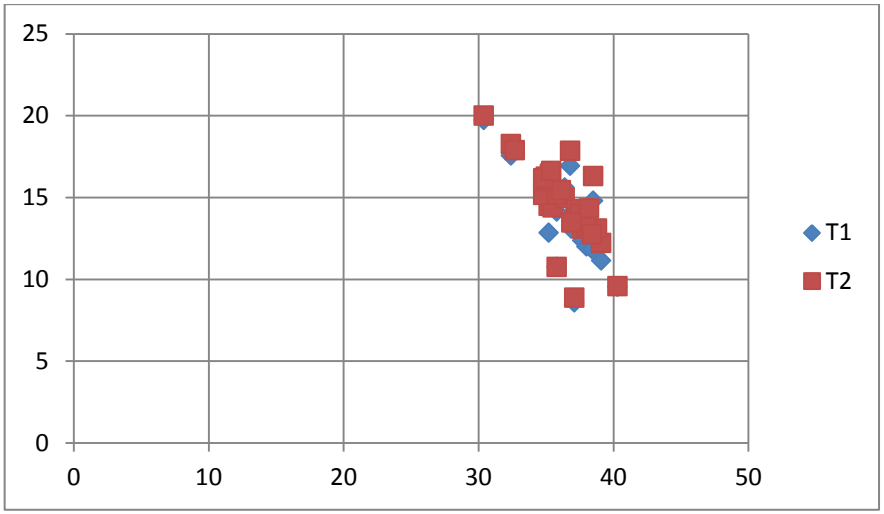
Southern North America: Here I used 31 random 'good data' stations. More stations were available.

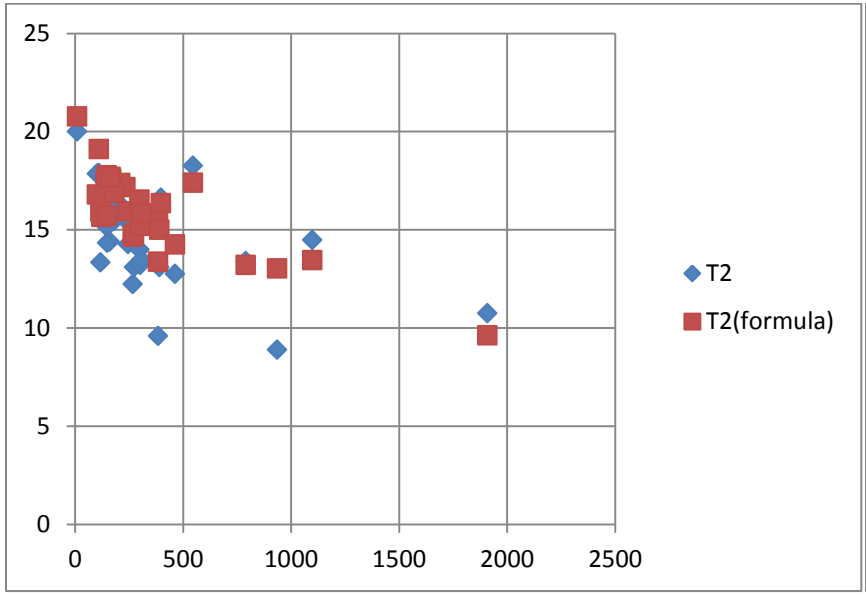
Average		36.33	**0.0041**	36.33	14.11	14.62	1889	2009	364.65	14.62	15.90	**-1.29**

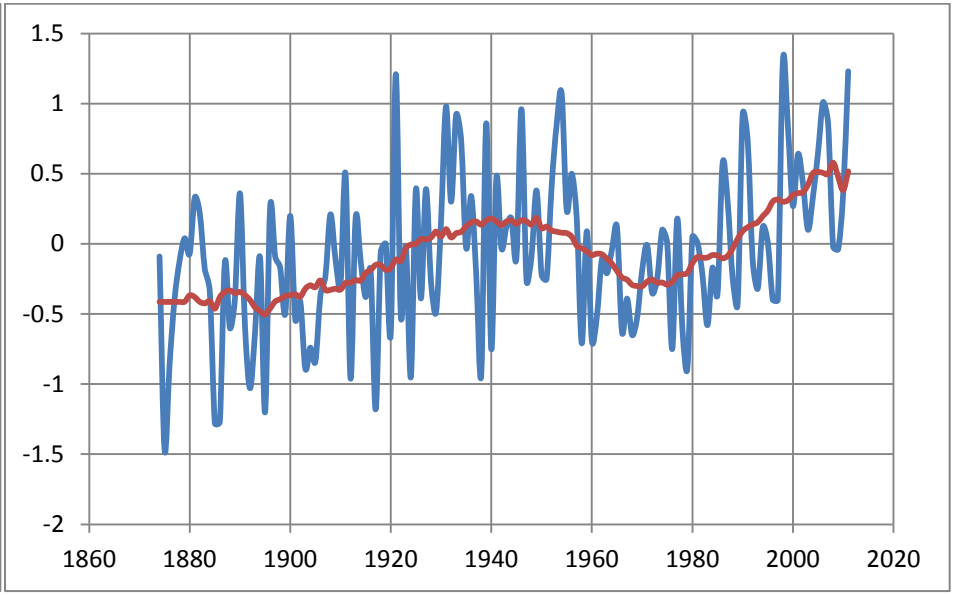
Station	Latitude	S NAmerica	Latitude	T1	T2	start	end	Elevation	T2	T2(formula)	error
Abilene /Mun.	32.4	0.0056	32.4	17.56	18.26	1886	2011	546	18.26	17.40	0.86
Amarillo/Int	35.2	0.013782	35.2	12.84	14.48	1892	2011	1098	14.48	13.45	1.03
Bowling Green Rgnl	35.5	-0.00723	35.5	15.2	14.39	1896	2008	161	14.39	17.30	-2.91
Burkes Garden	37.1	0.00287	37.1	8.57	8.88	1900	2008	935	8.88	13.02	-4.14
Cadiz	40.3	0.000521	40.3	9.53	9.58	1905	2001	384	9.58	13.37	-3.79
Charlotte/Dou	35.2	0.004015	35.2	14.97	15.5	1879	2011	234	15.5	17.16	-1.66
Chattanooga/L	35	0.009318	35	15.03	16.26	1879	2011	210	16.26	17.38	-1.12
Cincinnati/Gr	39.1	0.00806	39.1	11.14	12.22	1873	2007	267	12.22	14.64	-2.42
Columbia/Regi	38.8	0.00275	38.8	12.76	13.09	1890	2010	274	13.09	14.80	-1.71
Davis 2 Wsw Exp	38.5	0.015464	38.5	14.8	16.3	1910	2007	122	16.3	15.65	0.65
Dodge City/Mu	37.8	0.006397	37.8	12.53	13.4	1875	2011	790	13.4	13.21	0.19
Evansville/Re	38.1	0.001416	38.1	13.17	13.33	1898	2011	118	13.33	15.91	-2.58
Fort Smith/Mu	35.3	0.004766	35.3	15.82	16.43	1883	2011	141	16.43	17.50	-1.07
Fresno Yosemite Ap	36.8	0.008142	36.8	16.92	17.84	1895	2008	101	17.84	16.78	1.06
Gravette	36.4	-0.00565	36.4	15.59	14.98	1899	2007	384	14.98	15.81	-0.83
Holly Springs 4 N	34.8	-0.00676	34.8	15.89	15.14	1897	2008	147	15.14	17.77	-2.63
Independence	37.2	0.006106	37.2	13.57	14.26	1895	2008	245	14.26	15.92	-1.66
Jacksonville U/A to W	30.4	0.001985	30.4	19.73	20	1872	2008	9	20	20.76	-0.76
Jemez Springs	35.8	0	35.8	10.74	10.74	**1911**	2007	1908	10.74	9.61	1.13
Knoxville	35.8	0.007571	35.8	14.13	15.19	**1871**	2011	299	15.19	16.53	-1.34
Lamar	37.5	-0.00159	37.5	14.17	13.99	1895	2008	299	13.99	15.51	-1.52
Lebanon 2W	37.7	0.006396	37.7	12.38	13.09	1895	2006	390	13.09	14.99	-1.90
Lexington/Blu	38	0.008824	38	12	13.2	1873	2009	301	13.2	15.19	-1.99
Louisville/	38.2	0.002336	38.2	14	14.32	1873	2010	149	14.32	15.72	-1.40
Macon/	32.7	-0.00107	32.7	18.02	17.88	1880	2011	110	17.88	19.11	-1.23
Mcpherson	38.4	0.007965	38.4	11.84	12.74	1895	2008	463	12.74	14.24	-1.50
Monroe 2 Se	35	0.006727	35	15.26	16	1897	2007	168	16	17.56	-1.56
Nashville/	36.1	0.003913	36.1	14.9	15.44	1872	2010	180	15.44	16.86	-1.42
Neosho	36.9	0.003636	36.9	13.07	13.47	1898	2008	308	13.47	15.83	-2.36

North Little	34.8	0.00328	34.8	15.76	16.17	1880	**2005**	165	16.17	17.69	-1.52
Oklahoma City	35.4	0.008083	35.4	15.65	16.62	1891	2011	398	16.62	16.34	0.28







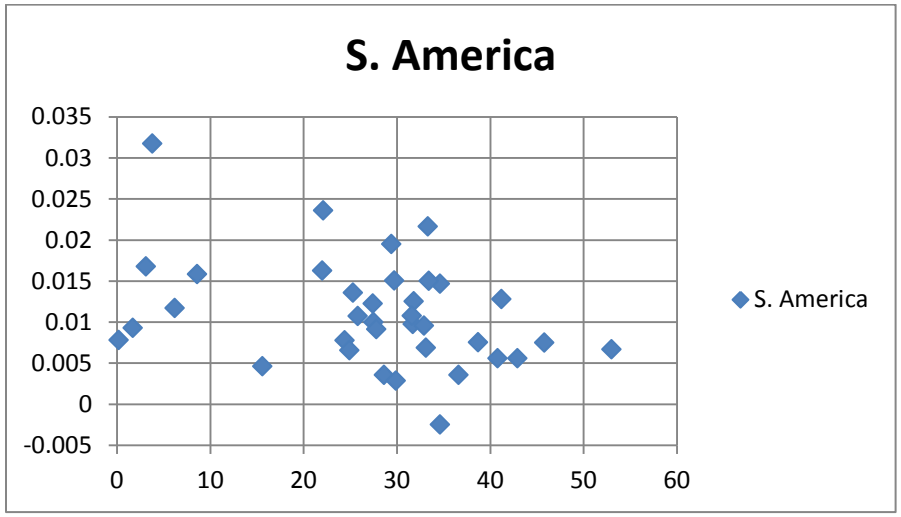


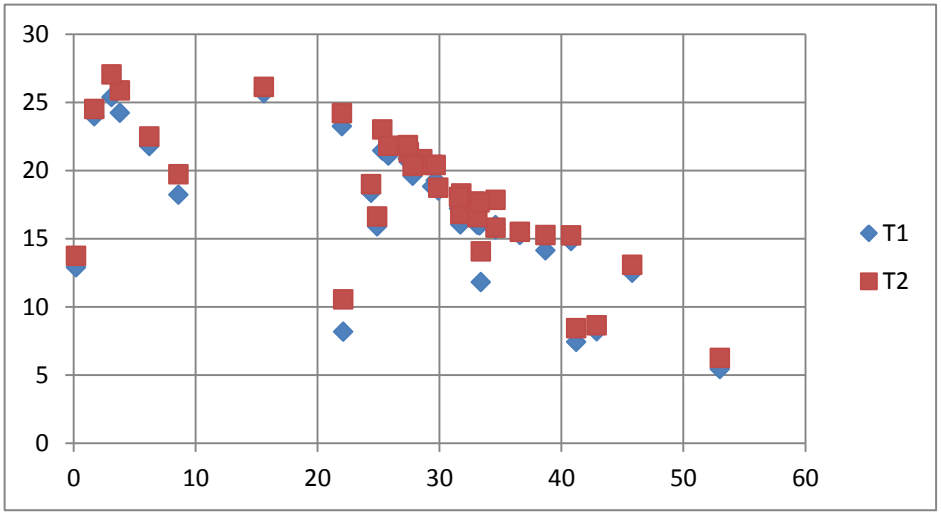
South America: Here I could only find 36 'good data' stations.

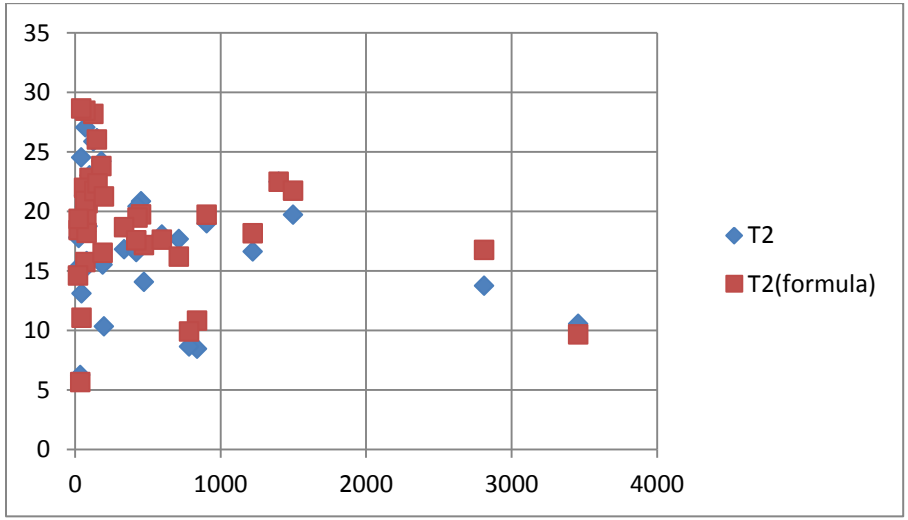
Average	27.22	**0.0110**	27.22	17.21	18.16	1921	2009	508.47	17.89	18.93	**-0.76**

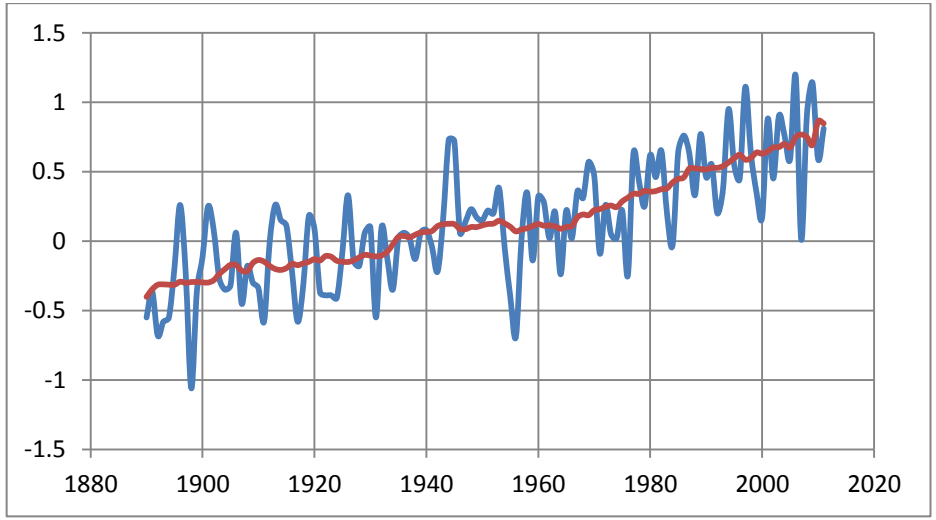
South America	Latitude	S. America	Latitude	T1	T2	start	end	Elevation	T2	T2(formula)	error
Asuncion/Aero	25.3	0.013565	25.3	21.45	23.01	1894	2009	101	23.01	22.79	0.22
Bahia Blanca Aero	38.7	0.007517	38.7	14.14	15.26	1862	2011	72	15.26	15.74	-0.48
Bariloche Aer	41.2	0.012785	41.2	7.43	8.44	1931	2010	840	8.44	10.82	-2.38
Buenos Aires	34.6	0.014662	34.6	15.67	17.84	**1856**	2004	25	17.84	18.41	-0.57
Catamarca Aer	28.6	0.003551	28.6	20.45	20.83	1904	2011	454	20.83	19.75	1.08
Ceres Aero	29.9	0.002838	29.9	18.53	18.74	1933	2007	88	18.74	20.68	-1.94
Comodoro Riva	45.8	0.0075	45.8	12.49	13.09	1931	2011	46	13.09	11.06	2.03
Corrientes Ae	27.5	0.01	27.5	20.63	21.35	1931	**2003**	62	21.35	21.96	-0.61
Cuiaba	15.6	0.004608	15.6	25.66	26.13	1902	2004	151	26.13	26.03	0.10
Esquel Aero	42.9	0.00557	42.9	8.2	8.64	1932	2011	785	8.64	9.91	-1.27
Iquitos	3.8	0.031731	3.8	24.22	25.87	1950	2002	126	25.87	28.17	-2.30
Jujuy Aero	24.4	0.00775	24.4	18.37	18.99	1931	2011	905	18.99	19.72	-0.73
Junin aero	34.6	-0.00247	34.6	16	15.81	1934	2011	81	15.81	18.17	-2.36
La Quiaca	22.1	0.0236	22.1	8.18	10.54	1911	2011	3459	10.54	9.66	0.88
La Rioja Aero	29.4	0.0195	29.4	18.84	20.4	1931	2011	429	20.4	19.46	0.94
Manaus	3.1	0.016768	3.1	25.38	27.04	1910	2009	72	27.04	28.44	-1.40
Mariscal	22	0.016271	22	23.24	24.2	1951	2010	181	24.2	23.79	0.41
Medelin/Olay	6.2	0.011695	6.2	21.8	22.49	1941	2000	1400	22.49	22.47	0.02
Merida	8.6	0.015851	8.6	18.23	19.72	1916	2010	1498	19.72	21.74	-2.02
Parana Aero	31.8	0.012532	31.8	17.33	18.32	1932	2011	78	18.32	19.73	-1.41
Paso De Los L	29.7	0.015067	29.7	19.28	20.41	1935	2010	70	20.41	20.86	-0.45
Pilar Observa	31.7	0.00975	31.7	16.03	16.81	1931	2011	338	16.81	18.67	-1.86
Posadas Aero	27.4	0.01225	27.4	20.87	21.85	1931	2011	133	21.85	21.70	0.15
Pudahuel	33.4	0.015	33.4	11.82	14.07	1861	2011	475	14.07	17.15	-3.08
Punta Arenas	53	0.006667	53	5.43	6.25	1888	2011	37	6.25	5.66	0.59
Quito/Marisca	0.2	0.007798	0.2	12.9	13.75	1891	2000	2812	13.75	16.75	-3.00
Rio Cuarto Ae	33.1	0.006875	33.1	16.02	16.57	1931	2011	421	16.57	17.55	-0.98
Rosario Aero	32.9	0.009571	32.9	17.07	17.74	1941	2011	25	17.74	19.36	-1.62
Salta Aero	24.9	0.006545	24.9	15.9	16.62	1901	2011	1221	16.62	18.14	-1.52
San Anntonio O	40.8	0.005584	40.8	14.81	15.24	1933	2010	20	15.24	14.61	0.63

San Juan Aero	31.6	0.010769	31.6	17.21	18.05	1932	2010	598	18.05	17.60	0.45
San Juan Bautista/	25.8	0.010746	25.8	21.09	21.81	1942	2009	155	21.81	22.34	-0.53
San Luis Aero	33.3	0.021646	33.3	15.96	17.67	1932	2011	713	17.67	16.18	1.49
Santa Rosa Ae	36.6	0.003571	36.6	15.26	15.51	1941	2011	191	15.51	16.52	-1.01
Santiago Del	27.8	0.009125	27.8	19.61	20.34	1931	2011	199	10.34	21.23	-0.89
Tumeremo	1.7	0.009298	1.7	23.98	24.51	**1951**	2008	44	24.51	28.62	-4.11





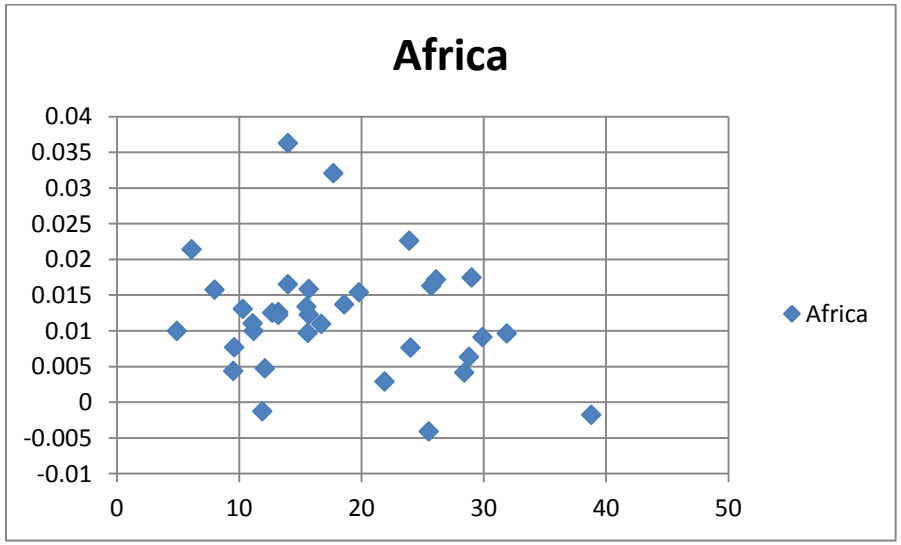


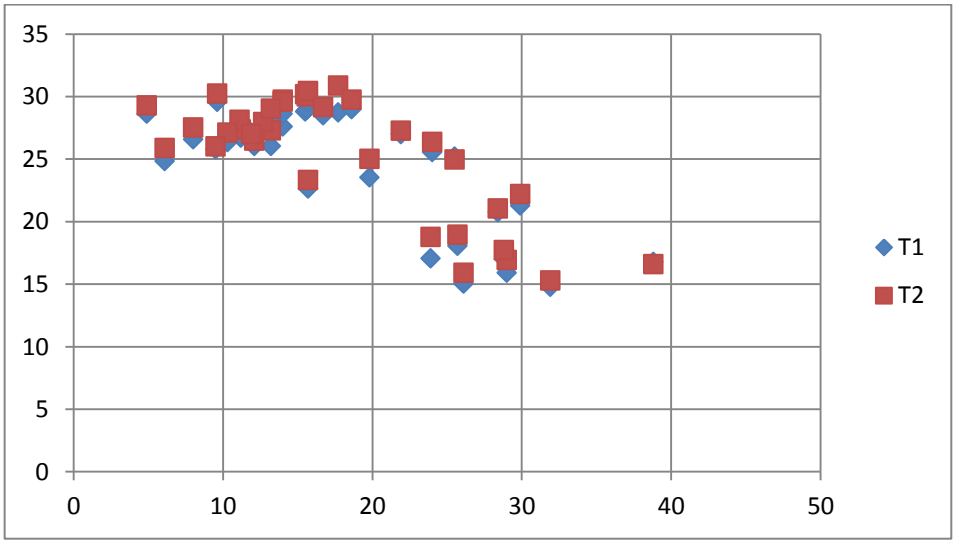


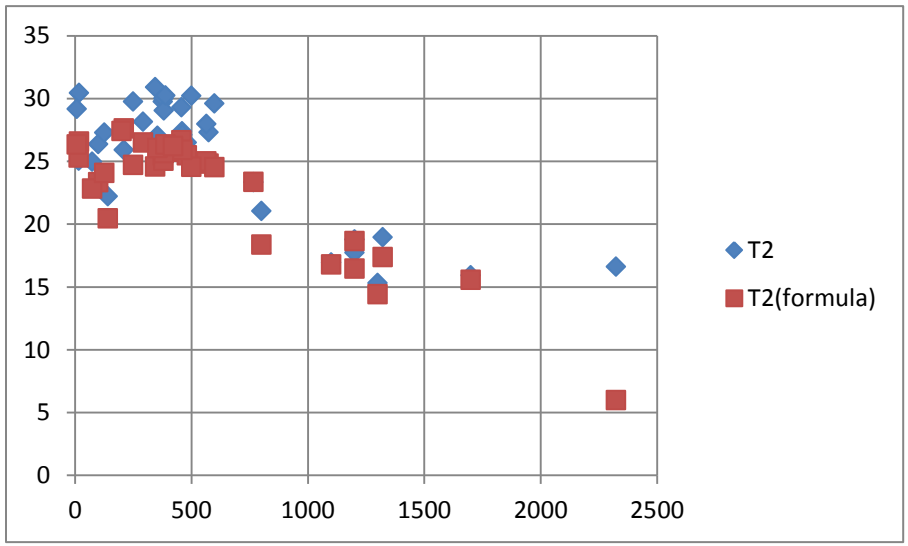
Africa: Here I could only get 35 ‘good data’ stations.

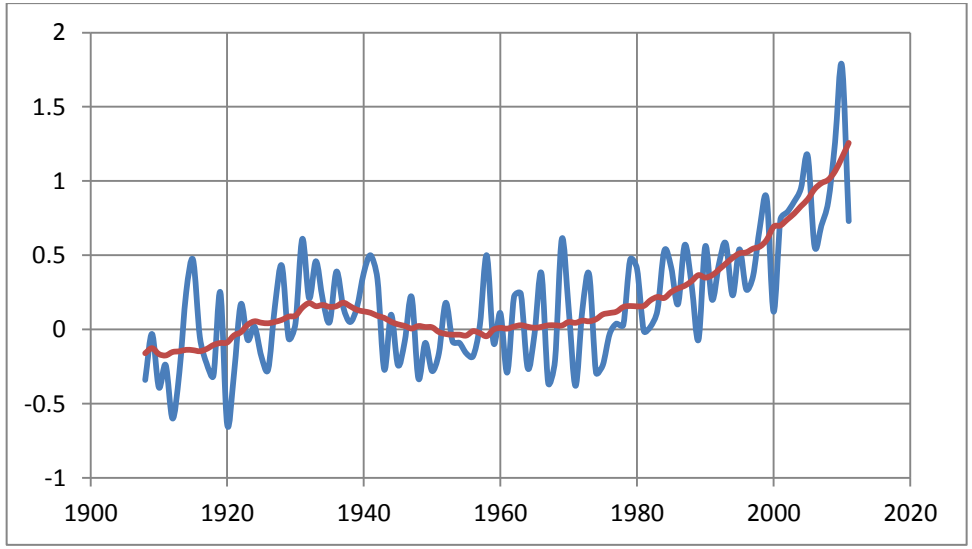
Average	18.03	**0.0119**	18.03	24.60	25.42	1933	2007	568.20	25.42	22.97	**2.45**
Africa	Latitude	Africa	Latitude	T1	T2	start	end	Elevation	T2	T2(formula)	error
Addis Ababa	38.8	-0.00175	38.8	16.78	16.6	1906	2009	2324	16.6	5.99	**10.61**
Aswan	24	0.007642	24	25.56	26.37	1901	2007	100	26.37	23.34	3.03
Atbara	17.7	0.03209	17.7	28.74	30.89	1943	2010	345	30.89	24.58	**6.31**
Beira	19.8	0.015417	19.8	23.55	25.03	1913	2009	16	25.03	25.30	-0.27
Bobo-Dioulass	11.2	0.01	11.2	26.71	27.37	1943	2009	460	27.37	25.74	1.63
Chileka	15.7	0.012281	15.7	22.64	23.34	1941	**1998**	767	23.34	23.35	-0.01
Ed Dueim	14	0.036271	14	27.61	29.75	1951	2010	378	29.75	25.47	4.28
El Obeid	13.2	0.0126	13.2	26.05	27.31	1910	2010	574	27.31	24.82	2.49
En Nahud	12.7	0.012542	12.7	27.22	27.96	1951	2010	564	27.96	24.98	2.98
Estcourt	29	0.017458	29	15.91	16.94	1941	2000	1100	16.94	16.78	0.16
Fraserburg	31.9	0.00963	31.9	14.78	15.3	1945	1999	1300	15.3	14.42	0.88
Gagnoa	6.1	0.021429	6.1	24.85	25.9	1951	2000	210	25.9	27.60	-1.70
Gedaref	14	0.0165	14	28.62	29.61	1950	2010	599	29.61	24.52	5.09
Helwan	29.9	0.009118	29.9	21.28	22.21	1905	2007	141	22.21	20.45	1.76
Jan Smuts	26.1	0.0172	26.1	15.05	15.91	1953	2003	1700	15.91	15.56	0.35
Juba	4.9	0.01	4.9	28.64	29.3	1941	2007	457	29.3	26.66	2.64
Kandi	11.1	0.011045	11.1	27.4	28.14	1942	2009	292	28.14	26.48	1.66
Kano	12.1	0.004737	12.1	26.04	26.49	1905	2000	481	26.49	25.46	1.03
Karima	18.6	0.013684	18.6	28.98	29.76	**1953**	2010	249	29.76	24.70	5.06
Kassala	15.5	0.013365	15.5	28.81	30.2	1906	2010	500	30.2	24.55	5.65
Kharga	25.5	-0.00411	25.5	25.19	24.96	1951	2007	73	24.96	22.82	2.14
Khartoum	15.6	0.009725	15.6	28.94	30	**1901**	2010	380	30	25.04	4.96
Kimberley	28.8	0.006364	28.8	17.02	17.72	1897	2007	1200	17.72	16.44	1.28
Kosti	13.2	0.012239	13.2	28.22	29.04	1943	2010	381	29.04	25.65	3.39
Maiduguri	11.9	-0.00125	11.9	27.13	27.02	1911	1999	354	27.02	26.05	0.97
Malakal	9.6	0.007701	9.6	29.57	30.24	1918	2005	388	30.24	26.35	3.89
Matam	15.7	0.015862	15.7	29.52	30.44	1952	2010	17	30.44	26.58	3.86
Natitingou	10.3	0.013051	10.3	26.34	27.11	1951	2010	461	27.11	25.91	1.20
Odienne	9.5	0.004386	9.5	25.78	26.03	1943	2000	421	26.03	26.22	-0.19
Pietersburg	23.9	0.022632	23.9	17.06	18.78	1933	2009	1200	18.78	18.66	0.12

Podor	16.7	0.010984	16.7	28.5	29.17	1950	2011	7	29.17	26.33	2.84
Pretoria	25.7	0.016296	25.7	18.07	18.95	1951	2005	1322	18.95	17.36	1.59
Save	8	0.015763	8	26.59	27.52	1952	2011	200	27.52	27.41	0.11
Upington	28.4	0.004143	28.4	20.76	21.05	1940	2010	800	21.05	18.36	2.69
Wadi Halfa	21.9	0.002913	21.9	26.98	27.28	1907	2010	126	27.28	24.07	3.21









Europe Here I obtained 136 'good data' stations, with 18 going all the way back to 1849.

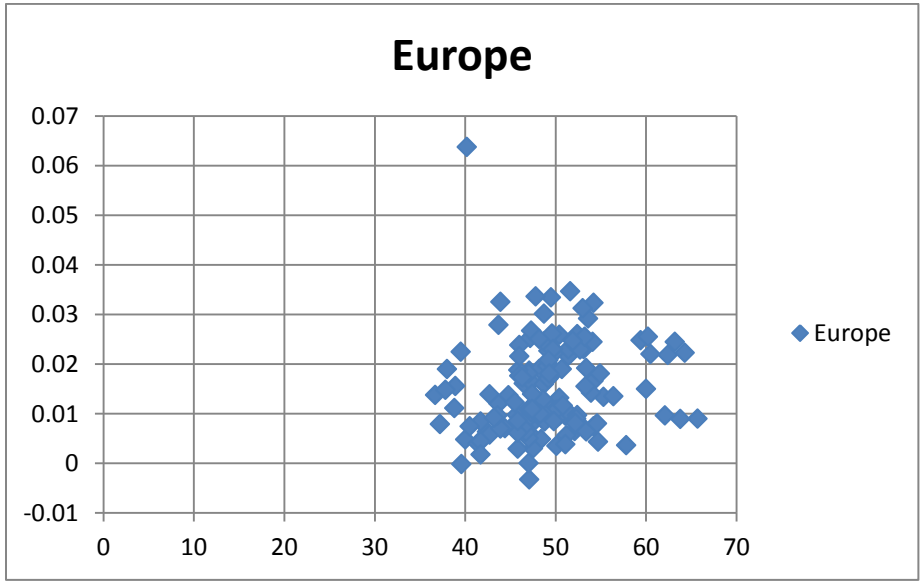
Average	49.09	**0.0149**	49.09	8.15	9.36	1903	2009	337.96	9.36	7.22	**2.14**

Europe	Latitude	Europe	Latitude	T1	T2	start	end	Elevation	T2	T2(formula)	error
Afyon	38.8	0.011129	38.8	10.88	11.57	1949	2011	1034	11.57	11.54	0.03
Akureyri	65.7	0.008984	65.7	2.78	3.93	1883	2011	27	3.93	-5.00	**8.93**
Ankara/Central	40	0.004819	40	12.07	12.47	1926	2009	894	12.47	11.37	1.10
Antalya	36.7	0.013766	36.7	17.79	18.85	1932	2009	57	18.85	17.03	1.82
Askaniia-Nova	46.5	0.016118	46.5	9.1	10.47	1926	2011	30	10.47	10.62	-0.15
Badajoz/Talav	38.9	0.015615	38.9	15.1	17.13	1881	2011	192	17.13	15.09	2.04
Belfast/Alder	54.7	0.004345	54.7	8.71	9.34	1866	2011	81	9.34	4.11	5.23
Beograd	44.8	0.01374	44.8	10.99	12.68	1888	2011	132	12.68	11.40	1.28
Berlin-Dahlem	52.5	0.008228	52.5	8.2	9.5	1850	2008	58	9.5	5.96	3.54
Bialystok	53.1	0.023	53.1	6.08	7.46	1951	2011	151	7.46	5.09	2.37
Bistrita	47.1	0.018667	47.1	7.74	8.86	1951	2011	367	8.86	8.74	0.12
Bourges	47.1	-0.00325	47.1	10.94	10.42	1851	2011	166	10.42	9.60	0.82
Bratislava lv	48.2	0.01898	48.2	9.5	10.43	1951	2000	142	10.43	8.89	1.54
Brno/Turany	49.2	0.022667	49.2	8.3	9.66	1951	2011	246	9.66	7.70	1.96
Bucuresti/Filaret	44.4	0.007078	44.4	9.6	10.69	1857	2011	82	10.69	11.90	-1.21
Budapest/	47.5	0.005333	47.5	10.45	11.25	1850	2000	129	11.25	9.47	1.78
Burgos/Villaf	42.4	0.006345	42.4	9.34	10.26	1866	2011	891	10.26	9.79	0.47
Bursa	40.2	0.06377	40.2	13.9	17.79	1949	2010	100	17.79	14.66	3.13
Chernivtsi	48.4	0.004884	48.4	7.67	8.3	1880	2009	246	8.3	8.30	0.00
Clones	54.2	0.0166	54.2	8.55	9.38	1950	2000	89	9.38	4.48	4.90
Cluj-Napoca	46.8	0.010231	46.8	7.45	8.78	1881	2011	413	8.78	8.76	0.02
De Bilt	52.1	0.0065	52.1	8.63	9.67	1851	2011	15	9.67	6.46	3.21
Debrecen	47.5	0.003038	47.5	9.86	10.34	1853	2011	112	10.34	9.54	0.80
Dijon	47.3	0.016333	47.3	9.98	10.96	1951	2011	227	10.96	9.19	1.77
Dresden-Klotz	51.1	0.009563	51.1	7.58	9.11	1851	2011	232	9.11	6.30	2.81
Edirne	41.7	0.008395	41.7	13.23	13.91	1929	2010	48	13.91	13.89	0.02
Elblag	54.2	0.032333	54.2	6.62	8.56	1951	2011	43	8.56	4.67	3.89
Erfurt-Binder	51	0.009815	51	6.92	8.51	1849	2011	322	8.51	5.99	2.52

Eskdalemuir	55.3	0.013375	55.3	6.61	7.68	1931	2011	242	7.68	2.93	4.75
Essen	51.4	0.021667	51.4	9.19	10.49	1951	2011	161	10.49	6.38	4.11
Fichtelberg	50.4	0.009565	50.4	2.33	3.43	1891	2006	1215	3.43	2.62	0.81
Fokstua li	62.1	0.009655	62.1	-0.44	0.4	1924	2011	874	0.4	-5.49	5.89
Geisenheim	50	0.0225	50	9.48	10.83	1951	2011	120	10.83	7.63	3.20
Geneve-Cointr	46.3	0.009006	46.3	9.11	10.56	1849	2010	416	10.56	9.11	1.45
Goerlitz	51.2	0.005679	51.2	7.69	8.61	**1849**	2011	238	8.61	6.20	2.41
Graz-Thalerho	47	0.018103	47	8.94	9.99	1951	2009	347	9.99	8.89	1.10
Hamburg-Fuhls	53.6	0.029167	53.6	8.06	9.81	1951	2011	15	9.81	5.27	4.54
Hannover	52.5	0.007677	52.5	8.21	9.4	1856	2011	59	9.4	5.96	3.44
Hohenpeissenb	47.8	0.00875	47.8	5.68	7.08	1851	2011	986	7.08	5.56	1.52
Iasi	47.2	0.025254	47.2	8.92	10.41	1952	2011	104	10.41	9.79	0.62
Innsbruck-Flughafen	47.3	0.026724	47.3	7.65	9.2	1952	2010	593	9.2	7.62	1.58
Innsbruck-University	47.3	0.011066	47.3	7.66	9.01	1877	1999	582	9.01	7.66	1.35
Isparta	37.8	0.014839	37.8	11.52	12.44	1949	2011	997	12.44	12.32	0.12
Jonkoping Fly	57.8	0.003667	57.8	5.72	5.94	1951	2011	232	5.94	0.92	5.02
Jyvaskyla	62.4	0.021818	62.4	2.23	3.43	1951	2006	145	3.43	-2.62	**6.05**
Kajaani	64.3	0.022281	64.3	0.99	2.26	1951	2008	136	2.26	-4.24	**6.50**
Karlstad Flyg	59.4	0.024821	59.4	5.24	6.63	1951	2007	55	6.63	0.33	**6.30**
Kassel	51.3	0.010515	51.3	7.38	8.81	1865	2001	233	8.81	6.15	2.66
Kastamonu	41.4	0.004032	41.4	9.59	9.84	1949	2011	799	9.84	10.86	-1.02
Kaunas	54.9	0.018068	54.9	5.57	7.16	1923	2011	77	7.16	3.96	3.20
Kharkiv	50	0.018571	50	6.13	8.34	1892	2011	155	8.34	7.48	0.86
Kisinev	47	0.005062	47	9.1	9.92	**1849**	2011	173	9.92	9.64	0.28
Klagenfurt-Fl	46.7	0.006375	46.7	7.46	8.48	1850	2010	476	8.48	8.56	-0.08
Klodzko	50.4	0.025918	50.4	6.54	7.81	1951	2000	357	7.81	6.31	1.50
Konya	38	0.019032	38	10.61	11.79	**1949**	2011	1022	11.79	12.09	-0.30
Kosice	48.7	0.024576	48.7	8.1	9.55	1952	2011	231	9.55	8.14	1.41
Koszalin	54.2	0.007483	54.2	6.81	7.94	**1849**	2000	34	7.94	4.71	3.23
Krakow	50.1	0.003519	50.1	7.37	7.94	**1849**	2011	237	7.94	7.05	0.89
Kyiv	50.4	0.013185	50.4	6.34	8.41	1854	2011	167	8.41	7.12	1.29
L'Viv	49.8	0.010625	49.8	6.06	7.76	1850	2010	323	7.76	6.91	0.85
Larissa	39.6	-0.00018	39.6	15.79	15.77	1899	2011	74	15.77	15.15	0.62
Leipzig-Schke	51.4	0.023	51.4	8.34	9.72	1951	2011	149	9.72	6.43	3.29
Limoges	45.9	0.018833	45.9	10.24	11.37	1951	2011	402	11.37	9.45	1.92
Lugano	46	0.023833	46	11.44	12.87	1951	2011	276	12.87	9.92	2.95

Luxembourg/	49.6	0.026167	49.6	8.17	9.74	1951	2011	379	9.74	6.82	2.92
Lyon	45.7	0.009796	45.7	10.41	11.85	1851	**1998**	201	11.85	10.46	1.39
Madrid/Baraja	40.5	0.007468	40.5	13.89	15.07	1853	2011	582	15.07	12.39	2.68
Magdeburg	52.1	0.024	52.1	8.71	10.15	1951	2011	85	10.15	6.16	3.99
Manchester Ai	53.4	0.019216	53.4	9.19	10.17	1952	2003	78	10.17	5.16	5.01
Mikolaiv	47	6.49E-05	47	9.83	9.84	**1849**	2003	50	9.84	10.17	-0.33
Minsk	53.9	0.014202	53.9	4.88	6.57	1892	2011	231	6.57	4.11	2.46
Miskolc	48.1	0.010408	48.1	9.1	9.61	1951	2000	233	9.61	8.57	1.04
Mugla	37.2	0.007903	37.2	14.75	15.24	1949	2011	646	15.24	14.20	1.04
Mullingar	53.3	0.01551	53.3	8.47	9.23	1950	1999	104	9.23	5.13	4.10
Nancy/Essey	48.7	0.012157	48.7	9.52	10.14	1951	2002	217	10.14	8.20	1.94
Nantes	47.2	0.009438	47.2	10.35	11.86	1851	2011	27	11.86	10.12	1.74
Nice	43.7	0.027931	43.7	14.55	16.17	1953	2011	10	16.17	12.69	3.48
Nimes/Courbes	43.9	0.032553	43.9	13.58	15.11	1953	2000	62	15.11	12.33	2.78
Nuernberg	49.5	0.033455	49.5	7.76	9.6	**1954**	2009	318	9.6	7.16	2.44
Odesa	46.4	0.007284	46.4	9.47	10.65	**1849**	2011	42	10.65	10.64	0.01
Oslo/Gardermo	60.2	0.0255	60.2	3.73	5.26	1951	2011	204	5.26	-0.98	**6.24**
Ostersund/Fro	63.2	0.0245	63.2	2.13	3.6	1951	2011	370	3.6	-4.28	**7.88**
Ostrava/Mosno	49.7	0.023018	49.7	7.778	9.09	1953	2010	256	9.09	7.27	1.82
Pecs	46	0.017667	46	10.13	11.19	1951	2011	203	11.19	10.24	0.95
Perpignan	42.7	0.005776	42.7	14.61	15.54	1850	2011	48	15.54	13.22	2.32
Pisa/S. Giust	43.7	0.012037	43.7	14.01	14.66	1951	2005	6	14.66	12.71	1.95
Poprad/Tatry	49.1	0.019667	49.1	5.42	6.6	1951	2011	695	6.6	5.84	0.76
Potsdam	52.4	0.009746	52.4	8.15	9.3	1893	2011	100	9.3	5.86	3.44
Poznan	52.4	0.026	52.4	7.66	9.22	1951	2011	92	9.22	5.89	3.33
Praha/Ruzyne	50.1	0.010741	50.1	6.6	8.34	**1849**	2011	365	8.34	6.50	1.84
Reboly	63.8	0.008966	63.8	0.77	1.55	1914	2001	182	1.55	-4.00	5.55
Saarbruecken/	49.2	0.020833	49.2	8.55	9.8	1951	2011	320	9.8	7.38	2.42
Saentis	47.3	0.010313	47.3	-2.49	-1.17	1883	2011	2500	-1.17	-0.58	-0.59
Salzburg-Flug	47.8	0.033621	47.8	7.57	9.52	1951	2009	450	9.52	7.86	1.66
Sandomierz	50.7	0.01898	50.7	7.24	8.17	1951	2000	218	8.17	6.67	1.50
Sarajevo	43.9	0.006983	43.9	9.24	10.05	1895	2011	637	10.05	9.86	0.19
Shannon Airpo	52.7	0.022951	52.7	9.23	10.63	**1948**	2009	20	10.63	5.97	4.66
Sibiu	45.8	0.002938	45.8	8.24	8.71	1851	2011	444	8.71	9.35	-0.64
Sliac	48.7	0.016	48.7	8.21	9.09	1951	2006	315	9.09	7.77	1.32
Sofia (Observ	42.7	0.013898	42.7	9.57	10.39	1951	2010	595	10.39	10.86	-0.47

Sonnblick	47.1	0.010976	47.1	-6.46	-5.11	1887	2010	3109	-5.11	-3.06	-2.05
St. Poelten	48.2	0.025094	48.2	8.32	9.65	1951	2004	282	9.65	8.29	1.36
St Peterburg	60	0.015	60	3.34	5.77	**1849**	2011	6	5.77	0.04	5.73
Strasbourg	48.6	0.010247	48.6	8.95	10.61	**1849**	2011	154	10.61	8.54	2.07
Stuttgart-	48.7	0.030172	48.7	8.16	9.91	1953	2011	391	9.91	7.45	2.46
Stuttgart/	48.8	0.008457	48.8	8.49	9.86	**1849**	2011	311	9.86	7.72	2.14
Suwalki	54.1	0.02449	54.1	5.44	6.64	1951	2000	186	6.64	4.14	2.50
Szczecin	53.4	0.00642	53.4	7.76	8.8	**1849**	2011	3	8.8	5.48	3.32
Szeged	46.3	0.017333	46.3	10.12	11.16	1951	2011	83	11.16	10.54	0.62
Timisoara	45.8	0.006183	45.8	10.36	11.17	1880	2011	88	11.17	10.88	0.29
Torun	53	0.031224	53	7.08	8.61	1951	2000	72	8.61	5.51	3.10
Toulouse/Blag	43.6	0.00963	43.6	11.85	13.41	**1849**	2011	153	13.41	12.15	1.26
Trier-Petrisb	49.8	0.008509	49.8	8.29	9.66	1850	2011	273	9.66	7.13	2.53
Turku	60.5	0.022034	60.5	4.46	5.76	1951	2010	59	5.76	-0.62	**6.38**
Uccle	50.8	0.011677	50.8	8.58	10.46	**1849**	2010	104	10.46	7.09	3.37
Udine/Campoformido	46	0.021569	46	12.5	13.6	1953	2004	92	13.6	10.72	2.88
Uzhhorod	48.6	0.012857	48.6	9.49	10.3	1948	2011	124	10.3	8.67	1.63
Valencia	39.5	0.022455	39.5	15.87	18.34	1900	2010	11	18.34	15.49	2.85
Valladolid	41.7	0.004437	41.7	11.83	12.46	1868	2010	739	12.46	10.92	1.54
Vasilevici	52.3	0.009	52.3	5.9	7.07	1881	2011	142	7.07	5.76	1.31
Velikie Luki	56.4	0.013538	56.4	4.53	5.41	1937	2002	106	5.41	2.62	2.79
Vf. Omu	45.5	0.012286	45.5	-3.05	-2.19	1941	2011	2509	-2.19	0.68	-2.87
Vilnius	54.6	0.008025	54.6	5.13	6.43	1849	2011	156	6.43	3.87	2.56
Vinnytsia	49.2	0.017083	49.2	6.71	7.94	1939	2011	298	7.94	7.47	0.47
Vratza	43.2	0.009184	43.2	11	11.45	1951	2000	310	11.45	11.75	-0.30
Waddington	53.2	0.0255	53.2	8.78	10.31	1951	2011	70	10.31	5.36	4.95
Warszawa-Okec	52.2	0.008086	52.2	7.01	8.32	**1849**	2011	107	8.32	5.99	2.33
Wien/Hohe War	48.3	0.01	48.3	8.76	10.37	**1849**	2010	209	10.37	8.53	1.84
Wlodawa	51.6	0.034667	51.6	6.2	8.28	1951	2011	179	8.28	6.14	2.14
Wroclaw li	51.1	0.003827	51.1	8.27	8.89	**1849**	2011	121	8.89	6.78	2.11
Zagreb/Gric	45.8	0.008523	45.8	10.87	12.14	1862	2011	162	12.14	10.56	1.58
Zakopane	49.3	0.018125	49.3	4.76	5.63	1951	1999	860	5.63	4.98	0.65
Zaragoza/Aeropuerto	41.7	0.001776	41.7	14.03	15.73	1051	2008	258	15.73	12.99	2.74
Zielona Gora	51.9	0.024694	51.9	7.66	8.87	1951	2000	192	8.87	5.85	3.02
Zugspitze	47.4	0.014	47.4	-4.96	-4.12	1951	2011	2962	-4.12	-2.64	-1.48
Zurich (Town/	47.4	0.010952	47.4	7.72	9.33	1864	2011	569	9.33	7.65	1.68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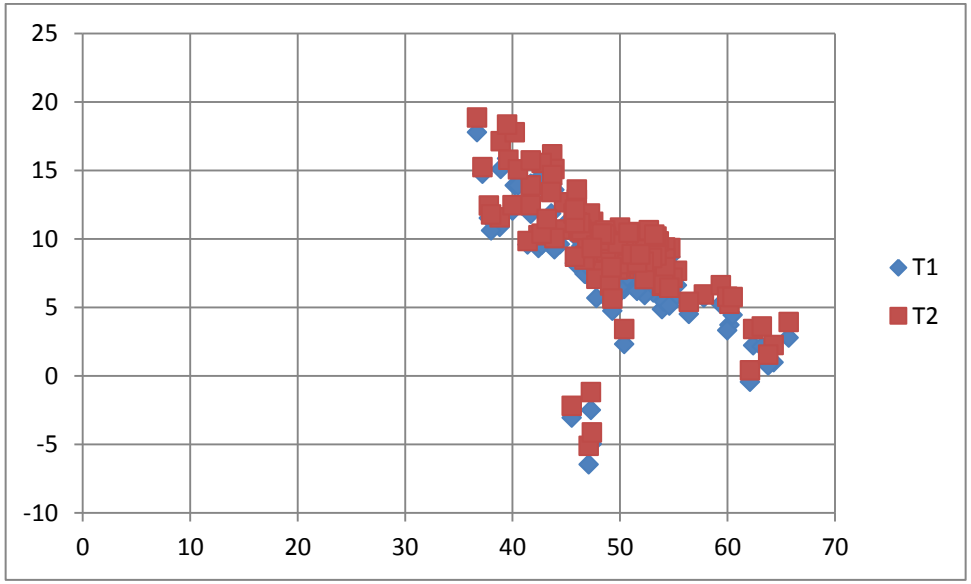
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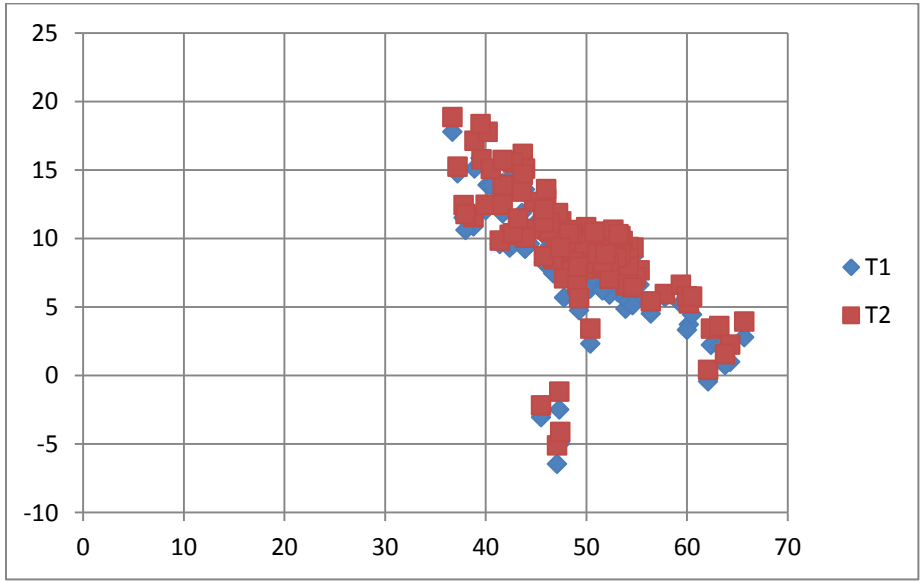
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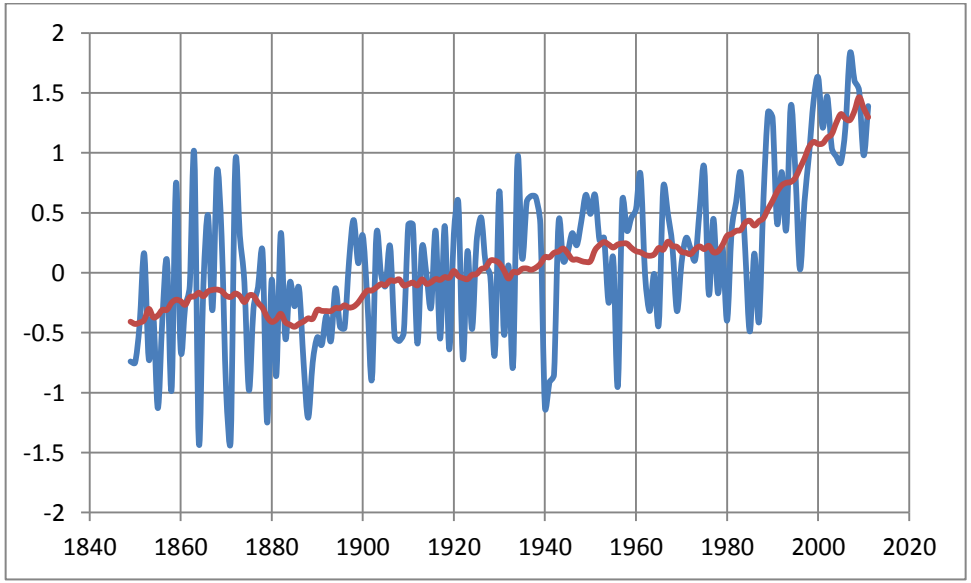
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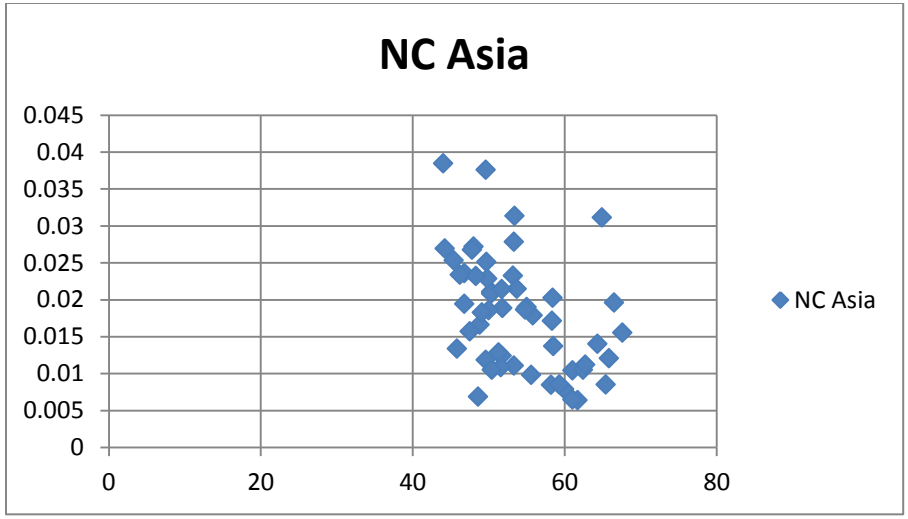
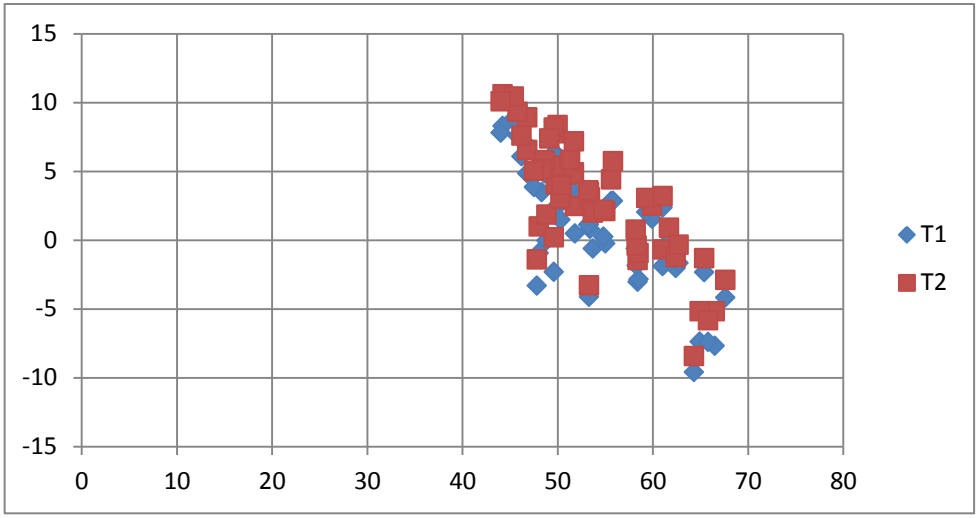
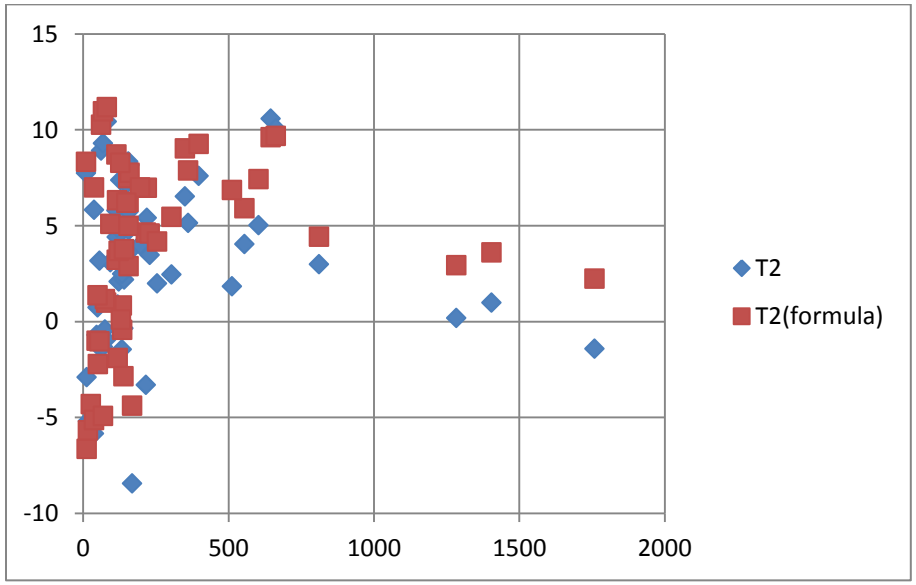
North Central Asia: Here I obtained 53 'good data' stations, with 5 going back to 1849.

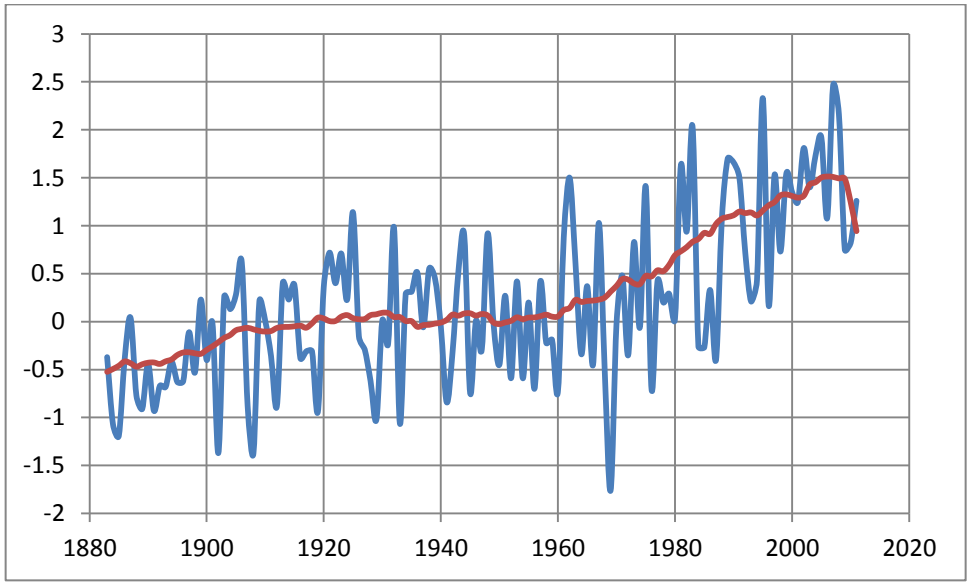
average	53.95	**0.0180**	53.95	1.18	2.90	1904	2009	266.53	2.90	3.74	**-0.84**
North Central Asia	Latitude	NC Asia	Latitude	T1	T2	start	end	Elevation	T2	T2(formula)	error
Aktjubinsk	50.3	0.021068	50.3	3.24	5.41	1908	2011	219	5.41	6.98	-1.57
Aralskoe More	46.8	0.019423	46.8	6.9	8.92	1907	2011	62	8.92	10.27	-1.35
Atbasar	51.8	0.018868	51.8	0.46	2.46	1905	2011	304	2.46	5.45	-2.99
Balhash	46.8	0.023611	46.8	4.83	6.53	1937	2009	350	6.53	9.03	-2.50
Bogucany	58.4	0.020256	58.4	-3.03	-1.45	1933	2011	133	-1.45	0.84	-2.29
Bor	53.3	0.011067	53.3	-4.13	-3.3	1936	2011	216	-3.3	4.65	-7.95
Enisejsk	58.5	0.013741	58.5	-2.85	-0.94	1872	2011	79	-0.94	0.99	-1.93
Furmanovo	49.7	0.025122	49.7	5.69	7.75	1927	2009	10	7.75	8.33	-0.58
Hanty-Mansijs	61	0.010439	61	-1.89	-0.7	1897	2011	46	-0.7	-0.99	0.29
Hovd	48	0.027183	48	-0.94	0.99	1937	2008	1405	0.99	3.61	-2.62
Irgiz	48.6	0.006861	48.6	4.85	5.79	1863	**2000**	114	5.79	8.71	-2.92
Irtyssk	53.4	0.03137	53.4	0.8	3.09	1938	2011	94	3.09	5.09	-2.00
Karaganda	49.8	0.022877	49.8	2.37	4.04	1936	2009	555	4.04	5.91	-1.87
Kazalinsk	45.8	0.013385	45.8	7.56	9.3	1881	2011	68	9.3	10.96	-1.66
Kazan'	55.6	0.009815	55.6	2.82	4.41	**1849**	2011	116	4.41	3.23	1.18
Kharkiv	50	0.018571	50	6.13	8.34	1892	2011	155	8.34	7.48	0.86
Kokpekty	48.8	0.016637	48.8	-0.04	1.84	1896	2009	512	1.84	6.85	-5.01
Kokshetay	53.3	0.027857	53.3	1.14	3.48	1927	2011	229	3.48	4.59	-1.11
Kolpasevo	58.3	0.017143	58.3	-1.85	-0.41	1927	2011	75	-0.41	1.17	-1.58
Kustanai	53.2	0.023241	53.2	1.09	3.6	1903	2011	156	3.6	4.99	-1.39
Kzyl-Zar	48.3	0.023194	48.3	3.47	5.14	1939	2011	361	5.14	7.88	-2.74
Leninogorsk	50.3	0.020822	50.3	1.47	2.99	1936	2009	811	2.99	4.43	-1.44
Minusinsk	53.7	0.021475	53.7	-0.63	1.99	1889	2011	254	1.99	4.17	-2.18
Moskva	55.8	0.017901	55.8	2.83	5.73	**1849**	2011	156	5.73	2.89	2.84
Muren	49.6	0.037612	49.6	-2.33	0.19	1941	2008	1283	0.19	2.93	-2.74

Nar'Jan-Mar	67.6	0.015542	67.6	-4.19	-2.9	1928	2011	12	-2.9	-6.63	3.73
Njaksimvol'	62.4	0.010533	62.4	-2.03	-1.24	1936	2011	51	-1.24	-2.22	0.98
Omsk	55	0.019024	55	-0.25	2.09	1888	2011	122	2.09	3.69	-1.60
Orenburg	51.7	0.012403	51.7	3	4.91	**1849**	2003	117	4.91	6.33	-1.42
Panifilov	44.2	0.026941	44.2	8.29	10.58	1926	2011	645	10.58	9.61	0.97
Petropavlovsk	54.8	0.018667	54.8	0.23	2.19	1902	2007	141	2.19	3.77	-1.58
Poltava	49.6	0.011852	49.6	6.24	8.16	**1849**	2011	160	8.16	7.76	0.40
Salehard	66.5	0.019609	66.5	-7.7	-5.19	1883	2011	16	-5.19	-5.66	0.47
Sam	45.4	0.025313	45.4	8.81	10.43	1947	2011	82	10.43	11.19	-0.76
Saratov	51.6	0.010878	51.6	3.14	4.75	1855	2003	156	4.75	6.24	-1.49
Semipalatinsk	50.4	0.010504	50.4	2.74	3.99	1892	2011	196	3.99	7.00	-3.01
Syktyvkar	61.7	0.006382	61.7	-0.09	0.88	1851	2003	119	0.88	-1.90	2.78
Tarko-Sale	64.9	0.031127	64.9	-7.38	-5.17	1939	2010	27	-5.17	-4.30	-0.87
Tobol'Sk	58.2	0.008457	58.2	-0.63	0.74	1849	2011	50	0.74	1.36	-0.62
Tot'Ma	59.9	0.007917	59.9	1.54	2.49	1891	2011	134	2.49	-0.43	2.92
Troicko-Pecer	62.7	0.011186	62.7	-1.67	-0.35	1893	2011	139	-0.35	-2.85	2.50
Tura	64.3	0.014024	64.3	-9.59	-8.44	1929	2011	168	-8.44	-4.37	**-4.07**
Turuhansk	65.8	0.012077	65.8	-7.4	-5.83	1881	2011	38	-5.83	-5.14	-0.69
Uc-Aral	46.2	0.023385	46.2	6.07	7.59	1935	2000	397	7.59	9.26	-1.67
Uil	49.1	0.018289	49.1	5.99	7.38	1935	2011	128	7.38	8.28	-0.90
Uliastai	47.8	0.026761	47.8	-3.31	-1.41	1937	2008	1759	-1.41	2.23	-3.64
Uralsk	51.3	0.01284	51.3	3.74	5.82	**1849**	2011	37	5.82	6.99	-1.17
Ust'-Cil'Ma	65.4	0.008512	65.4	-2.35	-1.32	1890	2011	68	-1.32	-4.91	3.59
Vologda	59.3	0.0085	59.3	2.03	3.05	1891	2011	130	3.05	0.10	2.95
Voronez	51.7	0.021429	51.7	5.21	7.16	1920	2011	149	7.16	6.20	0.96
Vytegra	61	0.006484	61	2.35	3.18	1882	2010	56	3.18	-1.03	4.21
Yining	44	0.038475	44	7.8	10.07	**1952**	2011	663	10.07	9.68	0.39
Zajsan	47.5	0.015733	47.5	3.85	5.03	1925	2000	603	5.03	7.43	-2.40









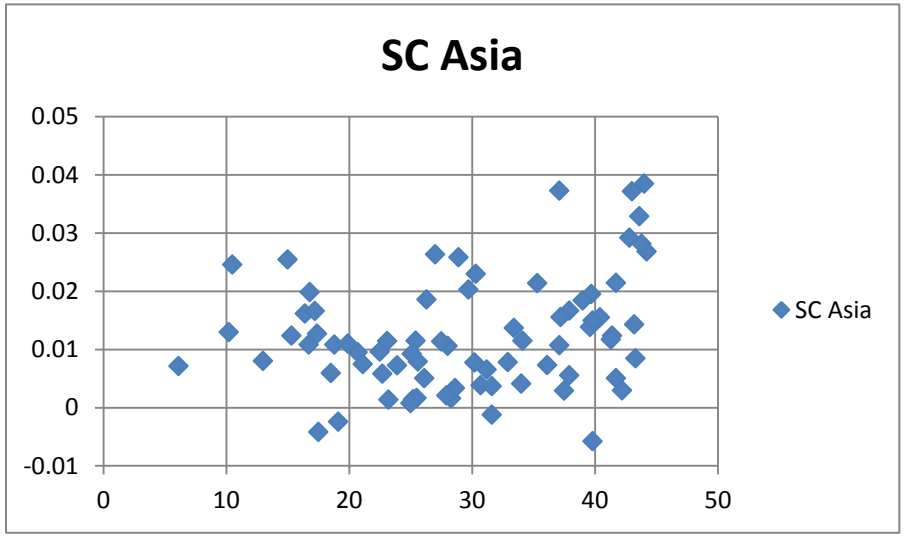
South Central Asia: Here I obtained 76 'good data' stations, one going back to 1849, and several to 1876.

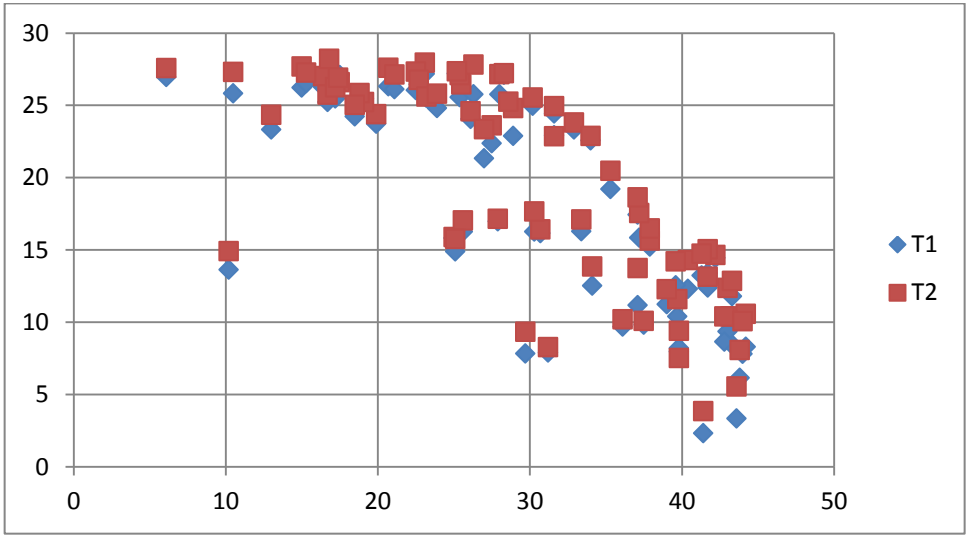
Average		29.56	**0.0124**	29.56	18.54	19.54	1920	2008	694.34	19.54	17.52	**2.03**

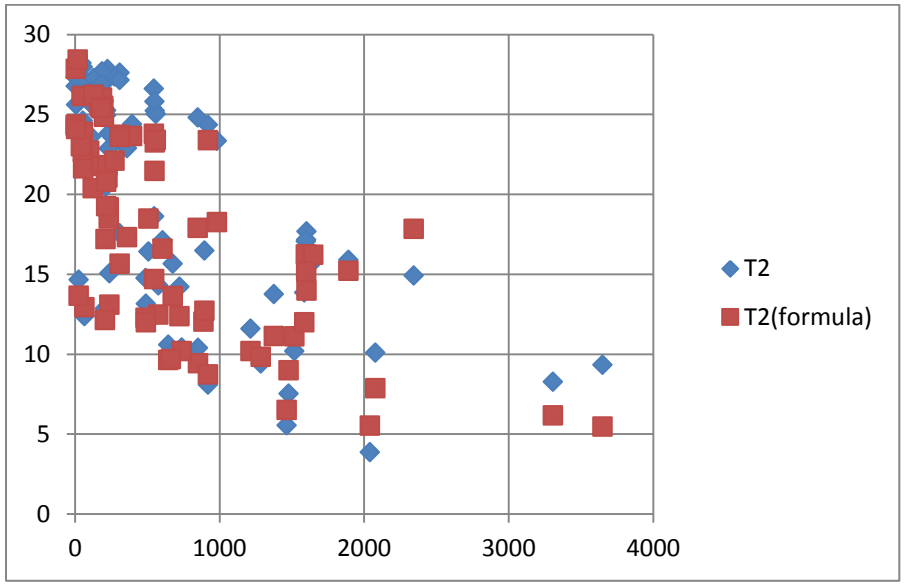
	Latitude	SC Asia	Latitude	T1	T2	start	end	Elevation	T2	T2(formula)	error
Ahmadabad	23.1	0.011449	23.1	27.16	27.95	1942	2011	55	27.95	23.90	4.05
Akola	20.7	0.009481	20.7	26.31	27.59	1876	2011	309	27.59	23.72	3.87
Allahbad/Bam	25.5	0.001667	25.5	26.23	26.44	1878	2004	98	26.44	22.71	3.73
Almaty	43.2	0.014264	43.2	8.55	10.39	1881	2010	851	10.39	9.42	0.97
Amritsar	31.6	-0.00121	31.6	22.93	22.86	1949	2007	234	22.86	19.17	3.69
Bangalore	13	0.008047	13	23.31	24.34	1882	2010	921	24.34	23.37	0.97
Begampet	17.5	-0.00419	17.5	27.08	26.59	1893	2010	545	26.59	23.78	2.81
Bikaner	28	0.010606	28	25.75	27.15	1879	2011	224	27.15	21.03	**6.12**
Calcutta/Alip	22.5	0.009621	22.5	26.05	27.32	1878	2010	6	27.32	24.35	2.97
Calcutta/Dum	22.7	0.005849	22.7	26.44	26.75	1947	2000	6	26.75	24.27	2.48
Chengdu	30.7	0.003857	30.7	16.14	16.41	1933	2003	508	16.41	18.46	-2.05
Chiang Rai	19.9	0.011	19.9	23.72	24.38	1940	2000	395	24.38	23.64	0.74
Chumphon	10.5	0.02459	10.5	25.81	27.31	1949	2010	5	27.31	27.83	-0.52
Cimbaj	43	0.03716	43	9.36	12.37	1928	2009	66	12.37	12.93	-0.56
Dal Bandin	28.9	0.025811	28.9	22.88	24.79	1937	2011	850	24.79	17.90	6.89
Dalanzadgad	43.6	0.032836	43.6	3.34	5.54	1941	2008	1465	5.54	6.51	-0.97
Damascus Int	33.4	0.013667	33.4	16.28	17.1	1951	2011	605	17.1	16.59	0.51
Deir Ezzor	35.3	0.021356	35.3	19.2	20.46	1952	2011	212	20.46	17.20	3.26
Dibrugarh /Mo	27.5	0.011389	27.5	22.37	23.6	1902	2010	111	23.6	21.75	1.85
Diyarbakir	37.9	0.00557	37.9	15.21	15.65	1929	2008	677	15.65	13.63	2.02
Erzincan	39.7	0.019508	39.7	10.4	11.59	1949	2010	1215	11.59	10.18	1.41
Fergana	40.4	0.015504	40.4	12.29	14.29	1882	2011	577	14.29	12.47	1.82
Gauhati	26.1	0.005047	26.1	24.05	24.59	1903	2010	54	24.59	22.64	1.95
Hambantota	6.1	0.007126	6.1	26.95	27.57	1921	2008	20	27.57	28.42	-0.85
Hami	42.8	0.029167	42.8	8.65	10.4	1951	2011	739	10.4	10.18	0.22
Hotan	37.1	0.037246	37.1	11.17	13.74	1942	2011	1375	13.74	11.12	2.62
Hyderabad Air	25.4	0.011504	25.4	25.56	27.09	1878	2011	41	27.09	23.00	4.09
Jacobabad	28.3	0.001579	28.3	27.1	27.22	1933	2009	56	27.22	21.61	5.61
Jagdalpur	19.1	-0.00242	19.1	25.45	25.21	1910	2009	553	25.21	23.23	1.98
Jessore	23.2	0.001364	23.2	25.5	25.59	1933	1999	7	25.59	24.07	1.52
Jhelum	32.9	0.007778	32.9	23.31	23.8	1948	2011	234	23.8	18.47	5.33
Jiuquan	39.8	-0.00579	39.8	7.97	7.53	1935	2011	1478	7.53	8.99	-1.46
Jodhpur	26.3	0.018559	26.3	25.76	27.82	1898	2009	224	27.82	21.82	**6.00**
Khon Kaen	16.4	0.01617	16.4	26.25	27.01	1951	**1998**	166	27.01	25.74	1.27

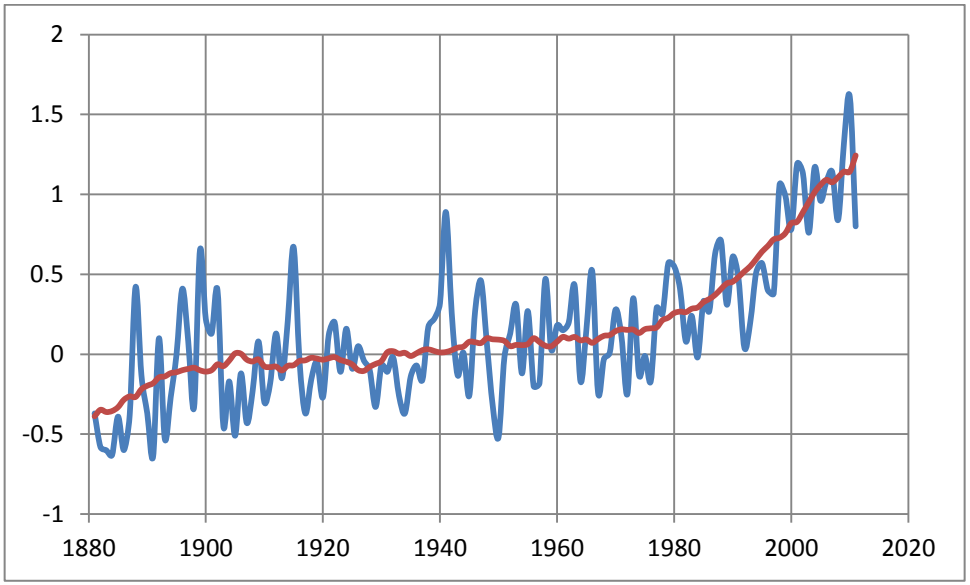
Khorog	37.5	0.002917	37.5	9.81	10.09	1902	**1998**	2077	10.09	7.86	2.23
Kodaikanal	10.2	0.012959	10.2	13.63	14.9	1901	1999	2343	14.9	17.83	-2.93
Kota Aerodrom	25.2	0.001416	25.2	27.19	27.35	1898	2011	274	27.35	22.09	5.26
Kunming	25	0.000787	25	15.82	15.89	1922	2011	1892	15.89	15.22	0.67
Lahore City	31.6	0.003704	31.6	24.43	24.93	1876	2011	215	24.93	19.25	5.68
Lanzhou	36.1	0.007286	36.1	9.68	10.19	1933	2003	1518	10.19	11.11	-0.92
Lhasa	29.7	0.02027	29.7	7.83	9.33	1936	2010	3650	9.33	5.46	3.87
Mae Sot	16.7	0.010816	16.7	25.21	25.74	1951	2000	197	25.74	25.52	0.22
Multan	30.2	0.007733	30.2	24.95	25.53	1936	2011	123	25.53	20.37	5.16
Nagpur Sonega	21.1	0.0075	21.1	26.11	27.13	1875	2011	310	27.13	23.57	3.56
Nakhon Ratcha	15	0.025439	15	26.22	27.67	1949	2006	188	27.67	26.03	1.64
Nan	18.8	0.010833	18.8	25.32	25.84	1952	2000	201	25.84	24.84	1.00
Naryn	41.4	0.012358	41.4	2.33	3.85	1886	2009	2041	3.85	5.52	-1.67
New Delhi/	28.6	0.003333	28.6	24.98	25.24	1931	2009	216	25.24	20.77	4.47
Panifilov	44.2	0.026824	44.2	8.3	10.58	1926	2011	645	10.58	9.61	0.97
Panjgur	27	0.026316	27	21.33	23.33	1935	2011	981	23.33	18.24	5.09
Peshawar	34	0.004133	34	22.56	22.87	1936	2011	360	22.87	17.31	5.56
Phitsanulok	16.8	0.019846	16.8	26.91	28.2	1945	2010	45	28.2	26.14	2.06
Poona	18.5	0.00594	18.5	24.23	25.02	1876	2009	559	25.02	23.40	1.62
Qamdo	31.2	0.006552	31.2	7.89	8.27	1953	2011	3307	8.27	6.17	2.10
Quetta/Samungli	30.3	0.022951	30.3	16.26	17.66	1950	2011	1601	17.66	13.97	3.69
Ruoqiang	39	0.018393	39	11.24	12.27	**1954**	2010	889	12.27	12.03	0.24
Sagar	23.9	0.007279	23.9	24.8	25.79	1875	2011	551	25.79	21.45	4.34
Sakon Nakhon	17.2	0.016596	17.2	25.46	26.24	1953	2000	172	26.24	25.47	0.77
Samarkand	39.6	0.013833	39.6	12.55	14.21	1891	2011	724	14.21	12.36	1.85
Samtredia	42.2	0.002969	42.2	14.45	14.64	1936	2000	26	14.64	13.65	0.99
Shillong	25.6	0.007938	25.6	16.27	17.04	1903	2000	1598	17.04	16.22	0.82
Siirt	37.9	0.016667	37.9	15.47	16.47	1951	2011	895	16.47	12.70	3.77
Sivas	39.8	0.014938	39.8	8.2	9.41	1930	2011	1285	9.41	9.82	-0.41
Srinagar	34.1	0.011466	34.1	12.52	13.85	1893	2009	1587	13.85	11.98	1.87
Tamdy	41.7	0.021429	41.7	13.39	15.04	1934	2011	237	15.04	13.08	1.96
Tashkent	41.3	0.011705	41.3	13.23	14.74	1882	2011	488	14.74	12.26	2.48
Tbilisi	41.7	0.005033	41.7	12.38	13.14	**1849**	2000	490	13.14	11.99	1.15
Tengchong	25.1	0.009255	25.1	14.89	15.76	1916	2010	1649	15.76	16.22	-0.46
Termez	37.2	0.015545	37.2	15.83	17.54	1901	2011	310	17.54	15.64	1.90
Turkestan	43.3	0.00848	43.3	11.79	12.85	1886	2011	207	12.85	12.12	0.73

Ubon Ratchath	15.3	0.012373	15.3	26.53	27.26	1951	2010	127	27.26	26.21	1.05
Udon Thani	17.4	0.012679	17.4	26.19	26.9	1950	2006	182	26.9	25.37	1.53
Urfa	37.1	0.010721	37.1	17.43	18.62	1900	2011	547	18.62	14.68	3.94
Urumqi	43.8	0.028116	43.8	6.14	8.08	1942	2011	919	8.08	8.71	-0.63
Xichang	27.9	0.002099	27.9	16.97	17.14	1930	2011	1599	17.14	15.16	1.98
Yining	44	0.038475	44	7.8	10.07	1952	2011	663	10.07	9.68	0.39



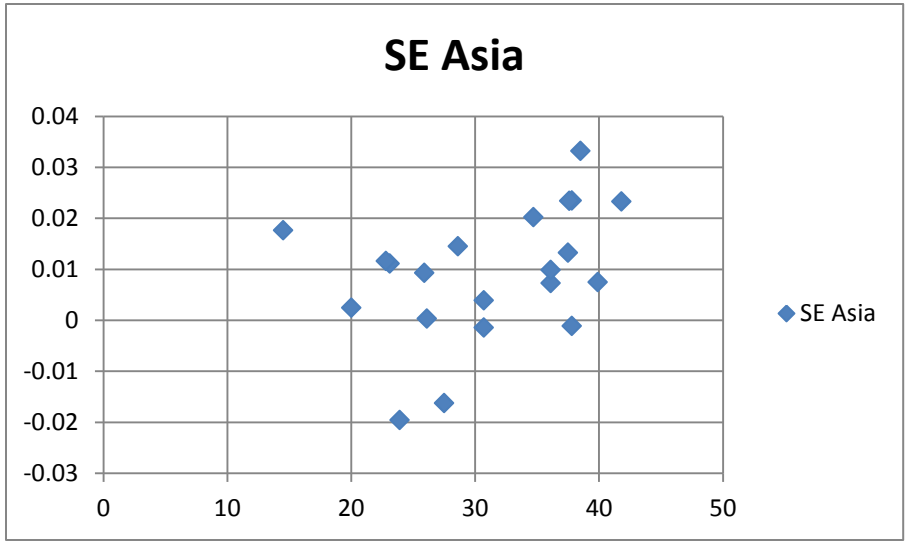


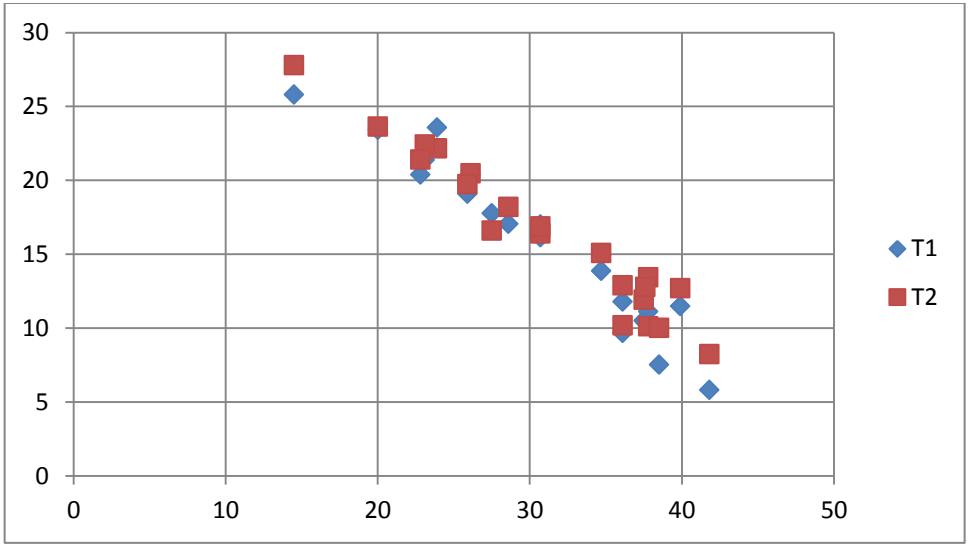


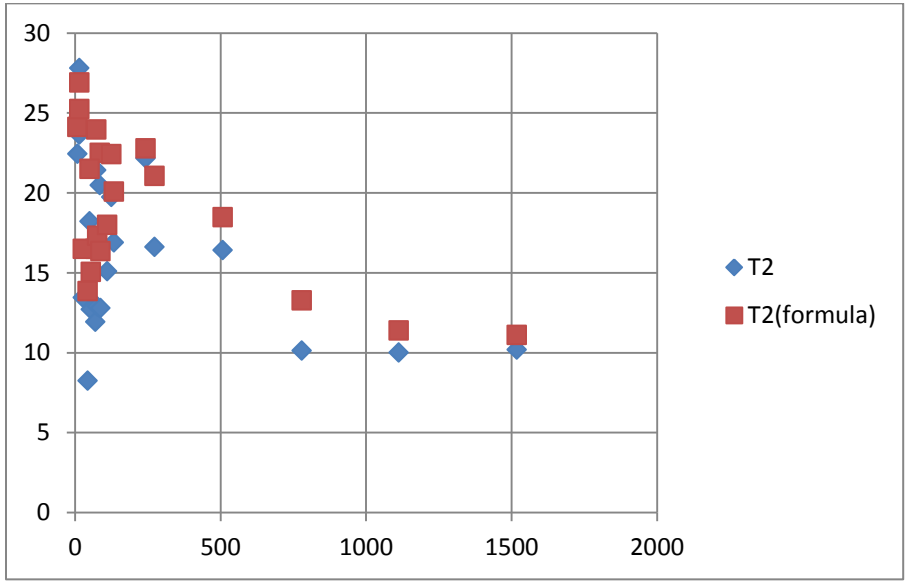


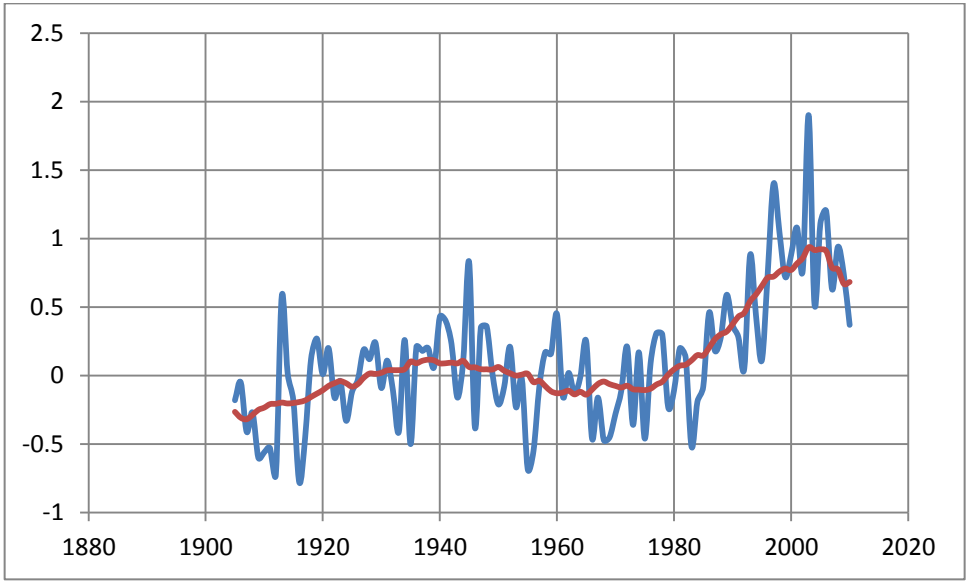
South East Asia: Here I could only find 21 'good data' stations.

Average	31.03	**0.0092**	31.03	15.45	16.34	1918	2010	257.48	16.34	18.96	**-2.62**
	Latitude	SE Asia	Latitude	T1	T2	start	end	Elevation	T2	T2(formula)	error
Baise	23.9	-0.01958	23.9	23.57	22.16	1939	2011	242	22.16	22.77	-0.61
Beijing	39.9	0.007469	39.9	11.5	12.71	1849	2011	55	12.71	15.04	-2.33
Chengdu	30.7	0.003857	30.7	16.14	16.41	1933	2003	508	16.41	18.46	-2.05
Fuzhou	26.1	0.000283	26.1	20.44	20.47	1905	2011	85	20.47	22.50	-2.03
Ganzhou	25.9	0.009265	25.9	19.1	19.73	1943	2011	125	19.73	22.42	-2.69
Guangzhou	23.1	0.011053	23.1	21.38	22.43	1913	2008	8	22.43	24.11	-1.68
Haikou	20	0.00241	20	23.43	23.63	1928	2011	15	23.63	25.24	-1.61
Inchon	37.5	0.013208	37.5	10.52	11.92	1905	2011	70	11.92	16.49	-4.57
Kangnung	37.8	0.023434	37.8	11.13	13.45	1912	2011	27	13.45	16.49	-3.04
Lanzhou	36.1	0.007286	36.1	9.68	10.19	1933	2003	1518	10.19	11.11	-0.92
Nanchang	28.6	0.0145	28.6	17.05	18.21	1931	2011	50	18.21	21.49	-3.28
Nanning	22.8	0.011573	22.8	20.38	21.41	1922	2011	73	21.41	23.95	-2.54
Ninoy Aquino	14.5	0.017611	14.5	25.8	27.79	1887	**2000**	15	27.79	26.90	0.89
Qingdao	36.1	0.009821	36.1	11.79	12.89	1899	2011	77	12.89	17.31	-4.42
Seoul	37.6	0.023398	37.6	10.38	12.79	1908	2011	87	12.79	16.36	-3.57
Shenyang	41.8	0.023238	41.8	5.81	8.25	1906	2011	43	8.25	13.85	-5.60
Taiyuan	37.8	-0.00116	37.8	10.23	10.12	1916	2011	779	10.12	13.26	-3.14
Yichang	30.7	-0.00149	30.7	17.02	16.89	1924	2011	134	16.89	20.07	-3.18
Yinchuan	38.5	0.0332	38.5	7.52	10.01	1936	2011	1112	10.01	11.39	-1.38
Zhengzhou	34.7	0.020167	34.7	13.88	15.09	**1951**	2011	111	15.09	17.98	-2.89
Zhijiang	27.5	-0.01625	27.5	17.78	16.61	1939	2011	273	16.61	21.05	-4.44







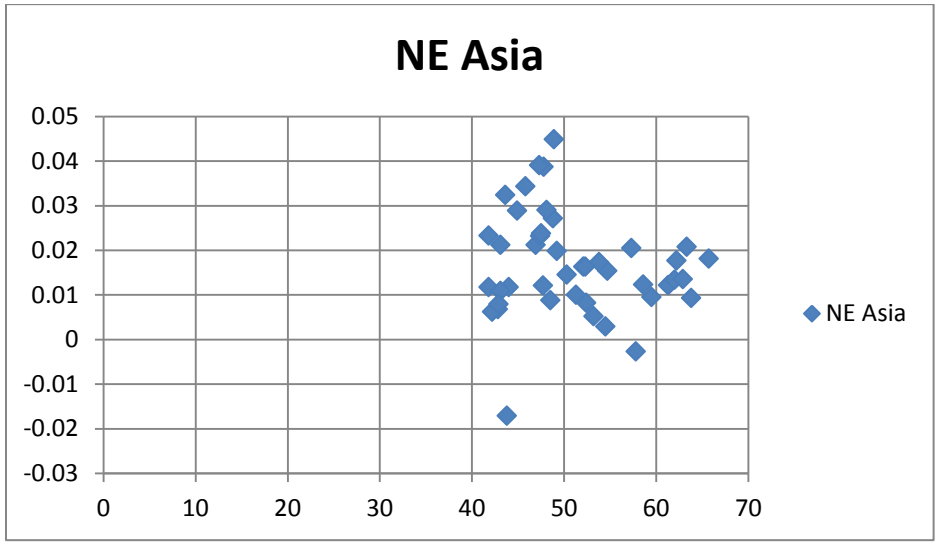


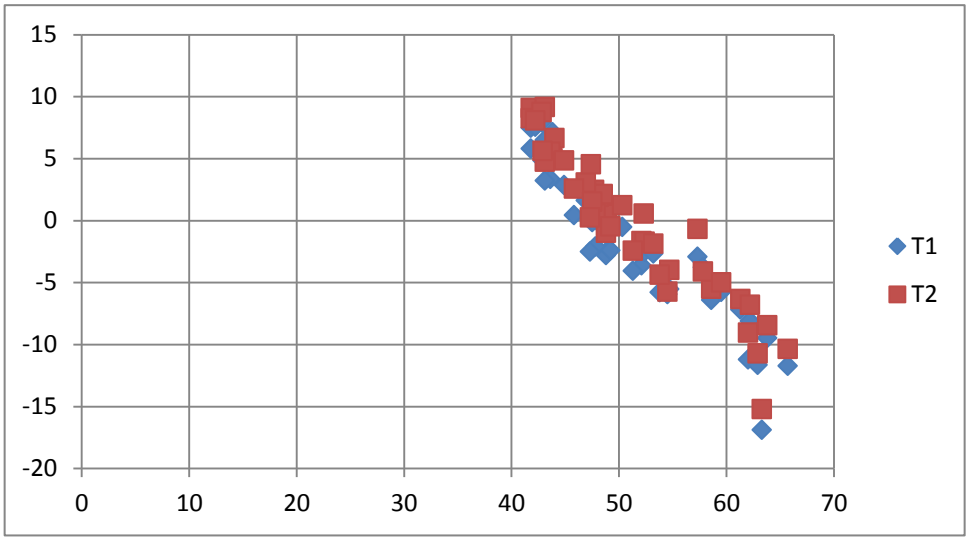
North East Asia: Here I obtained 43 'good data' stations.

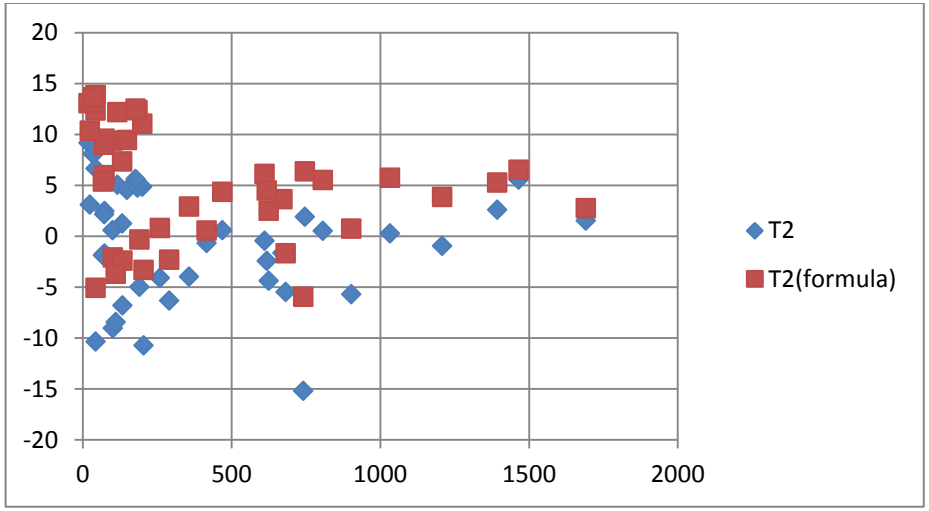
Average		51.09	**0.0167**	51.09	-1.65	-0.19	1911	2010	403.67	-0.19	5.34	**-5.53**

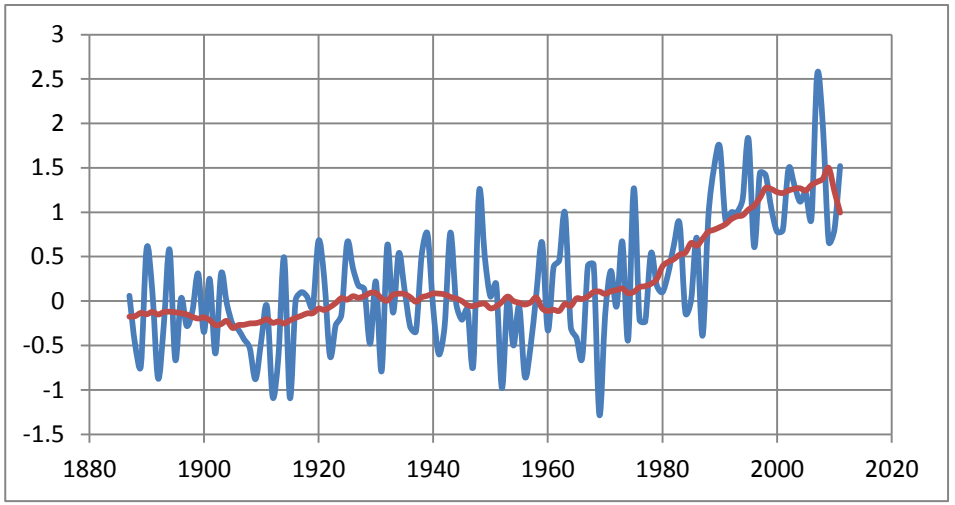
North East Asia	Latitude	NE Asia	Latitude	T1	T2	start	end	Elevation	T2	T2(formula)	error
Abashiri	44	0.01175	44	5.25	6.66	1891	2011	43	6.66	12.34	-5.68
Aldan	58.6	0.012267	58.6	-6.41	-5.49	1936	2011	682	-5.49	-1.69	-3.80
Asahikawa	43.8	-0.01713	43.8	7.12	5.03	1889	2011	116	5.03	12.17	**-7.14**
Bagdarin	54.5	0.002917	54.5	-5.93	-5.72	1939	2011	903	-5.72	0.73	**-6.45**
Bayan-Gol,Seleng	48.9	0.044848	48.9	-2.44	0.52	1942	2008	807	0.52	5.51	-4.99
Blagovescensk	50.3	0.014508	50.3	-0.52	1.25	**1881**	**2003**	132	1.25	7.35	**-6.10**
Bomnak	54.7	0.015347	54.7	-5.53	-3.98	1910	2011	357	-3.98	2.92	**-6.90**
Bratsk	57.3	0.020459	57.3	-2.91	-0.68	1902	2011	416	-0.68	0.54	-1.22
Bulgan	48.8	0.027164	48.8	-2.79	-0.97	1941	2008	1208	-0.97	3.86	-4.83
Choibalsan	48.1	0.029014	48.1	-0.16	1.9	1937	2008	747	1.9	6.36	-4.46
Cita	52.1	0.016333	52.1	-3.62	-1.66	1891	2011	671	-1.66	3.64	-5.30
Dalanzadgad	43.6	0.032388	43.6	3.37	5.54	1941	2008	1465	5.54	6.51	-0.97
Dauunmod, Central	47.8	0.038696	47.8	-2.09	0.58	1939	2008	100	0.58	9.37	**-8.79**
Ekaterino-Nik	47.7	0.012083	47.7	1.03	2.48	1891	2011	73	2.48	9.56	**-7.08**
Erbogacen	61.3	0.012143	61.3	-7.18	-6.33	1941	2011	291	-6.33	-2.30	-4.03
Habarovsk	48.5	0.00875	48.5	1.16	2.14	1891	**2003**	72	2.14	8.97	**-6.83**
Hailar	49.2	0.019798	49.2	-2.41	-0.45	1909	2008	611	-0.45	6.13	**-6.58**
Hakodate	41.8	0.011691	41.8	7.5	9.09	1875	2011	43	9.09	13.85	-4.76
Im Poliny Osi	52.4	0.008211	52.4	-2.49	-1.71	1916	2011	73	-1.71	5.97	**-7.68**
Irkutsk	52.3	0.01634	52.3	-1.93	0.57	1858	2011	469	0.57	4.35	-3.78
Jakutsk	62	0.013333	62	-11.2	-9.04	1849	2011	101	-9.04	-2.08	**-6.96**
Juzno-Sahalin	46.9	0.021176	46.9	1.64	3.08	1943	2011	24	3.08	10.36	**-7.28**
Kirensk	57.8	-0.00269	57.8	-3.77	-4.09	1892	2011	259	-4.09	0.80	-4.89
Mandalgovi	45.8	0.034286	45.8	0.43	2.59	**1945**	2008	1393	2.59	5.27	-2.68
Mogoca	53.8	0.017317	53.8	-5.79	-4.37	1929	2011	625	-4.37	2.49	**-6.86**
Nercinskij Za	51.3	0.01	51.3	-4.05	-2.43	1849	2011	619	-2.43	4.49	**-6.92**
Nikolaevsk-Na	53.2	0.005197	53.2	-2.65	-1.86	1859	2011	68	-1.86	5.36	**-7.22**
Ojmjakon	63.3	0.020741	63.3	-16.89	-15.21	1930	2011	741	-15.21	-5.96	**-9.25**
Qiqihar	47.4	0.023165	47.4	2.72	4.55	1932	2011	148	4.55	9.46	-4.91
Sainshand	44.9	0.028841	44.9	2.86	4.85	1939	2008	200	4.85	11.04	-6.19
Sapporo	43.1	0.0212	43.1	6.51	9.16	1886	2011	19	9.16	13.07	-3.91
Sejmchan	62.9	0.013478	62.9	-11.65	-10.72	1934	**2003**	205	-10.72	-3.31	**-7.41**
Shenyang	41.8	0.023238	41.8	5.81	8.25	1906	2011	43	8.25	13.85	-5.60

Suntar	62.2	0.017703	62.2	-8.11	-6.8	1937	2011	133	-6.8	-2.40	-4.40
Suttsu	42.8	0.006748	42.8	7.93	8.76	1888	2011	38	8.76	13.19	-4.43
Tsetserleg	47.5	0.023768	47.5	-0.12	1.52	1939	2008	1691	1.52	2.75	-1.23
Underkhann	47.3	0.039014	47.3	-2.5	0.27	1937	2008	1033	0.27	5.73	-5.46
Urakawa	42.2	0.00622	42.2	7.57	8.08	1929	2011	33	8.08	13.62	-5.54
Viljujsk	63.8	0.009286	63.8	-9.47	-8.43	1899	2011	111	-8.43	-3.69	-4.74
Vitim	59.5	0.009506	59.5	-5.75	-4.98	1930	2011	190	-4.98	-0.33	-4.65
Vladivostok	43.1	0.010863	43.1	3.24	4.75	1872	2011	184	4.75	12.36	**-7.61**
Yanji	42.9	0.007938	42.9	4.85	5.62	1914	2011	178	5.62	12.52	-6.90
Zyrjanka	65.7	0.018133	65.7	-11.72	-10.36	1936	2011	43	-10.36	-5.07	-5.29





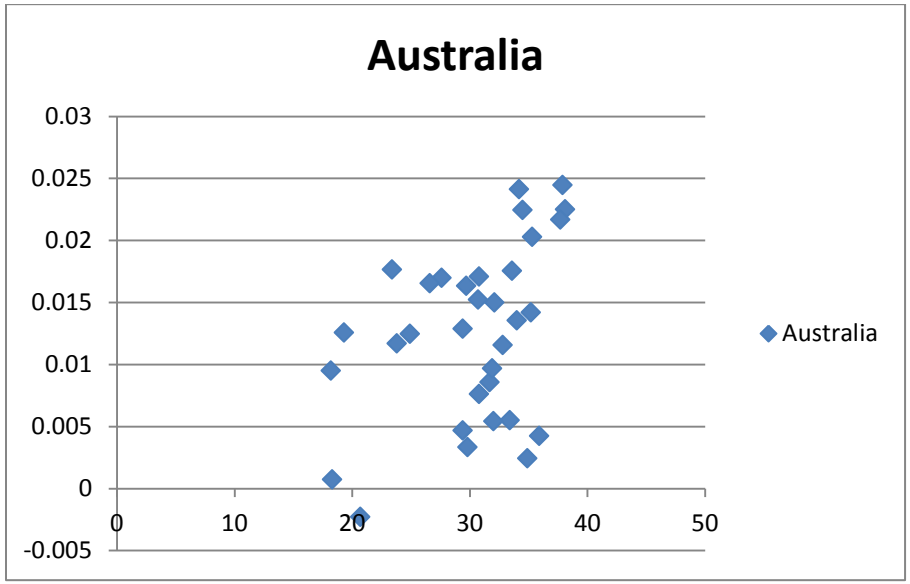


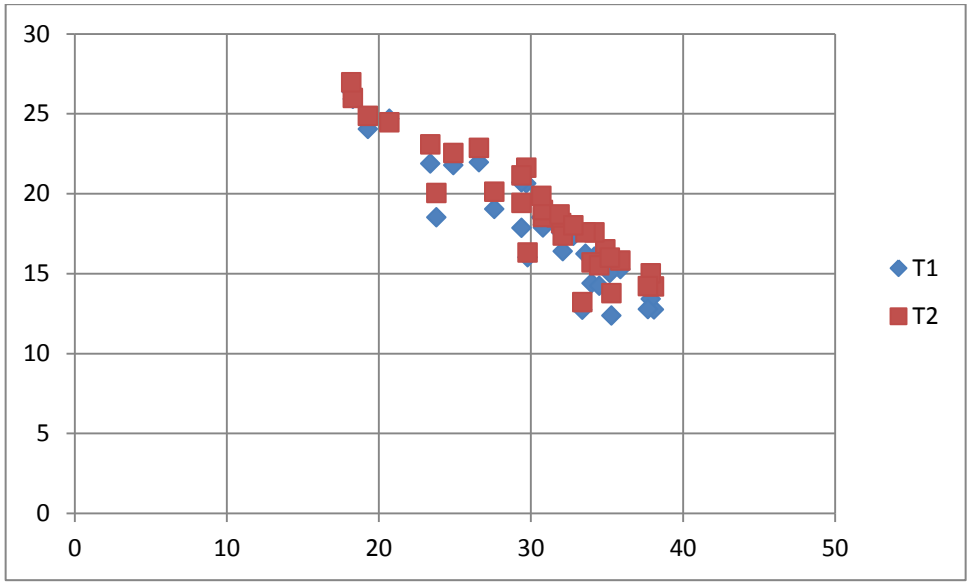


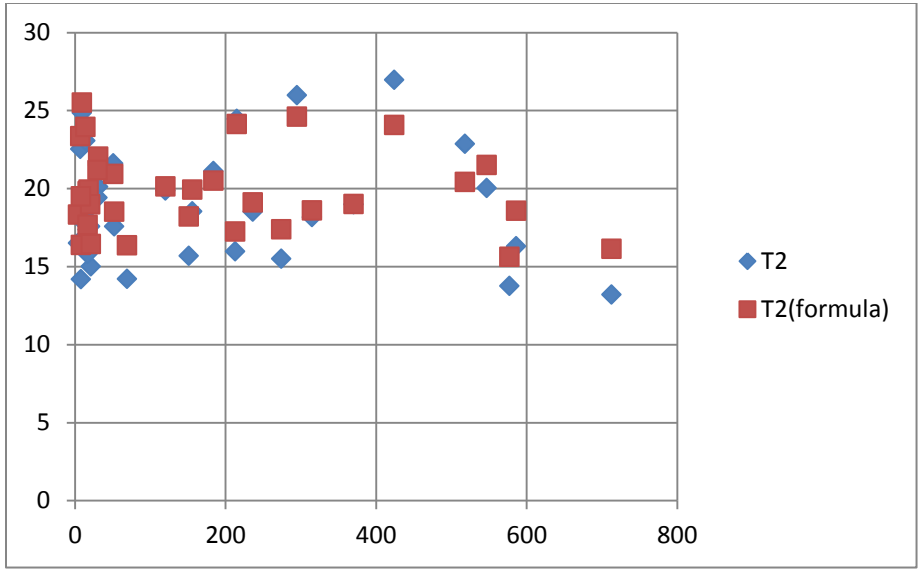
Australia: I found 33 'good data' stations for Australia.

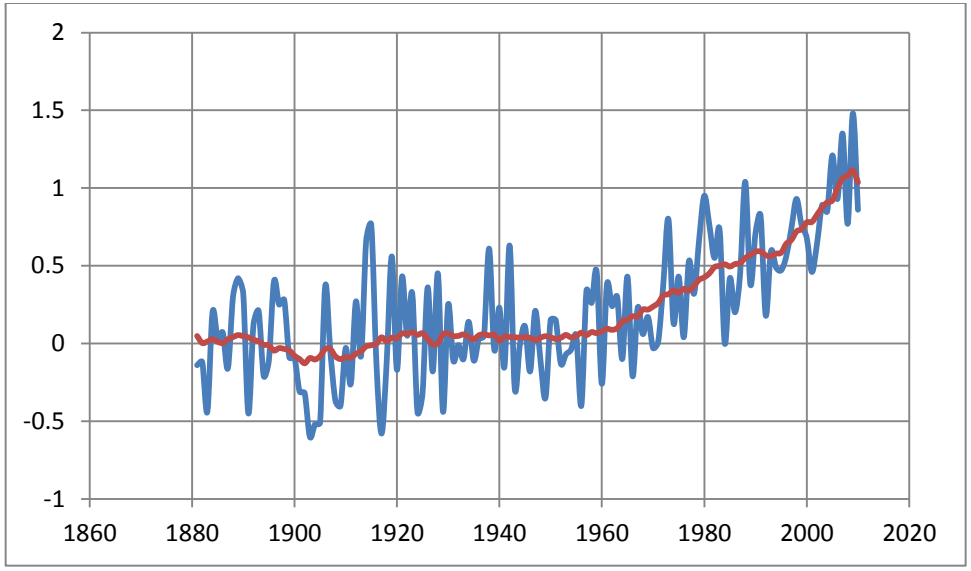
Average	30.26	**0.0126**	30.26	17.96	18.86	1927	2007	190.00	18.86	19.82	**-0.96**
Australia	Latitude	Australia	Latitude	T1	T2	start	end	Elevation	T2	T2(formula)	error
Adelaide Airp	34.9	0.002418	34.9	16.14	16.51	1857	2010	4	16.51	18.33	-1.82
Alice Springs	23.8	0.011679	23.8	18.51	20.04	1879	2010	547	20.04	21.50	-1.46
Amberley Aero	27.6	0.016984	27.6	19.04	20.11	1946	2009	31	20.11	22.05	-1.94
Bathurst Agri	33.4	0.005506	33.4	12.72	13.21	1911	2000	713	13.21	16.13	-2.92
Bridgetown	34	0.013542	34	14.38	15.68	1902	**1998**	151	15.68	18.21	-2.53
Broken Hill	32	0.005413	32	17.57	18.16	1891	2000	315	18.16	18.61	-0.45
Canberra Airp	35.3	0.02029	35.3	12.36	13.76	1940	2009	577	13.76	15.63	-1.87
Carnarvon Airp	24.9	0.012459	24.9	21.78	22.54	1949	2010	7	22.54	23.36	-0.82
Ceduna Airpor	32.1	0.015	32.1	16.38	17.37	1944	2010	17	17.37	19.83	-2.46
Cunderdin	31.7	0.008571	31.7	18.09	18.51	1951	2000	236	18.51	19.11	-0.60
East Sale Aer	38.1	0.0225	38.1	12.75	14.19	1946	2010	8	14.19	16.39	-2.20
Forrest (Forrest Amo)	30.8	0.007619	30.8	18.05	18.53	1947	2010	156	18.53	19.92	-1.39
Georgetown	18.3	0.000722	18.3	25.91	25.98	1907	2004	295	25.98	24.60	1.38

Halls Creek A	18.2	0.009492	18.2	26.4	26.96	1950	2009	424	26.96	24.08	2.88
Inverell	29.8	0.003333	29.8	16	16.31	1907	2000	586	16.31	18.59	-2.28
Kalgoorlie Bo	30.8	0.017077	30.8	17.87	18.98	1943	2008	370	18.98	19.00	-0.02
Laverton Aero	37.9	0.024462	37.9	13.41	15	1945	2010	21	15	16.45	-1.45
Marree	29.7	0.016333	29.7	20.63	21.61	1940	2000	51	21.61	20.94	0.67
Meekatharra A	26.6	0.016545	26.6	21.95	22.86	**1954**	2009	518	22.86	20.42	2.44
Mildura Aero	34.2	0.024127	34.2	16.05	17.57	1947	2010	52	17.57	18.52	-0.95
Moruya Heads	35.9	0.00424	35.9	15.27	15.8	1879	2004	17	15.8	17.68	-1.88
Mt Gambier Ai	37.7	0.021667	37.7	12.77	14.2	1943	2009	69	14.2	16.37	-2.17
Nuriootpa	34.5	0.022456	34.5	14.23	15.51	1953	2010	274	15.51	17.39	-1.88
Perth Airport	31.9	0.009683	31.9	18.08	18.69	1945	2008	18	18.69	19.94	-1.25
Richmond	20.7	-0.00228	20.7	24.67	24.46	1908	2000	215	24.46	24.13	0.33
Richmond Amo	33.6	0.017532	33.6	16.22	17.57	1930	2007	20	17.57	19.00	-1.43
Rockhampton A	23.4	0.017647	23.4	21.87	23.07	1942	2010	14	23.07	23.96	-0.89
Tarcoola	30.7	0.015227	30.7	18.52	19.86	1922	2010	120	19.86	20.13	-0.27
Tibooburra	29.4	0.004681	29.4	20.69	21.13	1910	2004	184	21.13	20.52	0.61
Townsville Am	19.3	0.012576	19.3	24.03	24.86	1944	2010	9	24.86	25.50	-0.64
Wagga Airport	35.2	0.014179	35.2	15.03	15.98	1943	2010	213	15.98	17.25	-1.27
Williamtown	32.8	0.011552	32.8	17.34	18.01	1951	2009	8	18.01	19.49	-1.48
Yamba	29.4	0.012869	29.4	17.85	19.42	1878	2000	30	19.42	21.18	-1.76





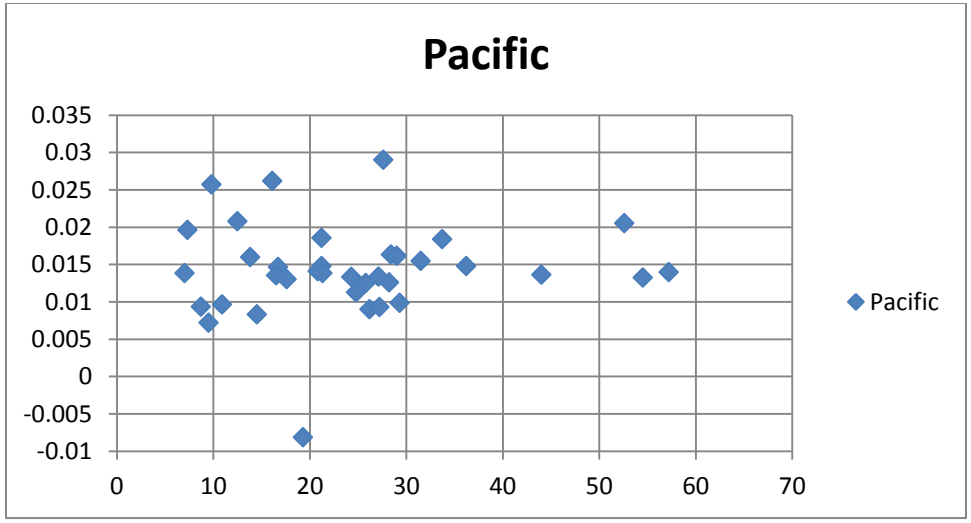


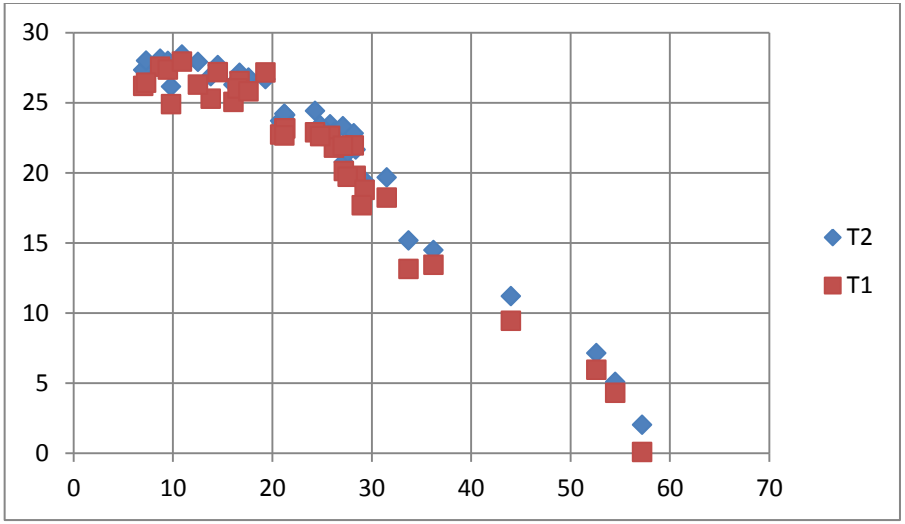


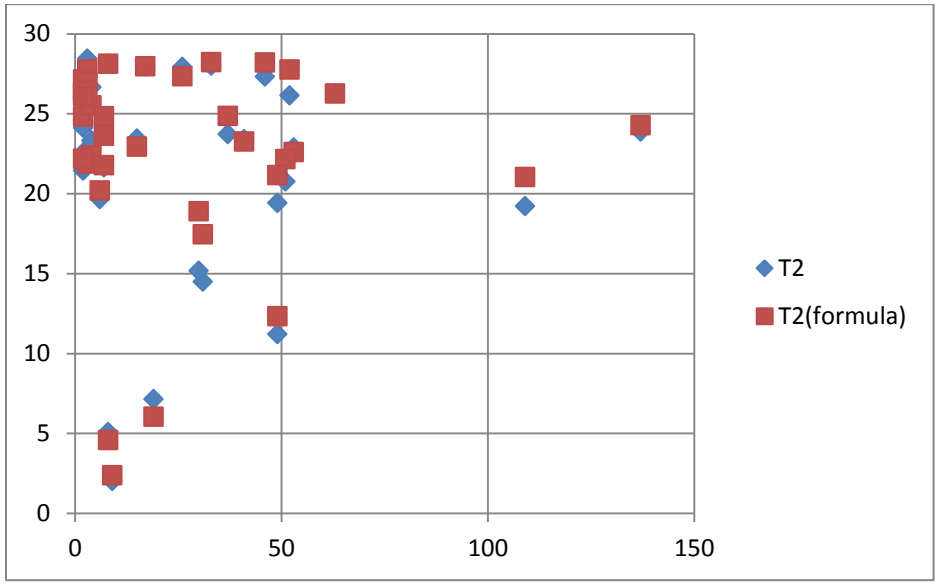
Pacific Ocean: I found 36 'good data' stations for the Pacific Ocean. The time frames suffered starting as late as 1962, and ending as early as 1978.

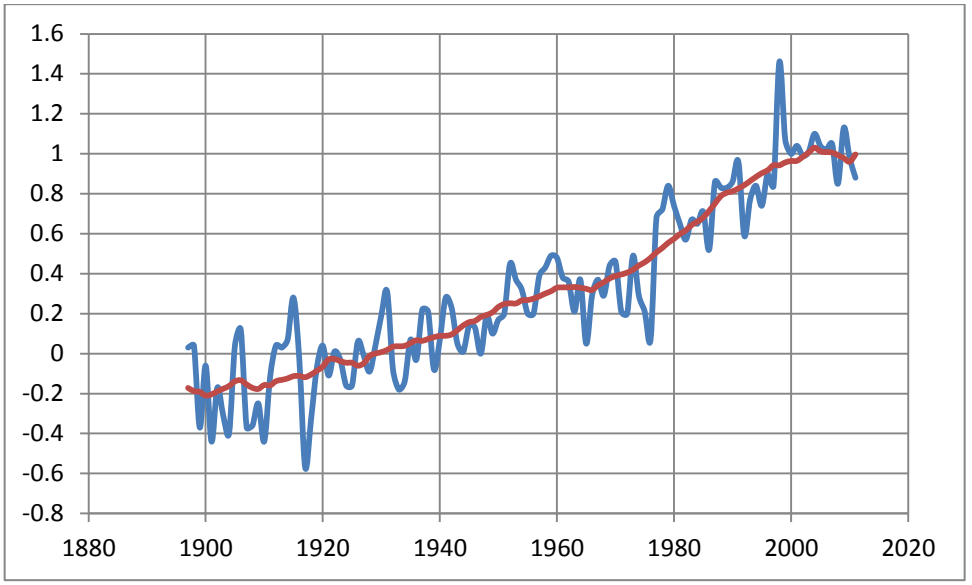
Average	24.23	**0.0143**	24.23	20.99	22.09	1927	2004	26.11	22.09	22.38	**-0.29**
Name	Latitude	Pacific	Latitude	T1	T2	Start	End	Elevation	T2	T2(formula)	error
Johnston Isla	16.7	0.014634	16.7	26.53	27.13	1959	2000	2	27.13	26.35	0.78
Hana, Maui	20.8	0.014085	20.8	22.71	23.71	1908	1979	37	23.71	24.86	-1.15
Molokai, Molo	21.2	0.014792	21.2	23.16	23.87	1951	1999	137	23.87	24.28	-0.41
Honolulu Obs	21.3	0.013857	21.3	23.15	24.12	1908	**1978**	2	24.12	24.83	-0.71
Midway Island	28.2	0.012609	28.2	21.94	22.81	1921	1990	3	22.81	21.88	0.93
St. Paul	57.2	0.013981	57.2	0.0706	2.014	1873	2012	9	2.014	2.37	-0.36
Kwajalein/Buc	8.7	0.009333	8.7	27.56	28.12	1948	2008	8	28.12	28.13	-0.01
Ponape	7	0.013827	7	26.2	27.32	1927	2008	46	27.32	28.20	-0.88
Wake Island A	19.3	-0.00814	19.3	27.14	26.66	1946	2005	4	26.66	25.52	1.14
Koror, Palau	7.3	0.01963	7.3	26.41	28	1924	2005	33	28	28.22	-0.22
Minamidaitoji	25.8	0.0125	25.8	22.64	23.44	1947	2011	15	23.44	22.94	0.50
Naha	26.2	0.009	26.2	21.79	22.87	1891	2011	53	22.87	22.60	0.27
Titzima/Chichi	27.1	0.013365	27.1	21.92	23.31	1907	2011	4	23.31	22.40	0.91

Ishigakijima	24.3	0.013333	24.3	22.88	24.4	1897	2011	7	24.4	23.62	0.78
Miyakojima	24.8	0.011286	24.8	22.6	23.39	1941	2011	41	23.39	23.26	0.13
Naze	28.4	0.016316	28.4	19.78	21.64	1897	2011	7	21.64	21.77	-0.13
Saigo	36.2	0.014789	36.2	13.43	14.48	1940	2011	31	14.48	17.45	-2.97
Yap, Caroline	9.5	0.007176	9.5	27.35	27.96	1922	2007	17	27.96	27.96	0.00
Atuona	9.8	0.025714	9.8	24.88	26.14	**1962**	2011	52	26.14	27.76	-1.62
Pukapuka	10.9	0.009623	10.9	27.92	28.43	1935	**1988**	3	28.43	27.77	0.66
Apia	13.8	0.016	13.8	25.28	26.88	**1890**	1990	2	26.88	27.13	-0.25
Takaroa	14.5	0.008305	14.5	27.18	27.67	1952	2011	3	27.67	26.95	0.72
Undu Point	16.1	0.02617	16.1	25.04	26.27	1951	1998	63	26.27	26.27	0.00
Bora-Bora	16.5	0.013556	16.5	26.01	26.62	1951	1996	3	26.62	26.41	0.21
Tahiti-Faaa	17.6	0.013026	17.6	25.79	26.78	1935	2011	2	26.78	26.08	0.70
Rarotonga	21.2	0.018554	21.2	22.66	24.2	1907	1990	7	24.2	24.84	-0.64
Is. De Pascau	27.2	0.009275	27.2	20.12	20.76	1942	2011	51	20.76	22.15	-1.39
Rapa	27.6	0.029	27.6	19.7	21.44	1951	2011	2	21.44	22.17	-0.73
Raoul Isla	29.3	0.009846	29.3	18.77	19.41	1941	2006	49	19.41	21.15	-1.74
Isla Juan Fer	33.7	0.018364	33.7	13.14	15.16	1901	2011	30	15.16	18.90	-3.74
Chattham Isla	44	0.013615	44	9.43	11.2	1878	2008	49	11.2	12.32	-1.12
Campbell Isla	52.6	0.020517	52.6	5.95	7.14	1942	2000	19	7.14	6.05	1.09
Lord Howe Isl	31.5	0.015484	31.5	18.22	19.66	1917	2010	6	19.66	20.20	-0.54
Macquarie Isl	54.5	0.01322	54.5	4.3	5.08	1949	2008	8	5.08	4.58	0.50
Norfolk Isla	29	0.016146	29	17.67	19.22	1915	2011	109	19.22	21.04	-1.82
Rotuma	12.5	0.020769	12.5	26.29	27.91	1933	2011	26	27.91	27.33	0.58





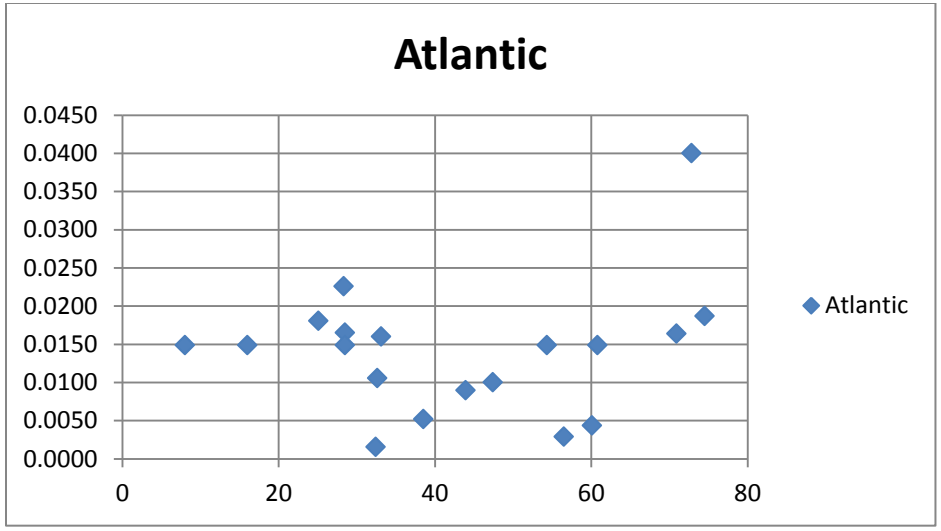


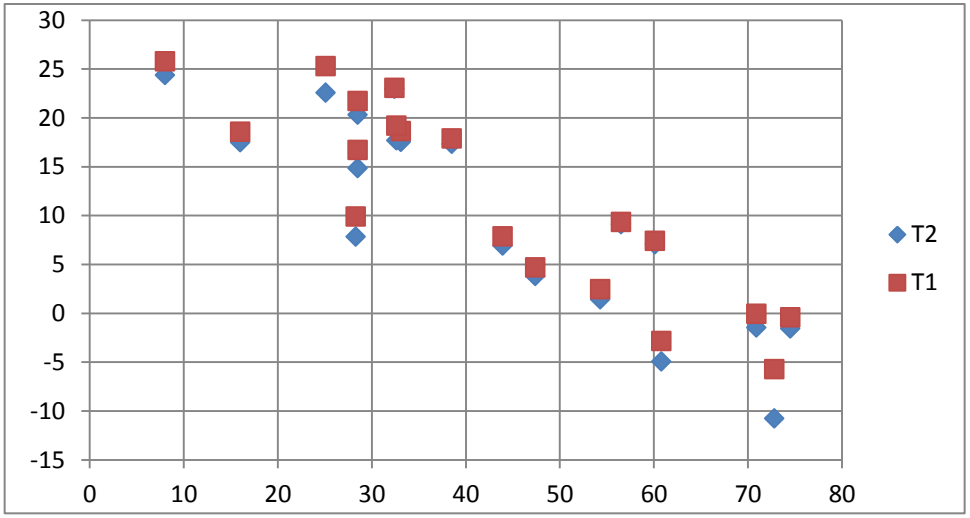


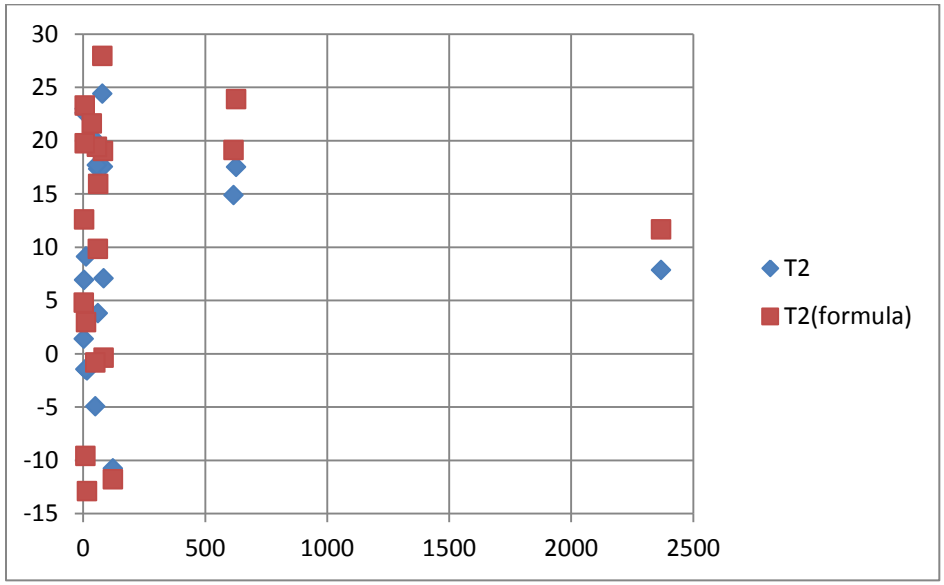
Atlantic Ocean: I found only 19 'good data' stations for the Atlantic Ocean.

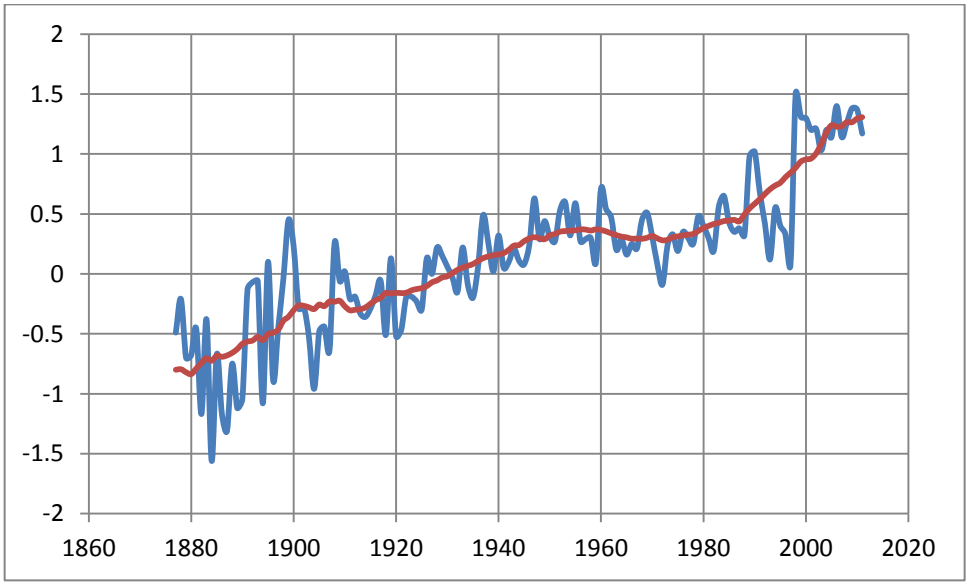
Average	42.75	**0.0140**	42.75	11.55	10.13	1909	2007	226.32	10.13	10.32	**-0.18**
Atlantic Ocean	latitude	Atlantic	latitude	T1	T2	time1	time2	Elevation	T2	T2(formula)	error
Bjornoya	74.5	0.0187	74.5	-0.42	-1.58	**1949**	2011	16	-1.58	-12.91	**11.33**
Jan Mayen	70.9	0.0164	70.9	-0.054	-1.48	1924	2011	9	-1.48	-9.59	**8.11**
Lerwick	60.1	0.0044	60.1	7.4	7.06	1933	2011	84	7.06	-0.38	**7.44**
Tiree	56.5	0.0029	56.5	9.33	9.1	1931	2011	12	9.1	2.94	**6.16**
Upernavik	72.8	0.0400	72.8	-5.72	-10.76	1875	2001	122	-10.76	-11.81	1.05
Grindstone Is	47.4	0.0100	47.4	4.69	3.79	1892	**1982**	60	3.79	9.84	**-6.05**
Horta	38.5	0.0052	38.5	17.88	17.34	1902	2006	62	17.34	15.90	1.44
Sable Isla	43.9	0.0090	43.9	7.87	6.91	1899	2006	4	6.91	12.58	-5.67
Porto Santo	33.1	0.0160	33.1	18.63	17.54	1943	2011	82	17.54	19.01	-1.47
Funchal	32.6	0.0106	32.6	19.21	17.69	1867	2011	56	17.69	19.39	-1.70
Bermuda N.	32.4	0.0016	32.4	23.07	22.98	1935	1993	6	22.98	19.72	3.26
Izana	28.3	0.0226	28.3	9.91	7.83	1916	2008	2368	7.83	11.66	-3.83

Nassau Air	25.1	0.0181	25.1	25.28	22.59	1856	2005	7	22.59	23.28	-0.69
Santa Cruz De	28.5	0.0165	28.5	21.74	20.32	1925	2011	36	20.32	21.59	-1.27
Tenerife/Los	28.5	0.0149	28.5	16.72	14.86	1886	2011	617	14.86	19.10	-4.24
Wide Awake Fi	8	0.0149	8	25.78	24.39	1926	2010	79	24.39	27.93	-3.54
Grytviken	54.3	0.0149	54.3	2.47	1.4	1905	2009	3	1.4	4.77	-3.37
St. Helena Is	16	0.0149	16	18.57	17.5	1893	2011	627	17.5	23.87	**-6.37**
Base Orcadas	60.8	0.0149	60.8	-2.85	-4.94	1906	2011	50	-4.94	-0.83	-4.11



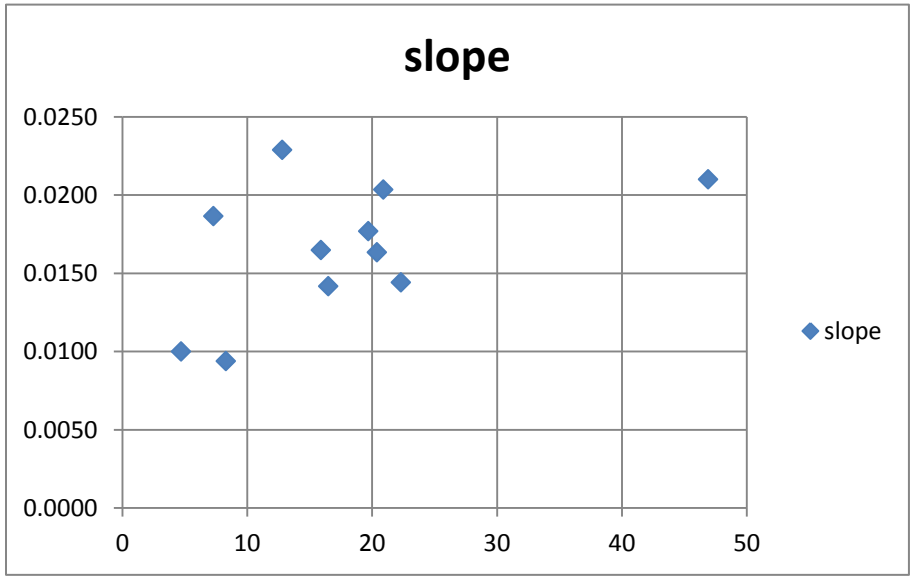


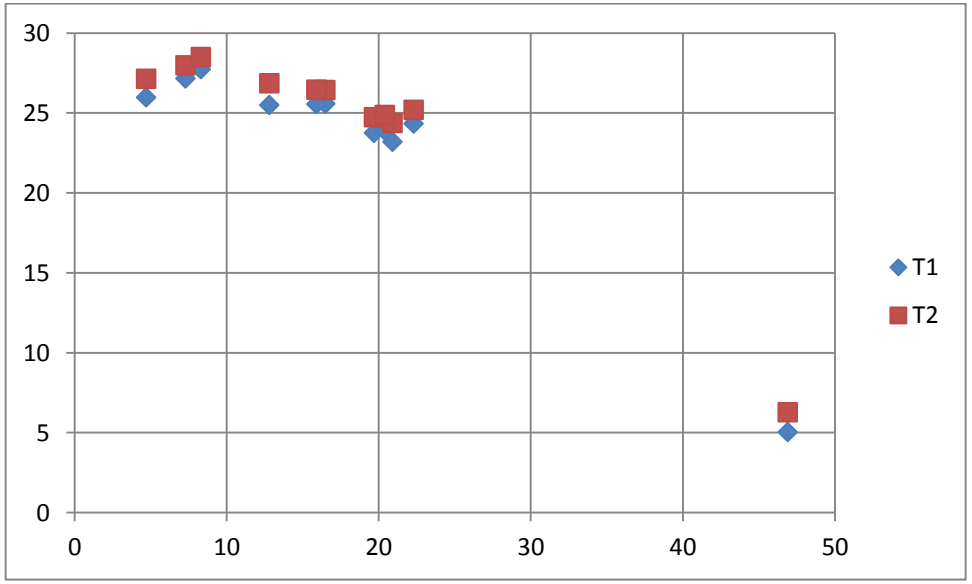


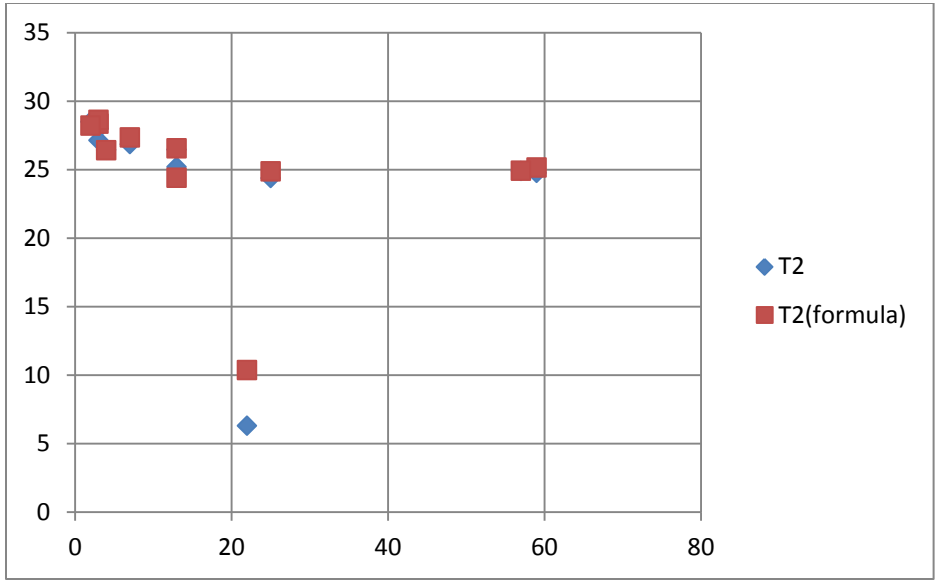


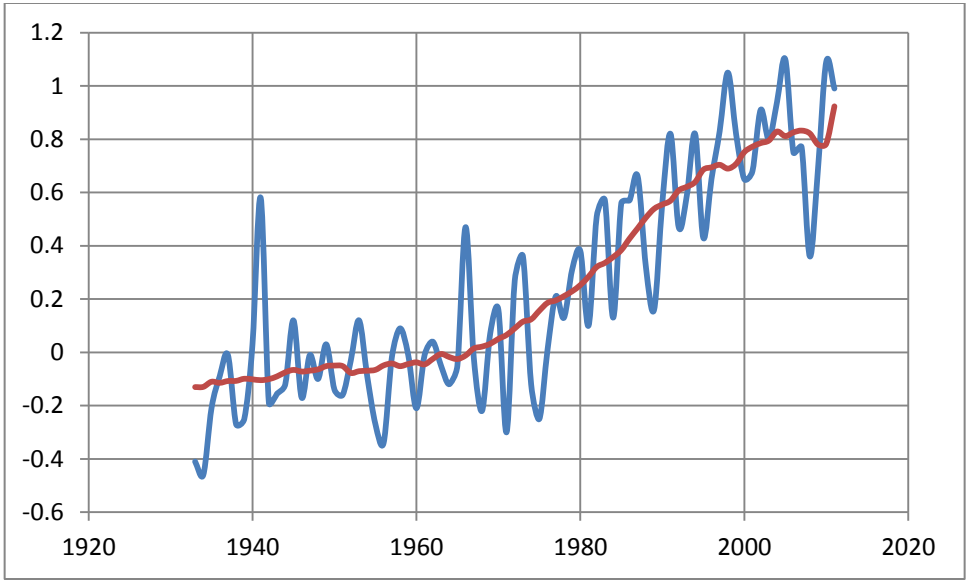
Indian Ocean: I found only 11 'good data' stations for the Indian Ocean.

Average	17.79	**0.0165**	17.79	23.43	24.44	1945	2010	18.91	24.44	25.02	**-0.58**
Indian Ocean	latitude	slope	latitude	T1	T2	time1	time2	Elevation	T2	T2(formula)	error
Diego Garcia	7.3	0.0186	7.3	27.16	27.98	1955	**1999**	3	27.98	28.35	-0.37
Seychelles In	4.7	0.0100	4.7	25.98	27.14	**1895**	2011	3	27.14	28.63	-1.49
Saint-Denis/G	20.9	0.0203	20.9	23.2	24.38	1953	2011	25	24.38	24.87	-0.49
Rodrigues	19.7	0.0177	19.7	23.75	24.74	1955	2011	59	24.74	25.15	-0.41
Iie Europa	22.3	0.0144	22.3	24.34	25.19	1952	2011	13	25.19	24.40	0.79
Plaisance	20.4	0.0163	20.4	23.9	24.88	1951	2011	57	24.88	24.92	-0.04
Dzaoudzi/Pama	12.8	0.0229	12.8	25.5	26.85	1952	2011	7	26.85	27.35	-0.50
St. Brandon	16.5	0.0142	16.5	25.58	26.43	1951	2011	4	26.43	26.40	0.03
Sergo-Frolow	15.9	0.0165	15.9	25.56	26.45	**1956**	2010	13	26.45	26.54	-0.09
Minicoy	8.3	0.0094	8.3	27.74	28.49	1931	2011	2	28.49	28.21	0.28
Marion Island	46.9	0.0210	46.9	5.03	6.29	1949	2009	22	6.29	10.37	-4.08





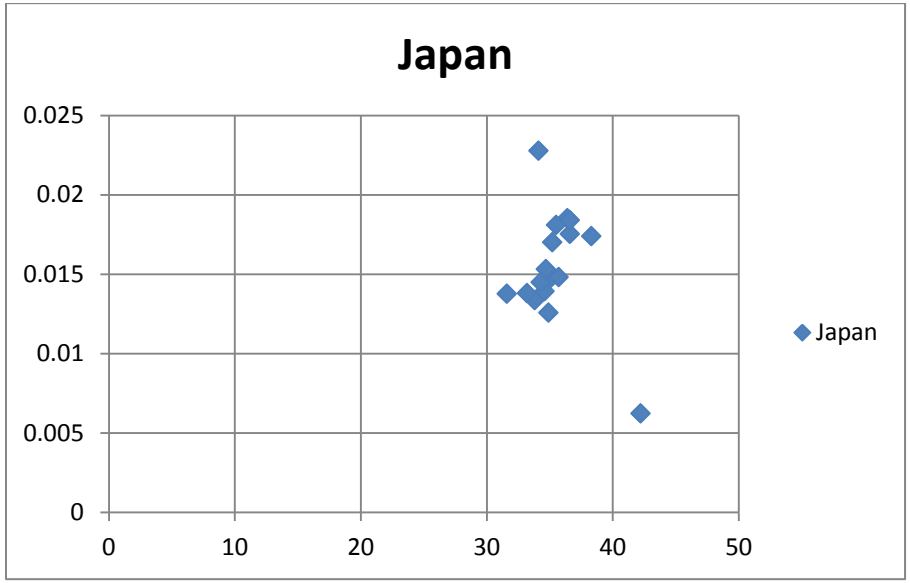


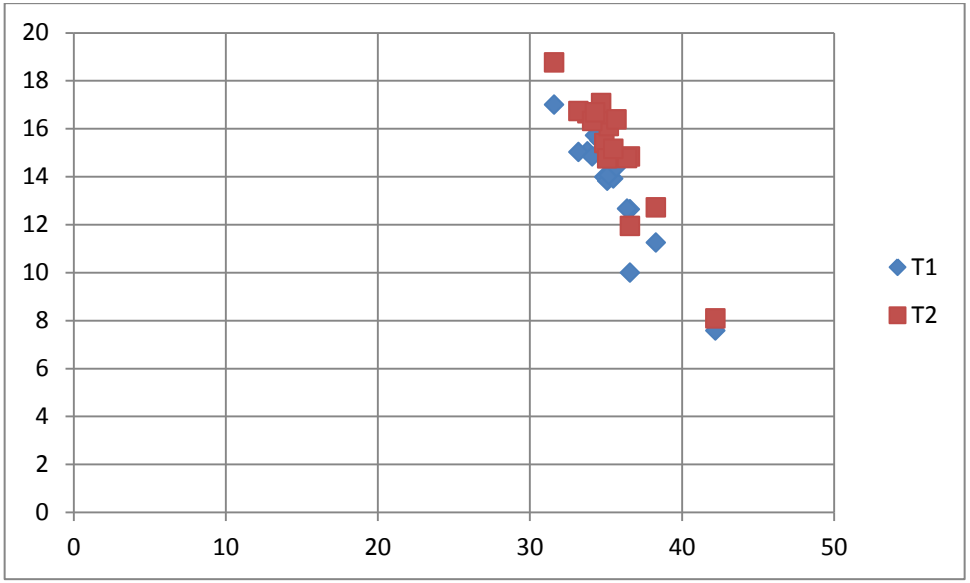


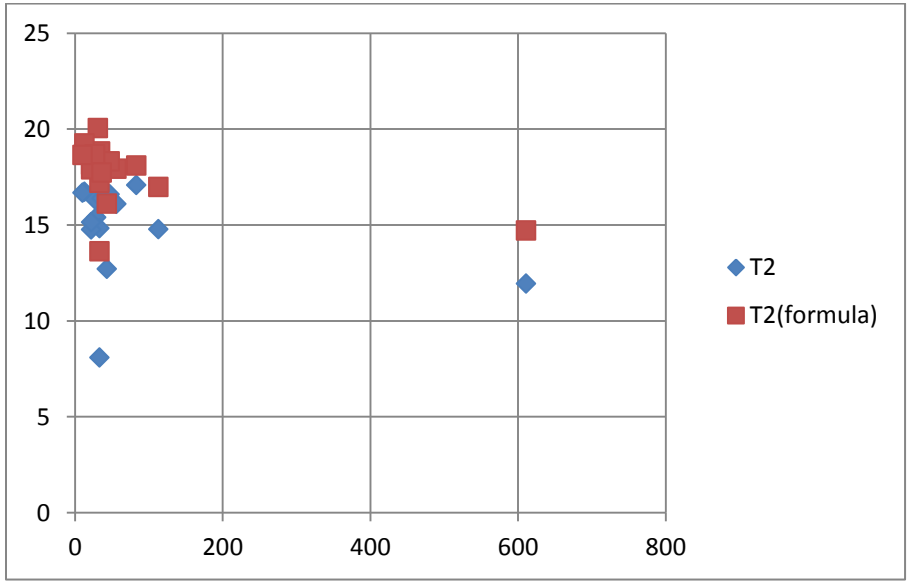
Japan: I found 17 'good data' stations for Japan. Japan would have been grouped with North-East Asia. But, North-East Asia covered a lot of area with little data, while Japan covered little area with lots of good data. Separating it out keeps it from dominating the North-East Asia data.

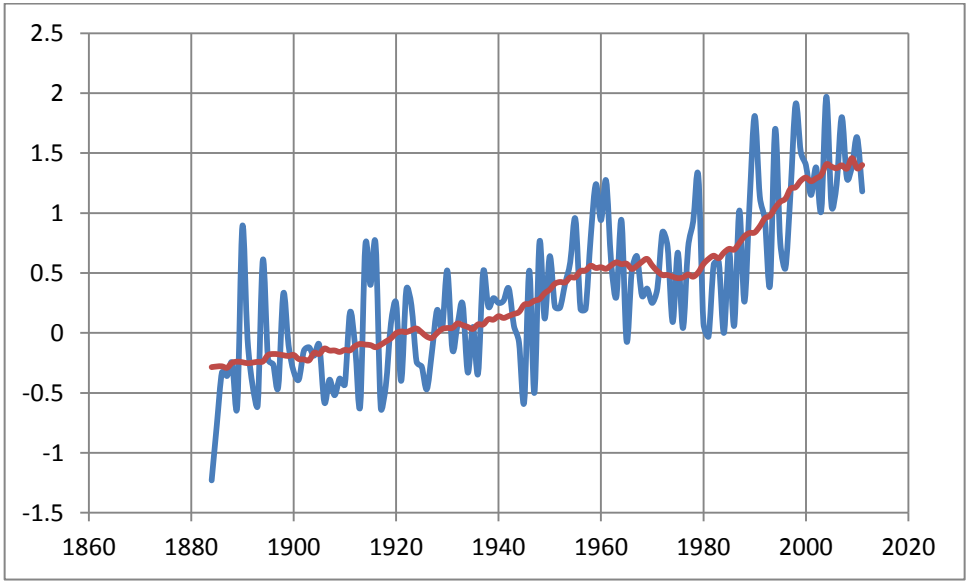
Average	35.46	**0.0154**	35.46	13.68	15.23	1909	2010	73.12	15.23	17.67	**-2.44**
Japan	Lattitude	Japan	Lattitude	T1	T2	start	end	Elevation	T2	T2(formula)	error
Hamada	34.9	0.012566	34.9	13.98	15.4	1893	2006	29	15.4	18.22	-2.82
Kagoshima	31.6	0.01375	31.6	17	18.76	1883	2011	31	18.76	20.04	-1.28
Kanazawa	36.6	0.01752	36.6	12.64	14.83	1886	2011	33	14.83	17.20	-2.37
Maebashi	36.4	0.018509	36.4	12.66	14.77	1897	2011	113	14.77	16.97	-2.20
Maizuru	35.1	0.014762	35.1	13.82	14.75	**1948**	2011	22	14.75	18.13	-3.38
Matsue	35.5	0.018088	35.5	13.92	15.15	1943	2011	22	15.15	17.90	-2.75
Matsumoto	36.6	0.018396	36.6	9.99	11.94	1898	**2004**	611	11.94	14.71	-2.77
Matsuyama	33.8	0.013361	33.8	15.05	16.64	1892	2011	34	16.64	18.82	-2.18
Nagoya	35.2	0.017	35.2	14.06	16.1	1891	2011	56	16.1	17.93	-1.83
Oita	33.2	0.01379	33.2	15.02	16.73	1887	2011	13	16.73	19.25	-2.52
Omaezaki	34.6	0.013924	34.6	15.5	16.6	1932	2011	47	16.6	18.31	-1.71
Osaka	34.7	0.015313	34.7	15.11	17.07	1883	2011	83	17.07	18.10	-1.03

Owase	34.1	0.022769	34.1	14.84	16.32	1940	2005	27	16.32	18.68	-2.36
Sendai	38.3	0.017381	38.3	11.25	12.71	1927	2011	43	12.71	16.11	-3.40
Takamatsu	34.3	0.014478	34.3	15.71	16.68	1944	2011	10	16.68	18.64	-1.96
Tokyo	35.7	0.014815	35.7	14.39	16.39	1876	2011	36	16.39	17.72	-1.33
Urakawa	42.2	0.00622	42.2	7.57	8.08	1929	2011	33	8.08	13.62	-5.54







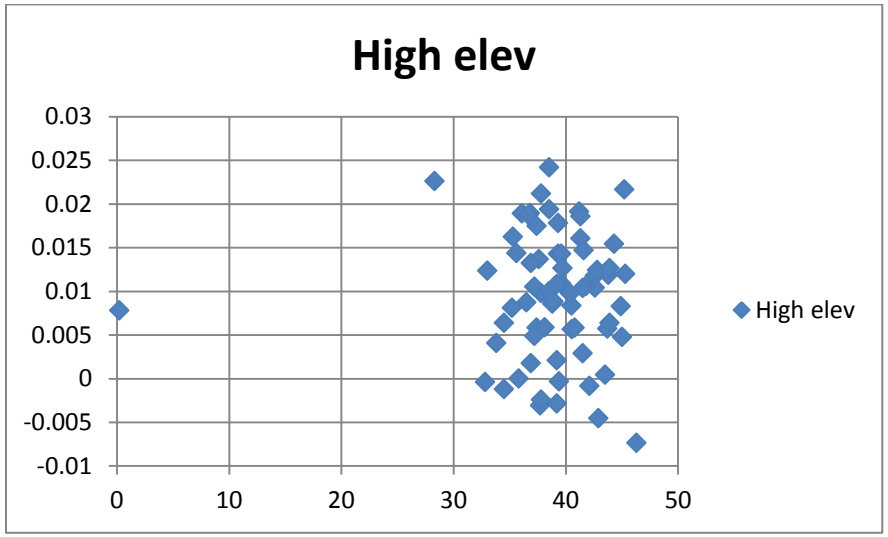


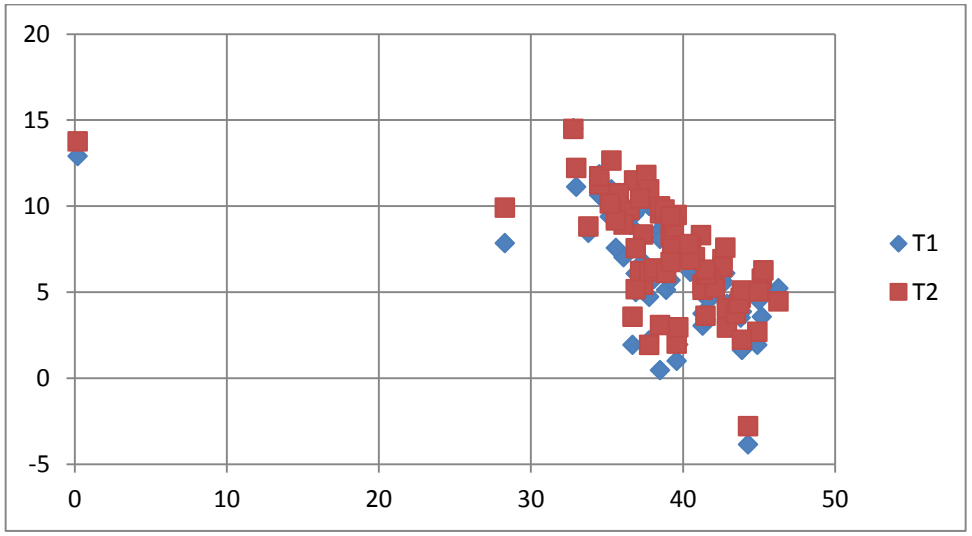
High Elevations: I found 68 'good data' stations above 1600 meters, before stopping because they were all clustered in the western United States.

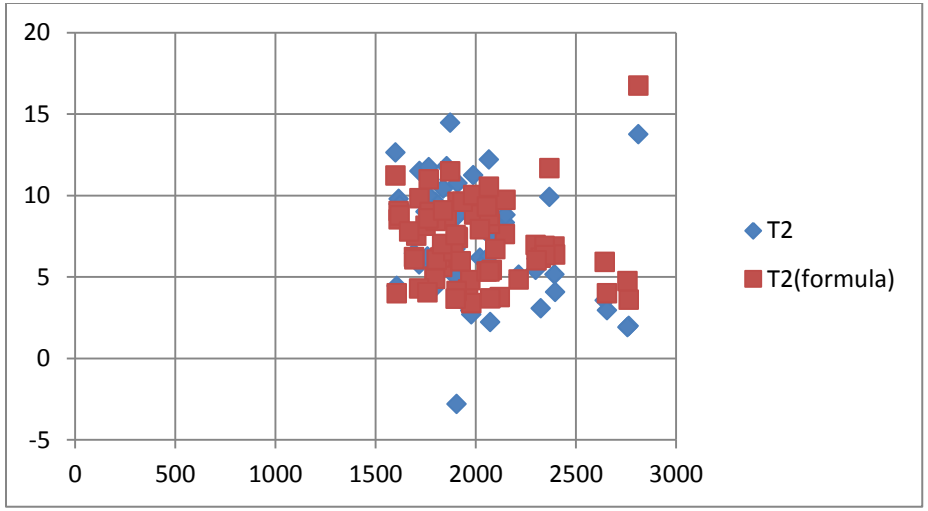
Average	38.79	0.0095	38.87	6.22	7.14	1910	2006	1999.24	7.14	7.14	0.00
Station	Lattitude	High elev	Lattitude	T1	T2	start	end	Elevation	T2	T2(formula)	error
Alamosa, Co	37.4	0.005833	37.4	5.07	5.42	**1951**	2011	2299	5.42	6.97	-1.55
Alton	37.4	0.017473	37.4	6.74	8.33	1916	2007	2146	8.33	7.63	0.70
Alta 1 Nnw	43.8	0.011856	43.8	3.5	4.65	1910	2007	1962	4.65	4.23	0.42
Aztec Ruins	36.8	0.018952	36.8	9.5	11.49	**1896**	2001	1720	11.49	9.82	1.67
Bates Creek #2	42.6	0.011776	42.6	5.64	6.9	1900	2007	1832	6.9	5.61	1.29
Blanding	37.6	0.013663	37.6	10.41	11.79	1907	2008	1855	11.79	8.75	3.04
Chama	36.9	0.001771	36.9	4.99	5.16	1907	2003	2393	5.16	6.87	-1.71
Cheesman	39.2	-0.00286	39.2	8.51	8.21	1903	2008	2097	8.21	6.71	1.50
Cheyenne Wsfo	41.2	0.019115	41.2	6.15	8.31	1895	2008	1868	8.31	6.40	1.91
Cimarron 4 Sw	36.5	0.008725	36.5	8.89	9.78	1905	2007	1993	9.78	8.83	0.95
Crater Lake Nps	42.9	-0.00453	42.9	3.27	2.93	1933	2008	1974	2.93	4.80	-1.87
Del Norte 2E	37.7	-0.00308	42.9	4.31	4.07	1927	2005	2397	4.07	6.36	-2.29
Dillon 1E	39.6	0.010879	39.6	1	1.99	1915	2006	2763	1.99	3.59	-1.60
Dubois	43.5	0.000435	43.5	3.68	3.72	1911	2003	2120	3.72	3.76	-0.04
Dulce	36.9	0.013243	36.9	6.07	7.54	1897	2008	2070	7.54	8.26	-0.72
Ely/Yelland	39.3	0.014286	39.3	6.62	7.52	1948	2011	1909	7.52	7.46	0.06
Escalante	37.8	0.009798	37.8	9.99	10.96	1909	2008	1771	10.96	8.99	1.97
Evanston 1E	41.3	0.016038	41.3	3.74	5.44	1899	2005	2080	5.44	5.42	0.02
Ft Bayard	32.8	-0.00038	32.8	14.51	14.47	1899	2003	1872	14.47	11.48	2.99
Grace	42.6	0.010417	42.6	5.45	6.45	1911	2007	1692	6.45	6.21	0.24
Grand Canyon Np2	36.1	0.018911	36.1	7.01	8.92	1907	2008	2068	8.92	8.75	0.17
Gunnison 3Sw	38.5	0.024167	38.5	0.46	3.07	1895	2003	2324	3.07	6.18	-3.11
Heber	40.55	0.005644	40.55	7.02	7.59	1899	**2000**	1704	7.59	7.53	0.06
Hebgen Dam	44.9	0.00828	44.9	1.92	2.69	1914	2007	1978	2.69	3.39	-0.70
Hermit 7 Ese	37.8	-0.00241	37.8	2.18	1.92	1899	2007	2758	1.92	4.75	-2.83

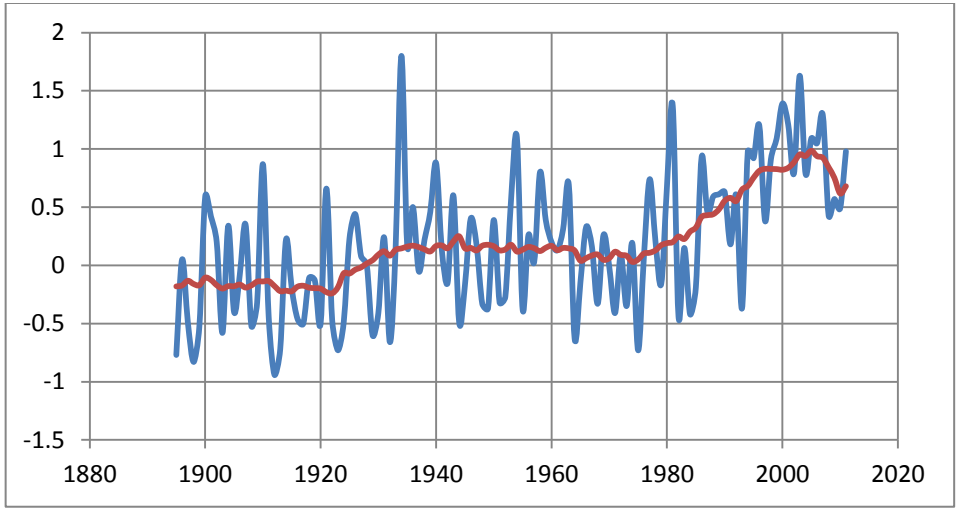
Izana near Africa	28.3	0.022609	28.3	7.83	9.91	1916	2008	2368	9.91	11.66	-1.75
Jemez Springs	35.8	0	35.8	10.74	10.74	1911	2007	1909	10.74	9.61	1.13
Ketchum Rs	43.7	0.005714	43.7	3.77	4.33	1909	2007	1795	4.33	5.02	-0.69
Laketown	41.8	0.010577	41.8	4.62	5.72	1901	2005	1823	5.72	6.19	-0.47
Lander/Hunt	42.8	0.012437	42.8	6.09	7.57	1892	2011	1694	7.57	6.07	1.50
Laramie Rgnl Ap	41.3	0.018584	41.3	3.03	5.13	1895	2008	2215	5.13	4.84	0.29
Las Vegas Wwtp	35.6	0.014375	35.6	7.55	9.16	1895	2007	1935	9.16	9.61	-0.45
Levan	39.6	0.014273	39.6	7.91	9.48	1896	2006	1615	9.48	8.53	0.95
Lifton Pumping Stn	42.1	-0.00082	42.1	5.33	5.26	1923	2008	1806	5.26	6.06	-0.80
Luna Rs	33.8	0.004066	33.8	8.44	8.81	1914	2005	2149	8.81	9.73	-0.92
Mackay Lost River	43.9	0.012653	43.9	3.85	5.09	1910	2008	1797	5.09	4.87	0.22
Manassa	37.2	0.010526	37.2	5.21	6.21	1908	2003	2344	6.21	6.90	-0.69
Manti	39.3	0.017822	39.3	7.21	9.01	1903	2004	1750	9.01	8.14	0.87
Marysvale	38.5	0.01	38.5	8.58	9.57	1908	2007	1801	9.57	8.43	1.14
Mcgill	39.4	-0.00033	39.4	8.81	8.78	1916	2008	1911	8.78	7.38	1.40
Montrose #2	38.5	0.019388	38.5	8.08	9.98	1908	2006	1764	9.98	8.59	1.39
Moran 5 Wnw	43.9	0.006383	43.9	1.62	2.22	1912	2006	2072	2.22	3.69	-1.47
Mountainair	34.5	0.006364	34.5	10.62	11.25	1903	2002	1987	11.25	10.03	1.22
Mt Washington Nh	44.3	0.015441	44.3	-3.86	-2.81	1933	2001	1905	-2.81	4.13	**-6.94**
Mtn Park	33	0.01236	33	11.11	12.21	1918	2007	2066	12.21	10.53	1.68
Navacerrada	40.8	0.005821	40.8	6.63	7.02	1943	2010	1888	7.02	6.58	0.44
Panguitch	37.8	0.021159	37.8	4.72	6.18	1932	2001	2021	6.18	7.92	-1.74
Philipsburg Rs	46.3	-0.00738	46.3	5.21	4.45	1904	2007	1606	4.45	3.99	0.46
Quito/Marisca sa	0.2	0.007798	0.2	12.9	13.75	**1891**	**2000**	2812	13.75	16.75	-3.00
Red Lodge	45.2	0.021667	45.2	3.56	5.77	1903	2005	1718	5.77	4.30	1.47
Red River	36.7	0.018736	36.7	1.93	3.56	1918	2005	2644	3.56	5.91	-2.35
Richfield Radio	38.8	0.008586	38.8	8.94	9.79	1909	2008	1615	9.79	9.04	0.75
Rock Springs Ap	41.6	0.014681	41.6	4.61	5.99	1914	2008	2055	5.99	5.33	0.66
Saguache	38.1	0.005865	38.1	5.75	6.36	1897	2001	2347	6.36	6.33	0.03
Saint Johns	34.5	-0.00122	34.5	11.84	11.73	1914	2004	1765	11.73	10.98	0.75
Salina 24E	38.9	0.008829	38.9	5.13	6.11	1896	2007	2304	6.11	6.01	0.10
Saratoga	41.5	0.010361	41.5	5.44	6.3	1923	2006	2069	6.3	5.33	0.97
Scipio	39.2	0.002091	39.2	9.17	9.4	1896	2006	1620	9.4	8.76	0.64
Scofield-Skyline	39.7	0.012625	39.7	1.94	2.95	1922	2002	2655	2.95	3.99	-1.04

Seligman	35.3	0.016214	35.3	10.97	12.64	1905	2008	1600	12.64	11.23	1.41
Snake Creek Pwr	40.5	0.008353	40.5	6.16	6.87	1916	2001	1832	6.87	7.01	-0.14
Tahoe City	39.2	0.010825	39.2	5.68	6.73	1911	2008	1899	6.73	7.56	-0.83
Trinidad	37.2	0.004857	37.2	9.91	10.42	1900	2005	1838	10.42	9.07	1.35
Vernal 2Sw xx	40.4	0.009747	40.4	7.01	7.78	1928	2007	1668	7.78	7.78	0.00
Virginia City	45.3	0.011964	45.3	4.91	6.25	1895	2007	1760	6.25	4.04	2.21
Williams	35.2	0.008105	35.2	9.38	10.15	1911	2006	2057	10.15	9.32	0.83
Woodruff	41.5	0.002911	41.5	3.39	3.62	1926	2005	1925	3.62	5.95	-2.33
Yellowstone Pk	45	0.004771	45	4.5	5.02	1896	2005	1899	5.02	3.66	1.36









Linear Temperature Estimation from Latitude and Elevation Formula:

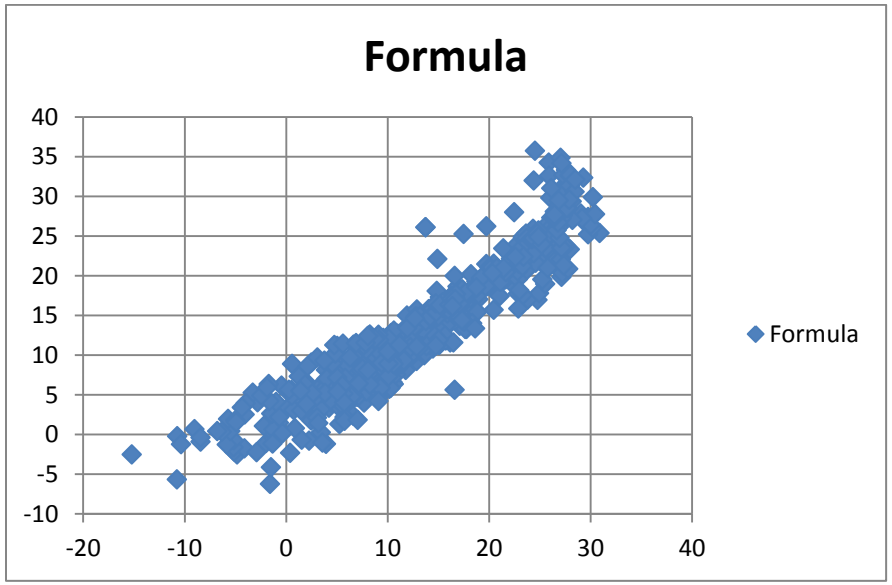
The first attempt at a formula used the following formula: T = T0 – KL x Lattitude – Ke x Elevation. All 669 station data were used. The constants T0, KL, and Ke were guessed, with successive guesses reducing the RMS error. This method is not used in the report. The section is included for extra information purposes only. The following spreadsheet format was used:

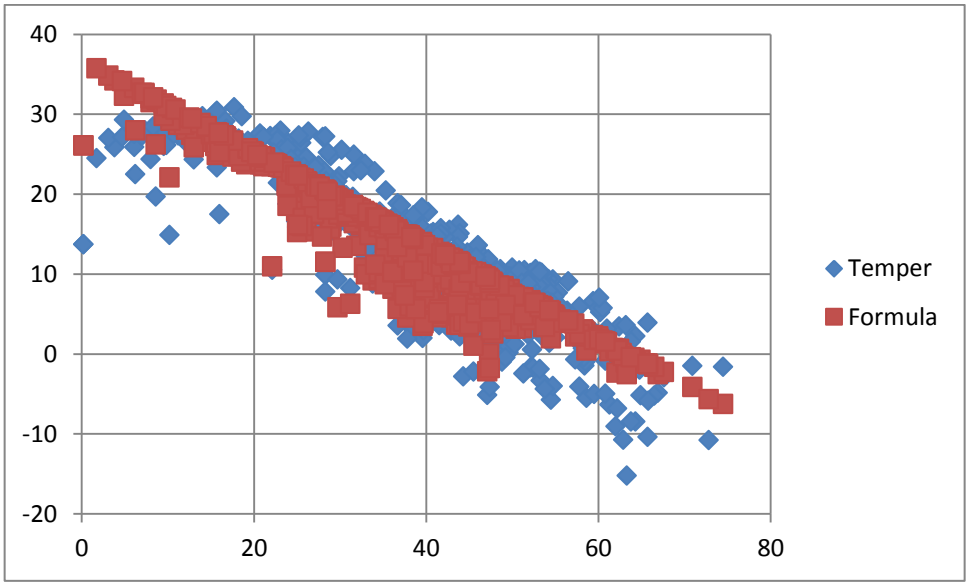
A	B	C	D	E	F	G	H	I	J
T = T0 – KL(Lattitude) – KE(Elevation)									
							sumsq	6599	
T0 = 36.9C					T0	36.9			
KL = -5.78C/10deg					KL		0.578		
KE = -3.8C/1000M					KE			0.0038	
RMS err =	3.14								
average	38.84	12.29	12.36	-0.07	9.86	2781.70	550.00	12.29	12.36
sheet	Lattitude	Temper	Formula	error	Errorsq	sumsq	Elevation	Temper	Formula
2	**43**	**6.99**	**6.9464**	0.0436	**0.001901**	**0.001901**	**1342**	**6.99**	**6.9464**
	43.8	4.65	4.128	0.522	0.272484	0.274385	1962	4.65	4.128
	46.1	6.19	4.14	2.05	4.2025	4.476885	1609	6.19	4.14
	42.2	10.96	10.4868	0.4732	0.223918	4.700803	532	10.96	10.4868
	44	5.93	5.4298	0.5002	0.2502	4.951003	1589	5.93	5.4298

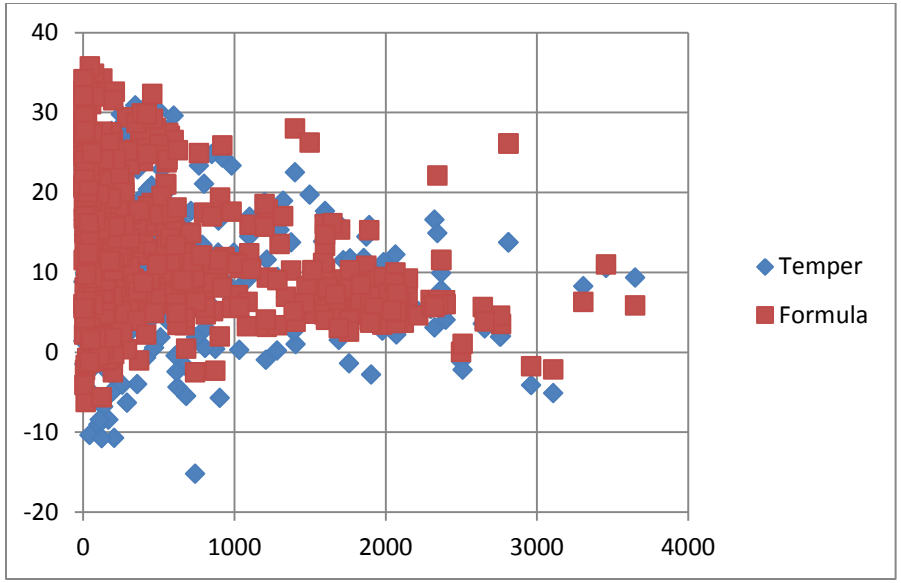
44.8	7.16	7.1144	0.0456	0.002079	4.953083	1024	7.16	7.1144
40.1	10.91	11.2218	-0.3118	0.097219	5.050302	658	10.91	11.2218

Table truncated below here.

The columns labeled Temper are for T2. The column labeled Formula is the calculated temperature. The guessed values were entered in cells G5, H6, and I7. The error is obtained (error), then squared (errorsq), then summed (sumsq). The sumsq in cell I4 was brought forward from the bottom of the table from cell G680, and placed in cell I4 for easy of viewing. The final RMS error was 3.14 degrees C shown in cell B8. The error balance is shown in cell E9 of the average row. The following plots summarize the data, and serve to check the results.







The top left graph plots measured temperature vs. formula temperature. It should be a thin straight line if the formula is correct and no error or noise exists in the data. The kink around 30C indicates a formula weakness.
The top right graph plots measured temperature and formula temperature vs. latitude. At low elevations the data deviates from the formula.
The bottom left graph shows measured temperature and formula temperature vs. latitude. The coefficient Ke causes the formula temperature to move up or down at the higher elevations.

Cosine Temperature Estimation from Latitude and Elevation Formula:

Because of the limitations of the linear formula, a cosine formula was developed to flatten the temperature predictions near the equator. This was based on the cosine of the solar angle averaged over a year, changing the amount of heat power delivered to the surface according law.
The formula used was:
T = TP + TC(Cos(KpKx(L-11.75))+Cos(KpKx(L+11.75)))/2-KE x E
Where:
TP is the polar temperature at zero elevation.
TC is a multiplier for the temperature variation from the pole to the equator at zero elevation.
Kp is pi/180 for the spread sheet.
Kx is a cosine angle spreading constant, to fit the data better in spite of not matching the solar input.
KE is the altitude reduction factor.

T is the predicted temperature T(formula).
L is the given station latitude.
E is the given station elevation.

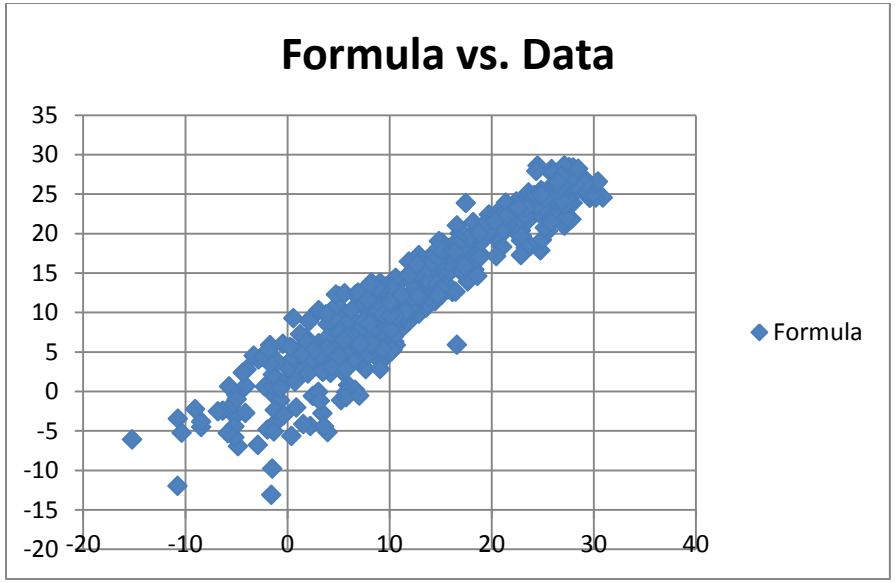
The spreadsheet layout was as follows:

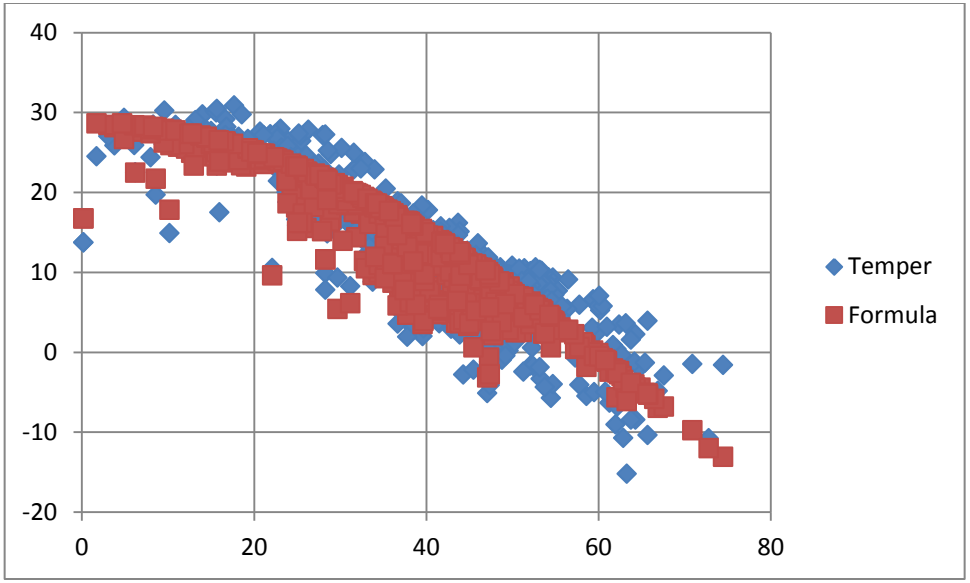
A	B	C	D	E	F	G	H	I	J
				Koff			11.75		
				Kp =	pi/180	0.017453	sumsq	**5778**	
TP = -19.2C				TP	-19.2				
TC = 49.3C				TC		49.3			
KX = 1.106				KX			1.109		
KE = -4.3C/1000M				KE				0.0043	
RMS err =	**2.94**								
average	38.84	12.29	12.28	0.01	8.64	2456.44	550.00	12.29	12.28

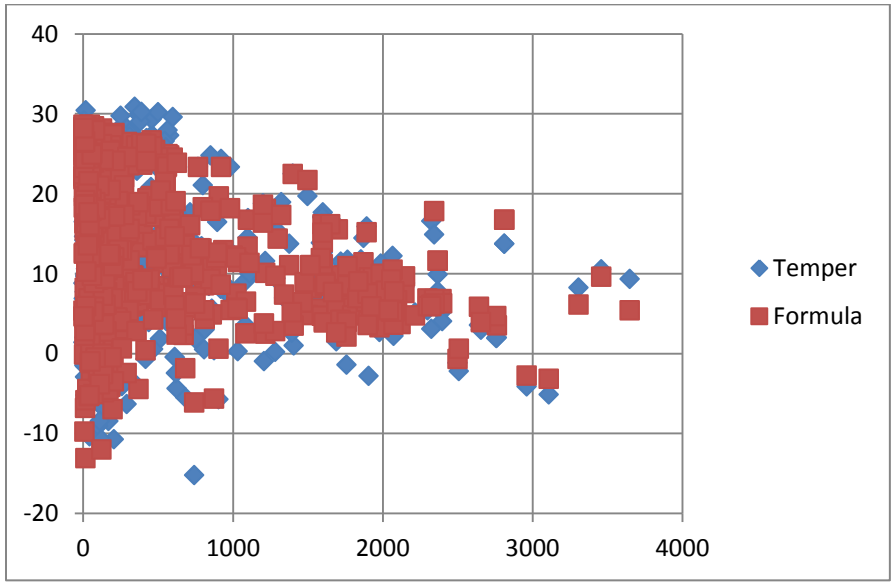
sheet	Lattitude	Temper	Formula	err	Errorsq	sumsq	Elevation	Temper	Formula
3	**43**	**6.99**	7.362578	-0.37258	0.138814	**0.138814**	**1342**	**6.99**	7.362578
NorthWest	43.8	4.65	4.142751	0.507249	0.257302	0.396116	1962	4.65	4.142751
North	46.1	6.19	4.026424	2.163576	4.681061	5.077177	1609	6.19	4.026424
America	42.2	10.96	11.39165	-0.43165	0.186324	5.263501	532	10.96	11.39165
	44	5.93	5.606998	0.323002	0.10433	5.367831	1589	5.93	5.606998
	44.8	7.16	7.473168	-0.31317	0.098074	5.465905	1024	7.16	7.473168

Continued for 669 cells, but truncated here for brevity.

All of the error calculations were done as for the linear spreadsheet, but the new cosine formula was used. The RMS error decreased slightly down to 2.94C, and the error balance averaged 0.01C. The new graphs are as shown below:







Regional and World Averages:

The averages from each region are brought forward to this table. The world averages is just taken as the average of these regional averages.

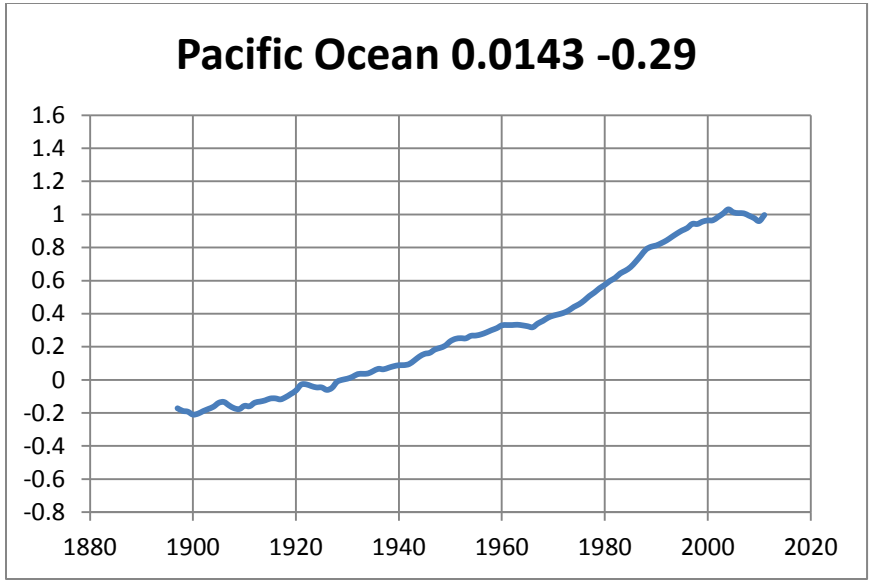
World Averages	all	35.95	**0.0130**	35.95	12.96	14.10	1914	2008	344	13.99	14.80	-0.80

Location	sheet	Lattitude	slope	Lattitude	T1	T2	start	end	Elevation	T2	T2(formula)	error
NW America	3	47.25	0.0128	47.25	4.97	6.31	1901	2007	988	6.31	5.74	0.57
NE America	4	45.24	0.0110	45.24	5.60	6.86	1892	2007	241	6.86	10.50	-3.65
S Namerica	5	36.33	0.0041	36.33	14.11	14.62	1889	2009	365	14.62	15.90	-1.29
S America	6	27.22	0.0110	27.22	17.21	18.16	1921	2009	508	17.89	18.93	-0.76
Africa	7	18.03	0.0119	18.03	24.60	25.42	1933	2007	568	25.42	22.97	2.45
Europe	8	49.09	0.0149	49.09	8.15	9.36	1903	2009	338	9.36	7.22	2.14
NC Asia	9	53.95	0.0180	53.95	1.18	2.90	1904	2009	267	2.90	3.74	-0.84
SC Asia	10	29.56	0.0124	29.56	18.54	19.54	1920	2008	694	19.54	17.52	2.03
SE Asia	11	31.03	0.0092	31.03	15.45	16.34	1918	2010	257	16.34	18.96	-2.62
NE Asia	12	51.09	0.0167	51.09	-1.65	-0.19	1911	2010	404	-0.19	5.34	-5.53
Japan	17	35.46	0.0154	35.46	13.68	15.23	1909	2010	73	15.23	17.67	-2.44
Australia	13	30.26	0.0126	30.26	17.96	18.86	1927	2007	190	18.86	19.82	-0.96
Pacific Ocean	14	24.23	0.0143	24.23	20.99	22.09	1927	2004	26	22.09	22.38	-0.29
Atlantic Ocean	15	42.75	0.0140	42.75	10.13	11.55	1909	2007	226	10.13	10.32	-0.18
Indian Ocean	16	17.79	0.0165	17.79	23.43	24.44	1945	2010	19	24.44	25.02	-0.58
Hi Elev	5	38.79	0.0095	38.87	6.22	7.14	1910	2006	1999	7.14	15.90	-1.29

Ideally, the area of each region used would be taken in as a weighing factor. This disregard for regional area, and the disregard for the number of data stations for each area causes the averages and world averages to be skewed toward the areas of high station count. The final world average temperature error is shown at -0.8C, when computed this way. It would be near zero if computed correctly. Nevertheless, considering that the stations are not uniformly scattered around the world, these additional computational errors can be somewhat overlooked. We just need to bear in mind the deficiencies in the numbers.

Summary Graphics:

For each region, a summary graph is formed. It includes the regional moving time average, the regional average trend line slope, and the regional deviation from the formula temperature prediction.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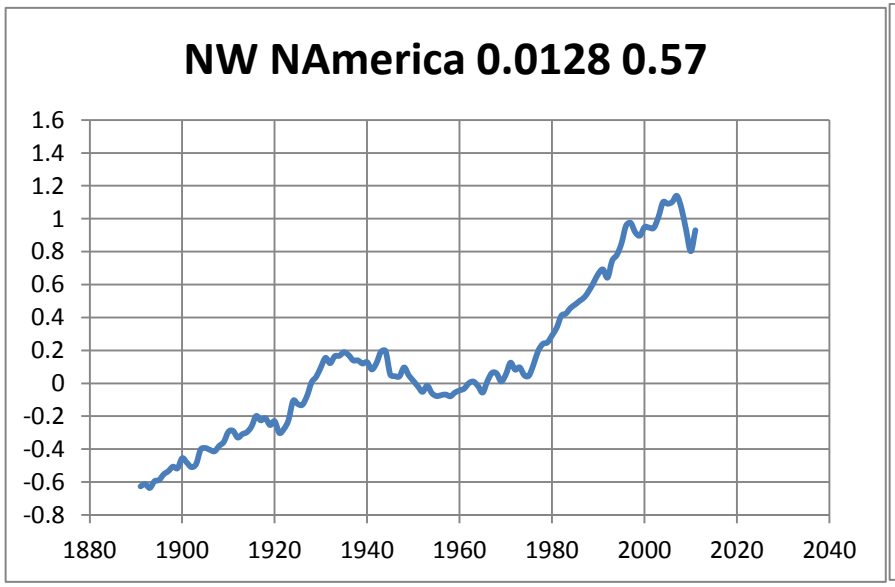
1.4
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
1880
1900
1920
1940
1960
1980
2000
2020


NW NAmerica 0.0128 0.57
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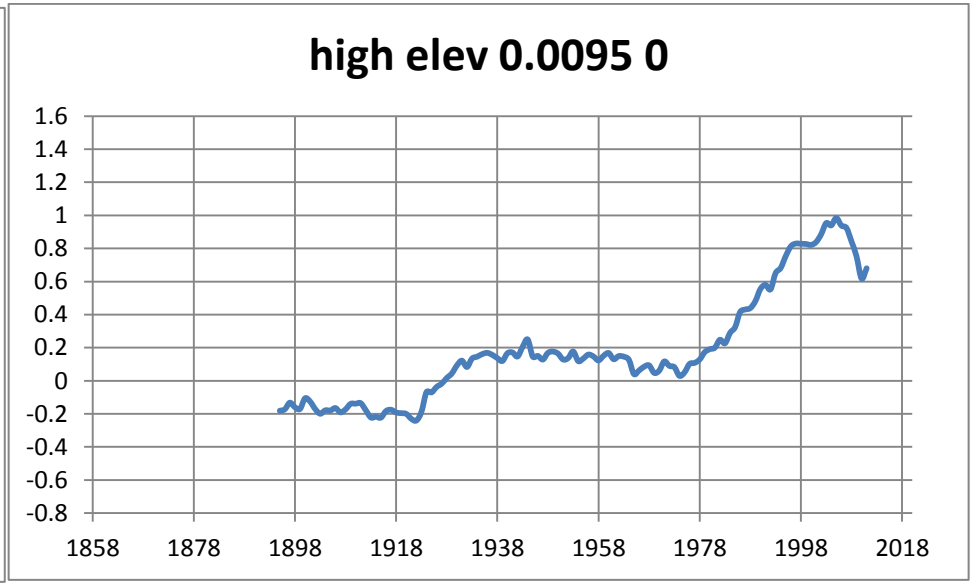
1.4
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
1880
1900
1920
1940
1960
1980
2000
2020
2040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1.4
1.2
1
0.8
0.6
0.4
0.2
0
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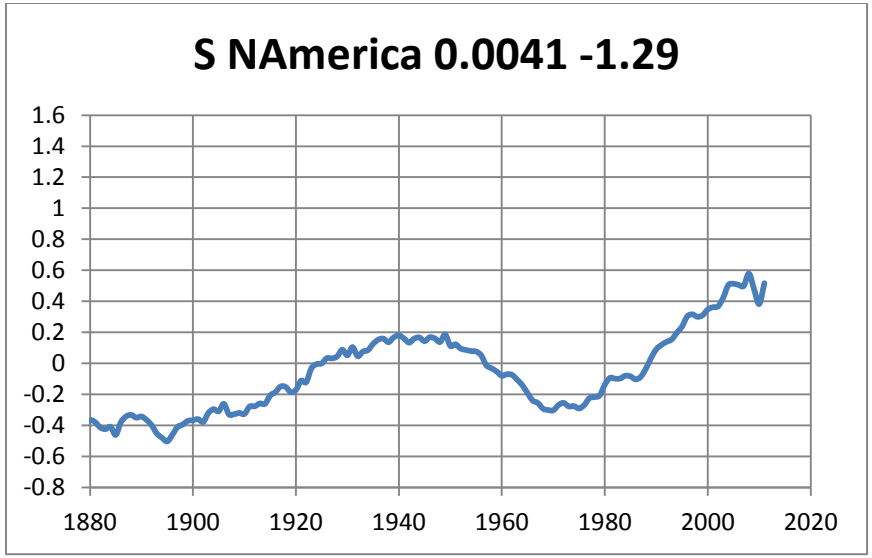
-0.4
-0.6
-0.8
1858
1878
1898
1918
1938
1958
1978
1998
2018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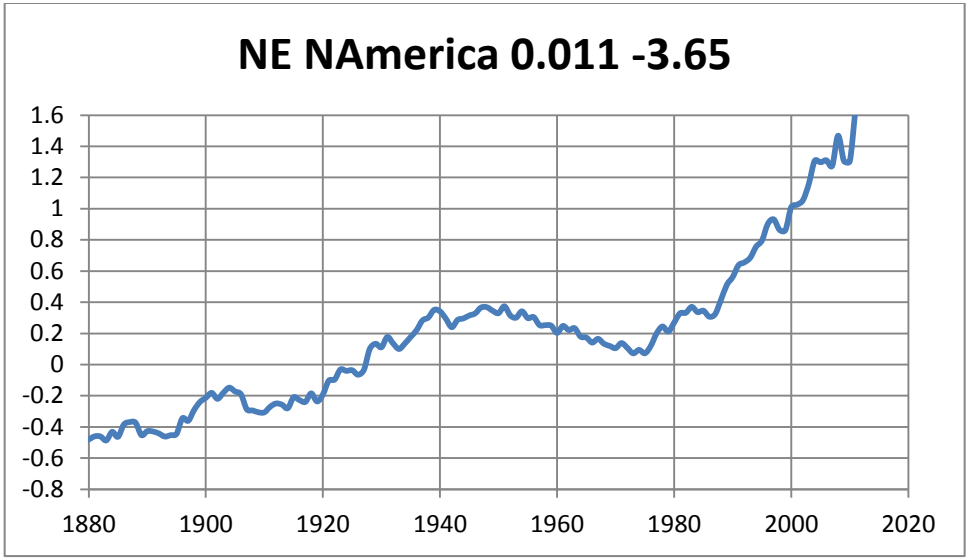
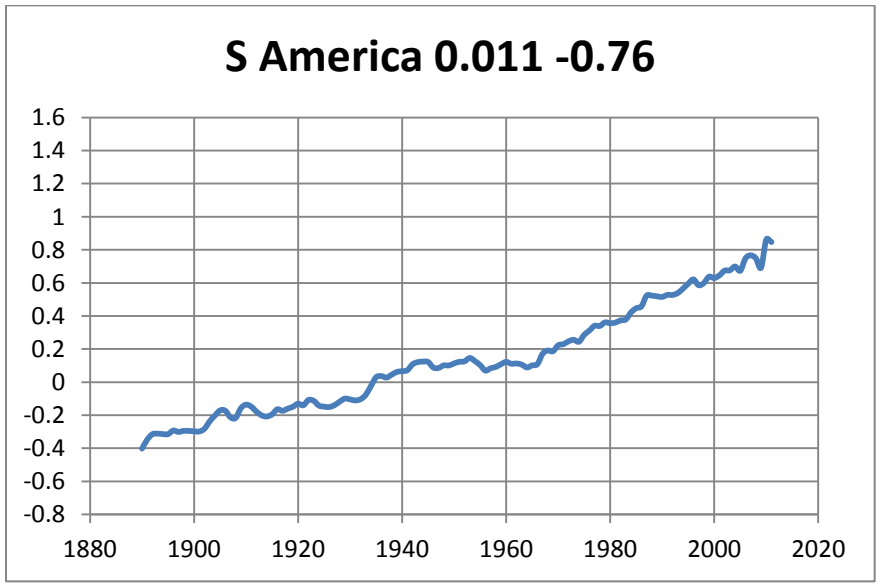
1.4
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
1880
1900
1920
1940
1960
1980
2000
2020


NE NAmerica 0.011 -3.65
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
1880
1900
1920
1940
1960
1980
2000
2020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1.4
1.2
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0.8
0.6
0.4
0.2
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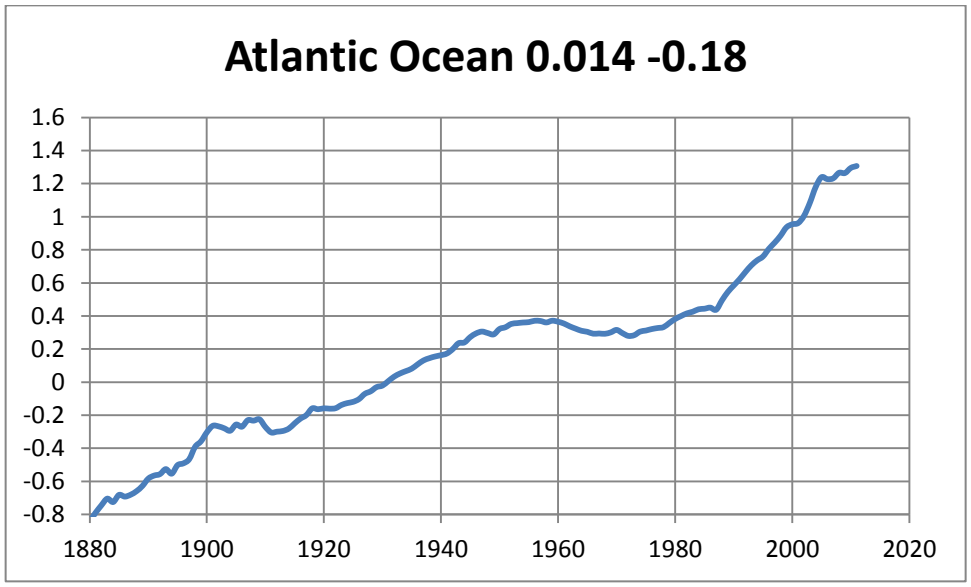
-0.2
-0.4
-0.6
-0.8
1880
1900
1920
1940
1960
1980
2000
2020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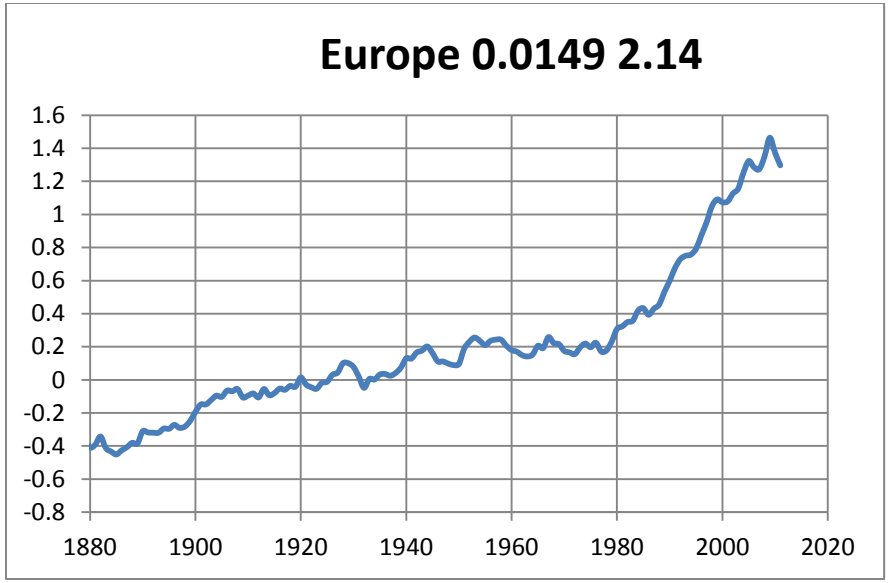
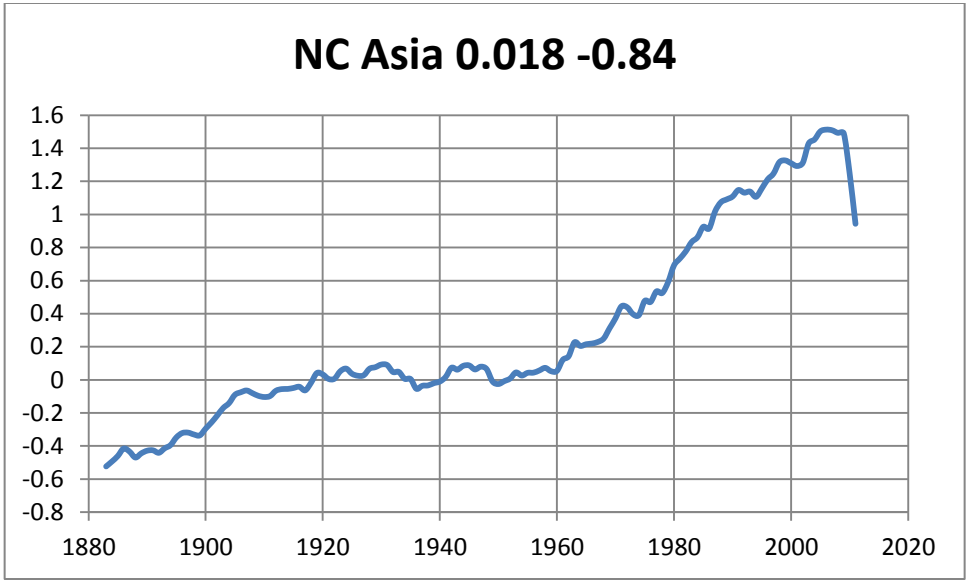
1.4
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
1880
1900
1920
1940
1960
1980
2000
2020


Europe 0.0149 2.14
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
1880
1900
1920
1940
1960
1980
2000
2020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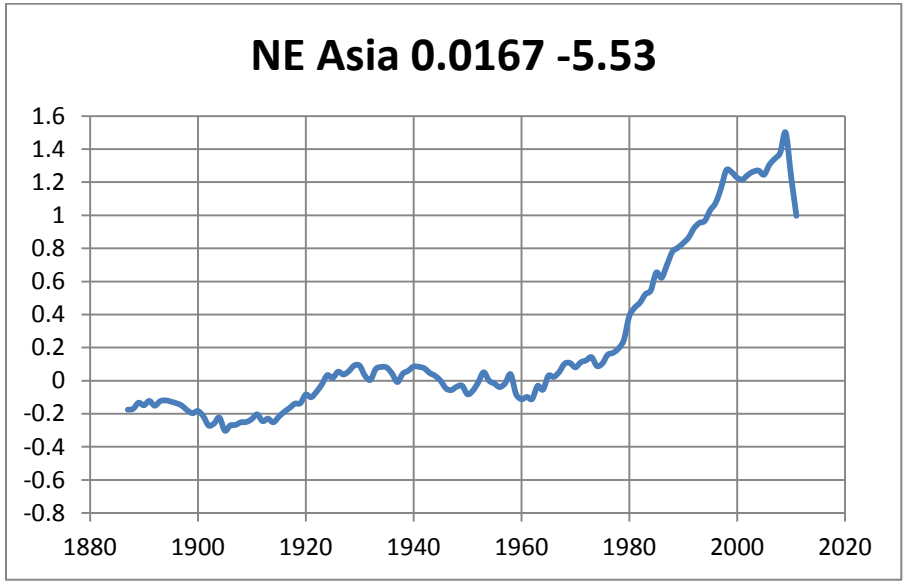
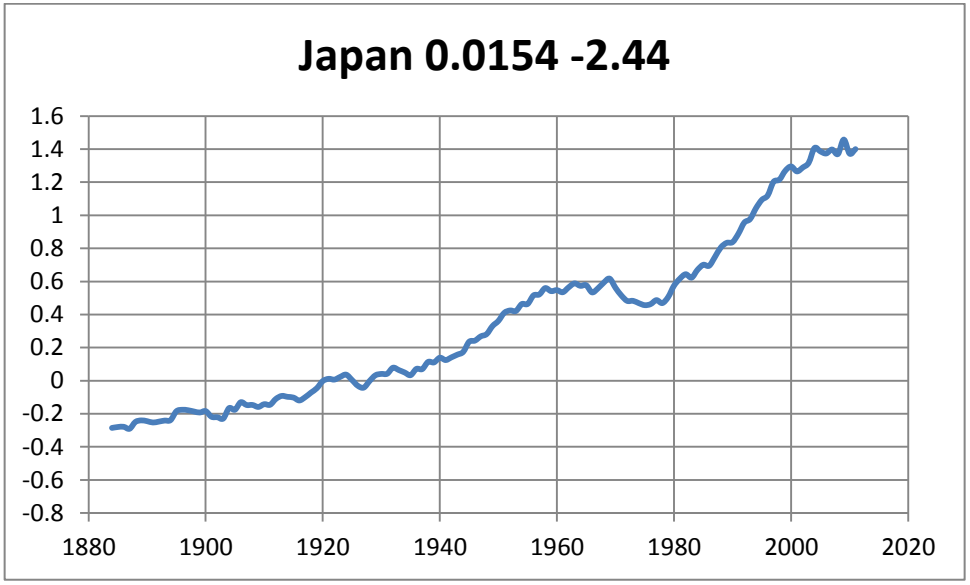
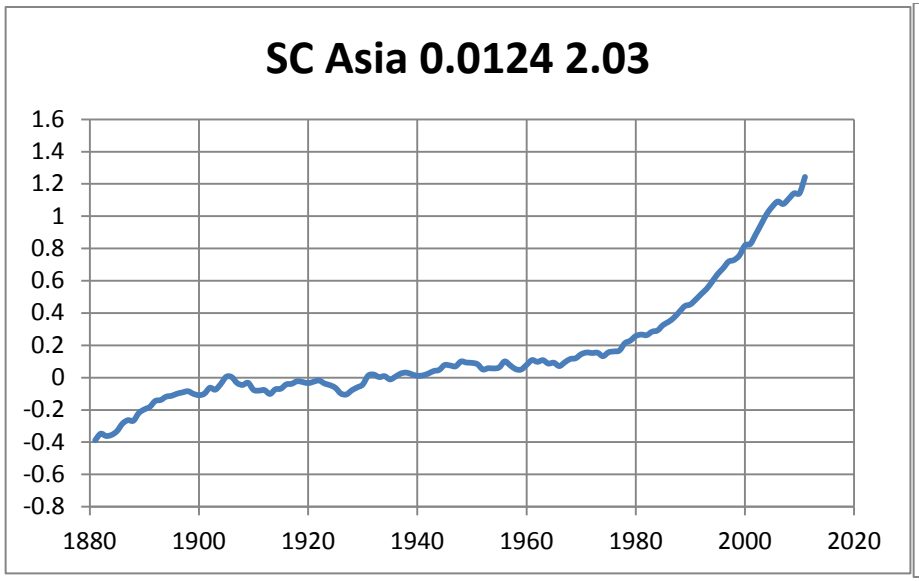
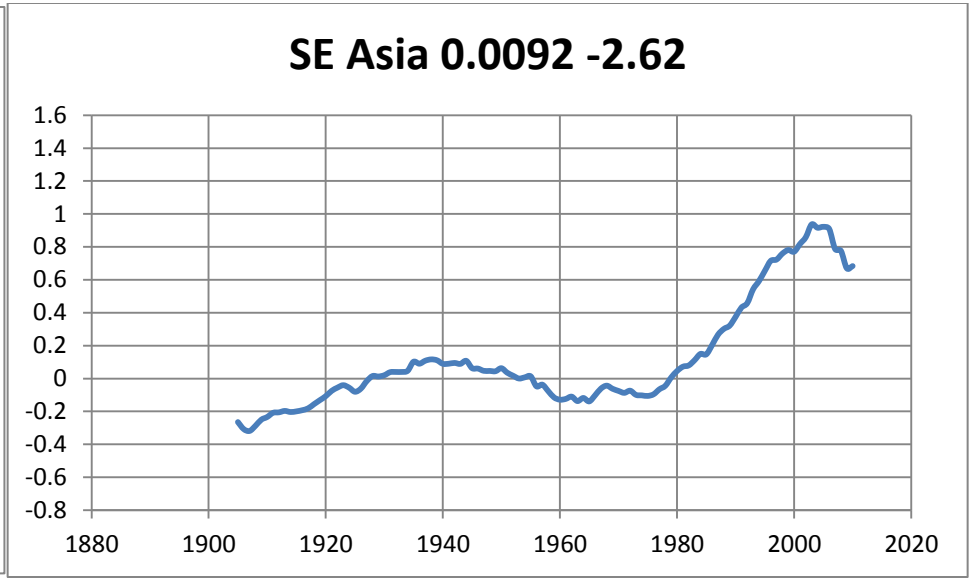
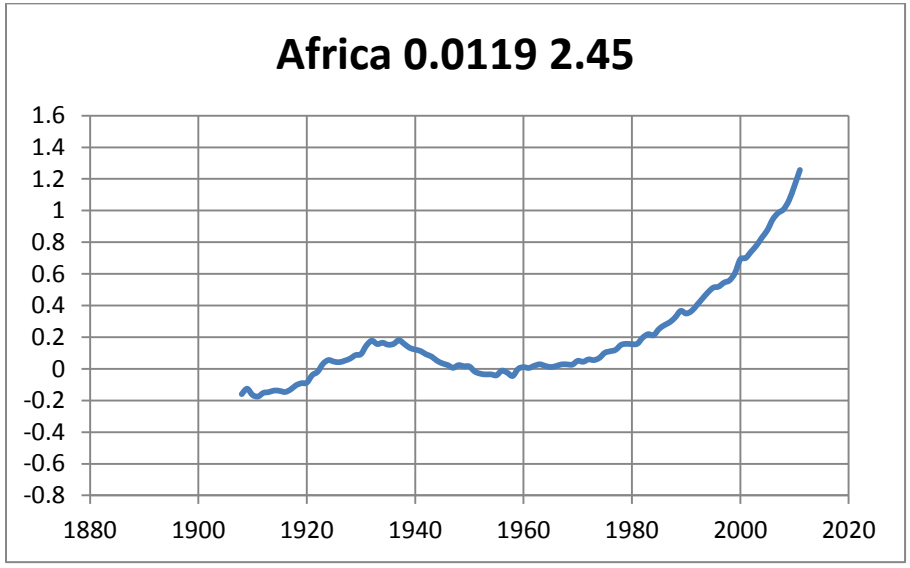
1.4
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
1880
1900
1920
1940
1960
1980
2000
2020

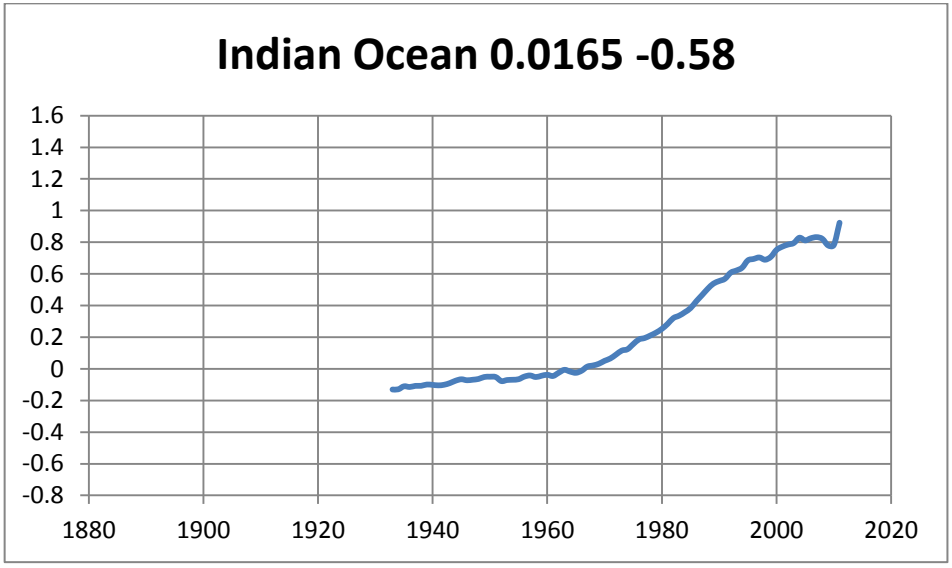

NE Asia 0.0167 -5.53
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
1880
1900
1920
1940
1960
1980
2000
2020

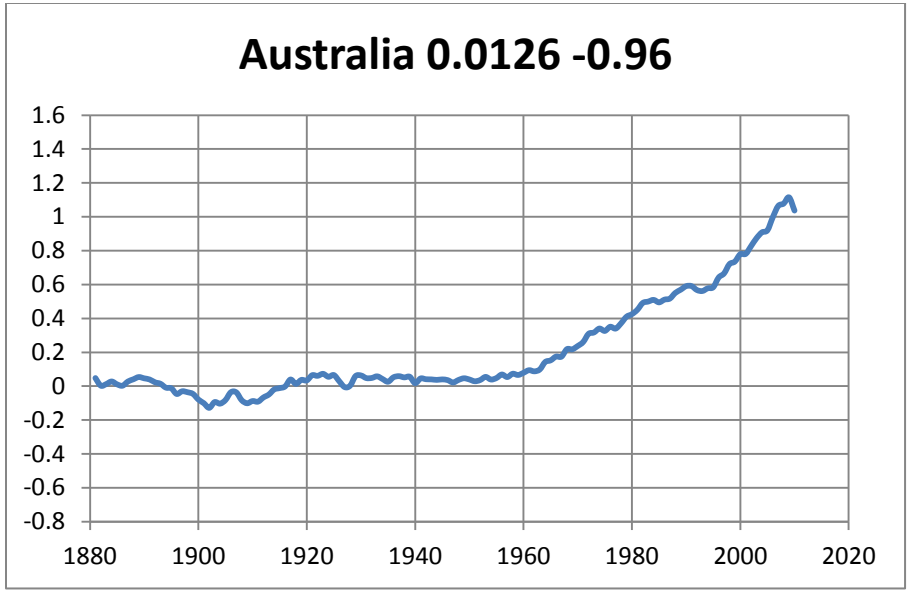

Japan 0.0154 -2.44
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
1880
1900
1920
1940
1960
1980
2000
2020

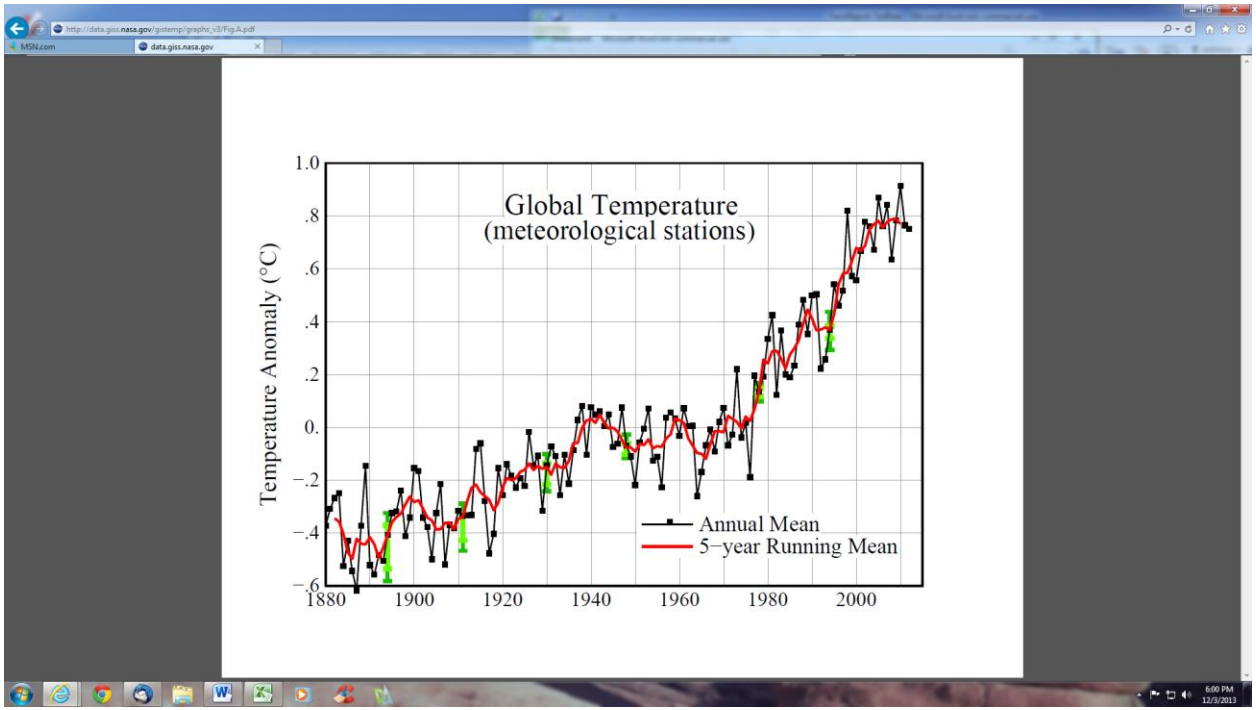

SC Asia 0.0124 2.03
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
1880
1900
1920
1940
1960
1980
2000
2020

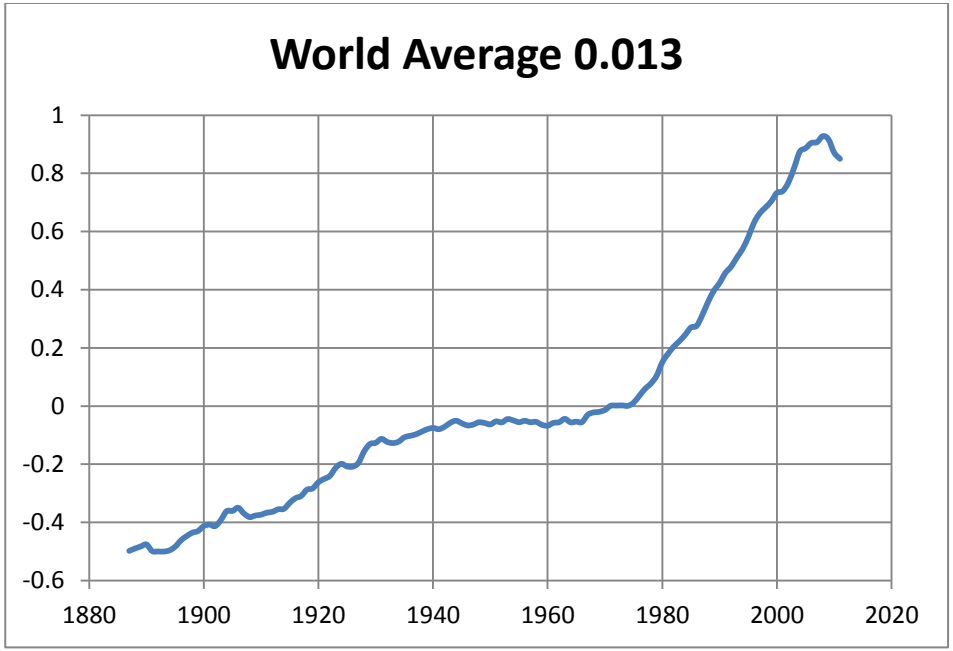

SE Asia 0.0092 -2.62
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
1880
1900
1920
1940
1960
1980
2000
2020


Africa 0.0119 2.45
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
1880
1900
1920
1940
1960
1980
2000
2020


Indian Ocean 0.0165 -0.58
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
1880
1900
1920
1940
1960
1980
2000
2020


Australia 0.0126 -0.96
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
1880
1900
1920
1940
1960
1980
2000
2020


Global Temperature
(meteorological stations)
Temperature Anomaly (°C)
1.0
.8
.6
.4
.2
0.
−.2
−.4
−.6
1880
1900
1920
1940
1960
1980
2000
Annual Mean
5−year Running Mean



Conclusions:

When looking at the conclusion graphics, the first thing that stands out, is that the regional temperature anomalies are not the same. North America, Africa, South East Asia, and Japan all show a negative temperature trend in the time frame from 1940 to 1970. Europe, North Central Asia, North East Asia, South Central Asia, The Indian Ocean, Australia, and my world average all show no change in temperature during this time frame. The Pacific Ocean and South America show a steady gradual warming over this time. The Atlantic Ocean and the official world plot show a slight negative slope in this period.

Examining the selected sites, it does not seem as if these differences are caused by a lack of data, or bad data. It seems that some weather induced effects are behind the differences. Or perhaps some local emission differences are responsible. It would take some research to find the cause of the differences.

The other thing to notice is the differences in the temperatures vs. the formula. These differences might be due to albedo differences, weather differences, or maybe have a man made cause. North-West North America, and Europe both show positive temperatures, probably due to gulf stream effects. North-East North America, and North East Asia both show large negative temperatures, probably due to cold arctic air flowing over them. The three oceans all show little deviation from the formula. This is perhaps because of their large extent and thermal inertia. Africa

and South Central Asia both show elevated temperatures, probably due to the influence of the Sahara desert. South East Asia is on the low side, probably because of the isolation of the Himalayan Mountains and the vast arctic further north.

All of the plots show a fast rise in temperature from 1970 to 2000. The end points of the graphs are difficult to make conclusions on, because the 10 year average starts to run out of data after 2001. This causes the average to shift back in time. In other words, the average for 2010 averages back to 2000, but has no forward average. Thus it represents 2005 in time. There is a way to eliminate the backward time shift. It is done by reducing the size of the average. Thus for example, for 5 data points until the end, the average would be reduced to +/- 5 years. But, the noise in the data then becomes larger and larger as the last data point is approached. This was done in the regional time series average reducing from +/- 10 years average down toward no average, and putting in a +/- 3 year clamp for years 2009,2010, and 1011. The noise still shows up and the last two numbers have delay error as well. You just can't reduce the noise in the data in the last few years.

Final Short Summary:

1) The different regions can show considerable multi-decade differences in temperature trend.
2) The different regions vary in average temperature from a simple latitude-elevation model.
3) All of the regions show warming over any 50 year time span.
4) All of the regions show more warming over the last 50 years than over any other time interval.
5) Some of the regions show cooling over the last 10 years.

Speculation:

The oceans have a higher specific heat than the land, and the ability to carry heat to depths quicker than can occur on land. The oceans cover more of the earth. Apparently ocean temperatures are responsible for weather events on land. Yet, there is little temperature data available for the oceans. Perhaps the multi-decadal differences in land temperature trends are due to variations in ocean temperatures.

The latitude-elevation model was able to fit station average temperature to a 1 sigma error of 3C. I wonder how much better that prediction could become if the vegetation information were analyzed and used.

The cosine temperature model almost matches the cosine factor of solar incidence. I wonder why I had to accelerate the latitude angle by 10% to obtain the improved fit to data.

I ignored the wealth of coastal data, because it did not represent an area, but a boundary. I wonder if that data would reveal anything new.