6.0 Miscellaneous Climatological Statistics

6.1 Sky Cover

The term sky cover is used to express the portion of the celestial dome that is (1) covered, but not necessarily hidden, by clouds or obscuring phenomena aloft; (2) hidden by an obscuring phenomenon on the ground (such as fog or smoke); or (3) a combination of both 1 and 2. The sky cover is determined hourly by scanning the sky and estimating the number of tenths that are covered (0 denotes clear and 10 denotes overcast). Average monthly sunrise-to-sunset sky covers for the period 1946 through 2004 are shown in Table 6.1. Also shown in Table 6.1 is the number of clear, partly cloudy, and cloudy days for the period 1954 through 2004. The number of clear, partly cloudy, and cloudy days is the result of assigning each day to one of the following categories based on its average sky cover for that day:

Category	Average Sky Cover
Clear	0 - 3 tenths
Partly cloudy	4 - 7 tenths
Cloudy	8 - 10 tenths

During the period of record (1954 through 2004), an average of 202 sunny days (the sum of the clear and partly cloudy days) was recorded per year at the HMS. The longest consecutive number of cloudy days was 28, from December 27, 2003 through January 23, 2004 and also from January 30 through February 26, 1958.

6.2 Fog and Dense Fog

Table 6.2 shows the average monthly and annual number of days with fog and dense fog. Fog is reported any time horizontal visibility is reduced to 6 miles or less because of the suspension of water droplets in the surface layer of the atmosphere. Dense fog is reported when horizontal visibility is reduced to 0.25 mile or less. Most fog at the HMS is radiation fog, a common type of fog that forms during nights characterized by light wind, clear sky, and moist air in the lower levels of the atmosphere. Nearly 90% of both fog and dense fog at the HMS occurs during the late autumn and winter months, though fog is observed every month of the year.

6.3 Psychrometric Data

Psychrometric data include observations of dry bulb, wet bulb, dew point temperatures, and relative humidity. The dry bulb temperature is the temperature of the ambient air; the wet bulb temperature is the lowest temperature to which a parcel of air, under constant pressure, can be cooled by evaporating water into it. The dew point temperature is the temperature to which a given parcel of air, under constant water-vapor content, must be cooled to attain saturation. Relative humidity is the ratio of the actual water-vapor content of the air to the one where saturation would occur if the pressure and temperature remained unchanged. Figure 6.1 graphically presents the hourly average values for dry bulb temperature, web bulb temperature, dew point temperature and relative humidity by month for the period from 1955 through 2004.

Table 6.1. Average Sky Cover (sunrise to sunset), 1946 through 2004, and Number of Days Clear, Partly Cloudy, and Cloudy, 1954 through 2004

	Sky Cover (Scale 0-10)					Number of Clear Days					Number of Partly Cloudy Days	Number of Cloudy Days				
Month	Avg	Max	Year	Min	Year	Avg	Max	Year	Min	Year		Avg	Max	Year	Min	Year
Jan	8.0	9.4	2004[a]	4.3	1949	3.3	9	1984	0	2004[a]	5.1	22.6	29	2004	17	1963
Feb	7.4	9.3	1980	5.9	1996	4.6	14	2003	0	1984[a]	5.5	18.2	26	1980[a]	7	2003
Mar	6.8	8.5	1978	4.9	1965	6.2	12	1979[a]	1	1978[a]	8.4	16.4	24	1993	9	1979[a]
Apr	6.3	8.1	1963	3.7	1951	6.7	14	2004	1	1963	9.1	14.2	21	1979[a]	6	1956
May	5.9	8.1	1993	3.6	1992	8.4	18	1992	1	1977	10.4	12.2	19	1977[a]	3	1992
Jun	5.1	7.0	1950	2.8	1961	10.6	21	1961	5	1972[a]	10.0	9.3	15	1983[a]	1	2003
Jul	3.0	5.0	1983	0.9	1953	19.1	26	2003[a]	12	1987[a]	7.7	4.2	12	1976	0	2003[a]
Aug	3.2	5.9	1968	0.6	1955	18.8	30	1955	9	1978	7.5	4.7	13	1983[a]	0	2000[a]
Sep	3.9	6.7	1978	1.4	1990[a]	15.6	27	1975	6	1978	7.4	6.9	16	1977	0	1990
Oct	5.5	8.0	1975	3.3	1987	10.6	25	2002	1	1975	7.9	12.5	22	1973	6	1986
Nov	7.5	9.1	1972	5.2	1993	4.8	12	1993	1	1973[a]	5.8	19.4	25	1973[a]	13	1993
Dec	8.0	9.3	1985	6.4	1978	3.8	9	1978	1	2002[a]	4.5	22.7	29	1985	17	1978
Annual	5.9	6.6	1978[a]	5.1	1949	113.0	144	1998	80	1977	89.3	163.1	193	1978	133	2002

(a) Most recent of multiple occurrences.

Table 6.2. Monthly and Annual Number of Days with Fog and Dense Fog, 1945 through 2004

	Days with Fog (Visibility ≤6 miles)					Days with Dense Fog (Visibility ≤0.25 mile)				
Month	Avg	Max	Year	Min	Year	Avg	Max	Year	Min	Year
Jan	11.9	25	1979	0	1949	6.4	15	2004[a]	0	1949
Feb	6.7	20	1963	0	1988[a]	3.3	11	2004[a]	0	1999[a]
Mar	2.0	10	1993	0	2003[a]	0.8	5	1993[a]	0	2004[a]
Apr	0.5	3	1992	0	2004[a]	0.1	1	2003[a]	0	2004[a]
May	0.2	3	1948	0	2004[a]	<0.1	1	1958	0	2004[a]
Jun	0.1	2	1971	0	2004[a]	<0.1	1	1971	0	2004[a]
Jul	<0.1	1	1966	0	2004[a]	0	0	0		
Aug	0.1	1	1985[a]	0	2004[a]	<0.1	1	1985[a]	0	2004[a]
Sep	0.3	2	1985[a]	0	2004[a]	0.1	1	1995[a]	0	2004[a]
Oct	2.0	9	1962	0	1989[a]	1.0	7	1980	0	1998[a]
Nov	9.8	19	1985[a]	0	1990	5.7	14	2001	0	1990[a]
Dec	14.3	25	1989[a]	2	1968	7.5	17	1950	2	1996[a]
Annual	47.8	84	1985-86	22	1948-49	25.1	42	1950-51	9	1948-49

(a) Most recent of multiple occurrences.
Longest duration of fog: 113.7 hours, December 16-20, 1985.
Longest duration of dense fog: 47.0 hours, December 1957.

Table 6.3 presents monthly averages and extremes of dry bulb, wet bulb, dew point temperatures, and relative humidity from the HMS for the period 1950 through 2004. These variables are collected hourly and are averaged on a monthly (as opposed to a daily) basis. Prior to 1975, wet bulb temperatures ≥75°F had never been observed at the HMS. On July 8, 9, and 10, 1975, 7 hourly observations were made of wet bulb temperatures ≥75°F.

6.4 Solar Radiation

Table 6.4 presents average and extreme daily solar radiation values by month for the period 1953 through 2004. These data are reported in langleys (a langley is a unit defined as 1 gram calorie per square centimeter) and are integrated over an hour period and totaled for a daily value.

The highest daily values occur with a clear sky and clean air; the lowest commonly occur on days overcast with low stratus clouds. The lowest midday values of hourly solar radiation occurred on May 18, 1980, as the dense ash cloud from the morning eruption of Mount St. Helens passed over eastern Washington. Hourly solar radiation values dropped to 0 at 1100 hours and remained at 0 for the rest of that day.

6.5 Thunderstorms, Dust, and Glaze

A thunderstorm day is one in which thunder is heard at the observing station one or more times during a calendar day. If a thunderstorm were to begin before midnight and continue until after midnight, it is possible to have two thunderstorm days from a single storm.

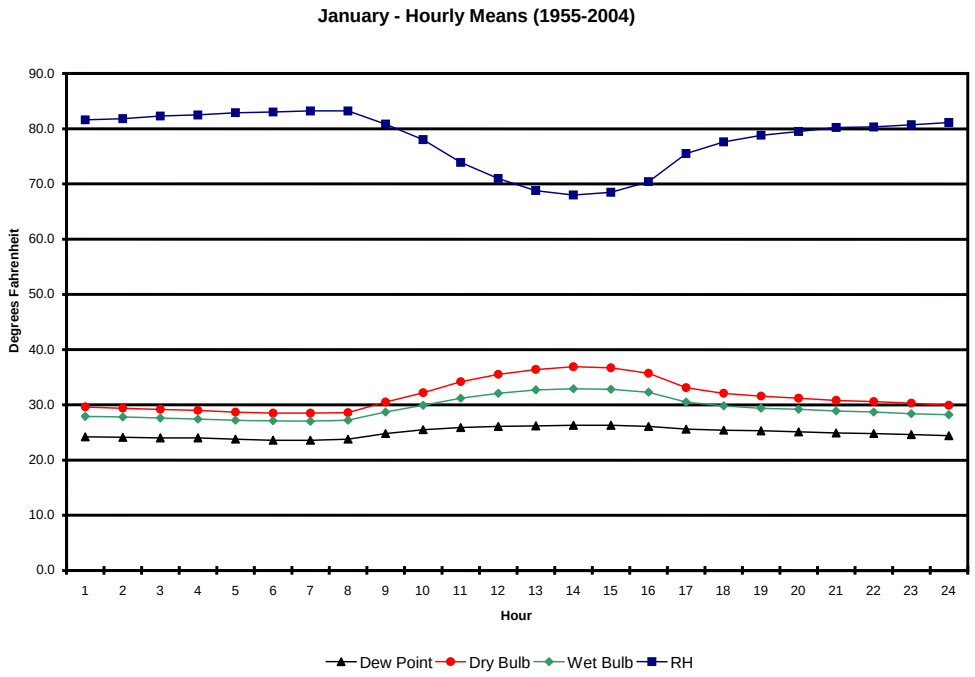

Figure 6.1. Average Hourly Dry Bulb Temperature, Web Bulb Temperature, Dew Point Temperature (°F) and Relative Humidity (%) by Month, 1955 through 2004

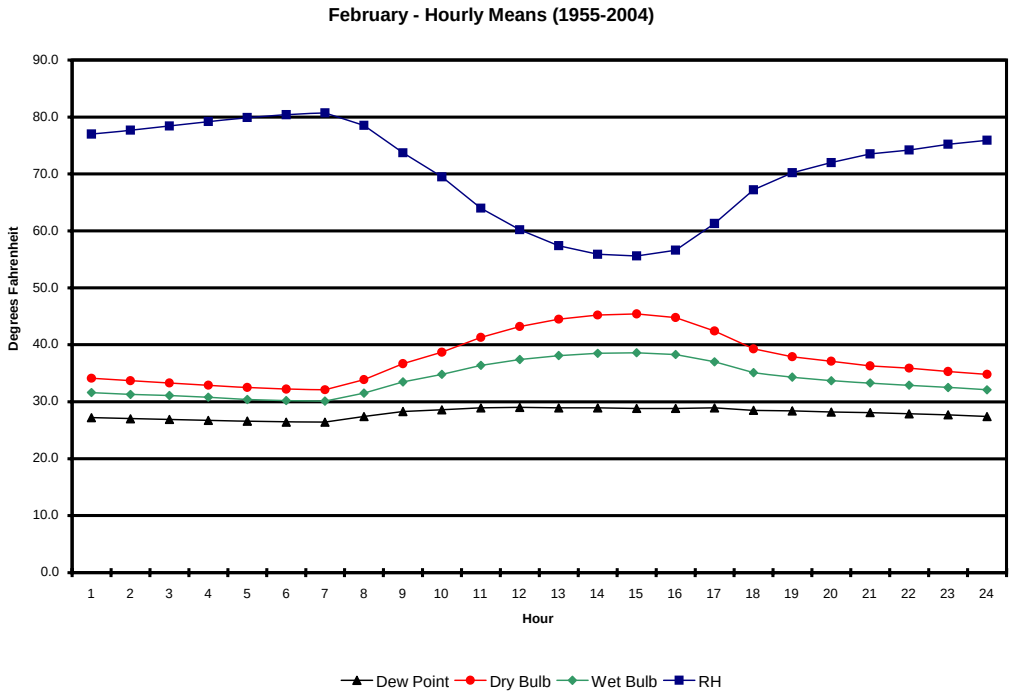

Figure 6.1. (contd)

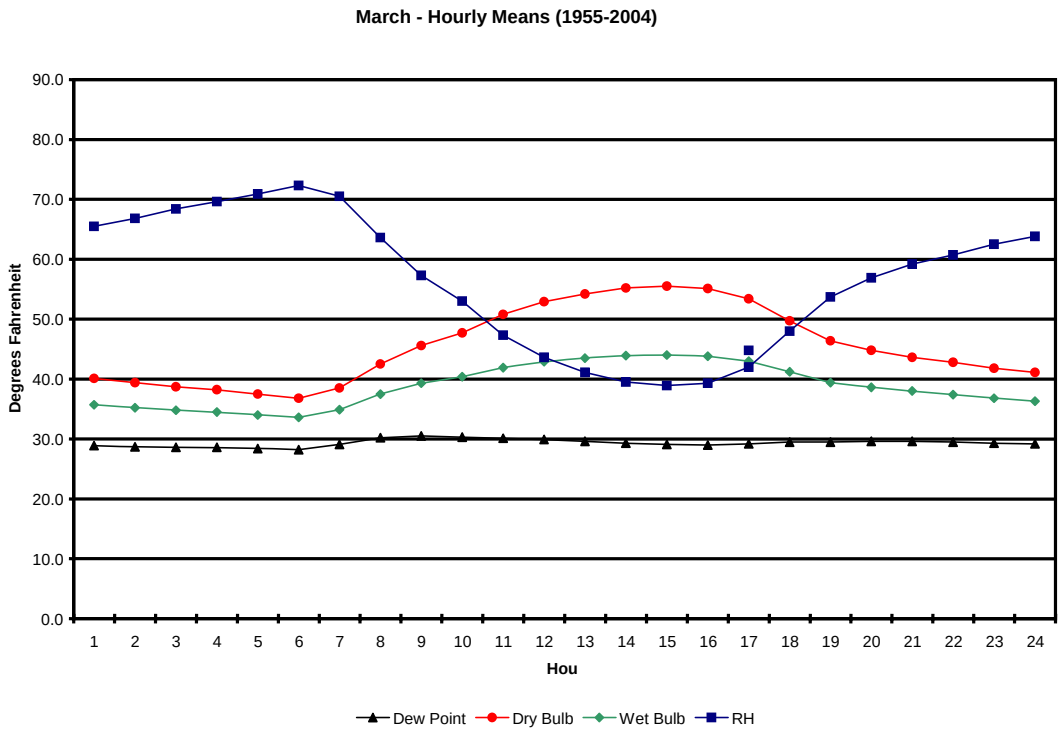

Figure 6.1. (contd)

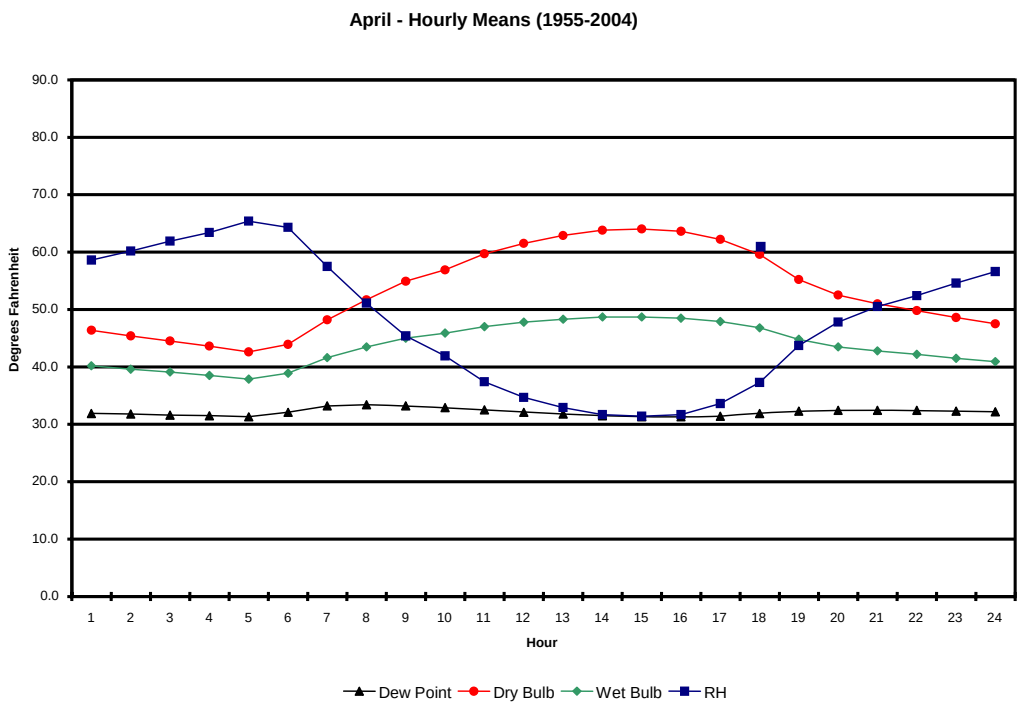

Figure 6.1. (contd)

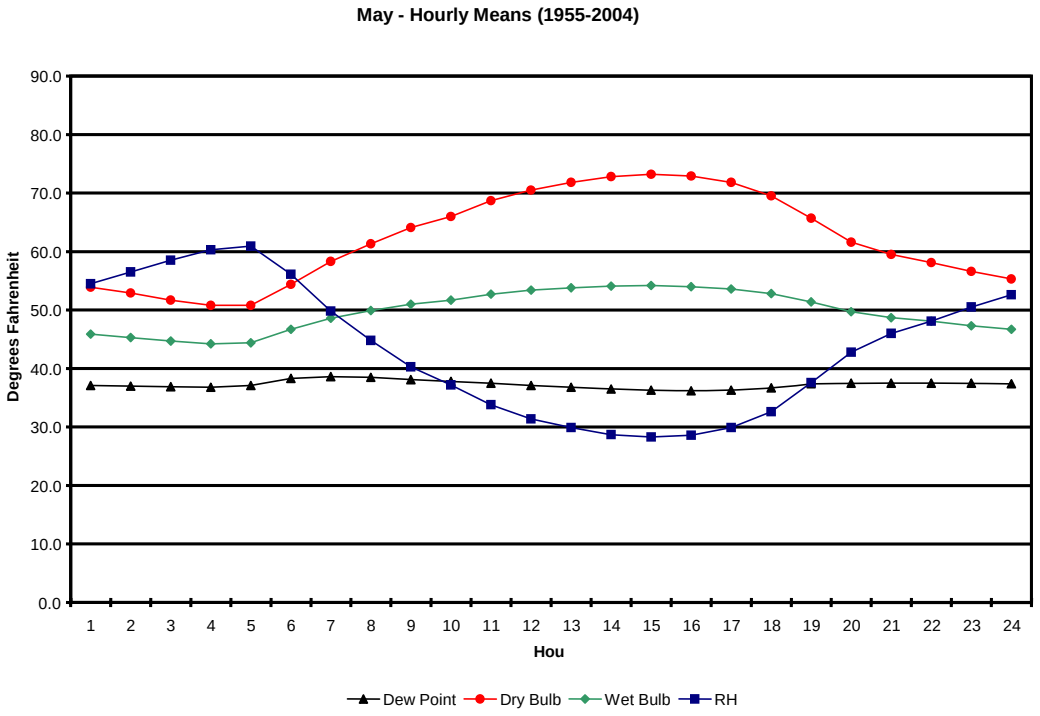

Figure 6.1. (contd)

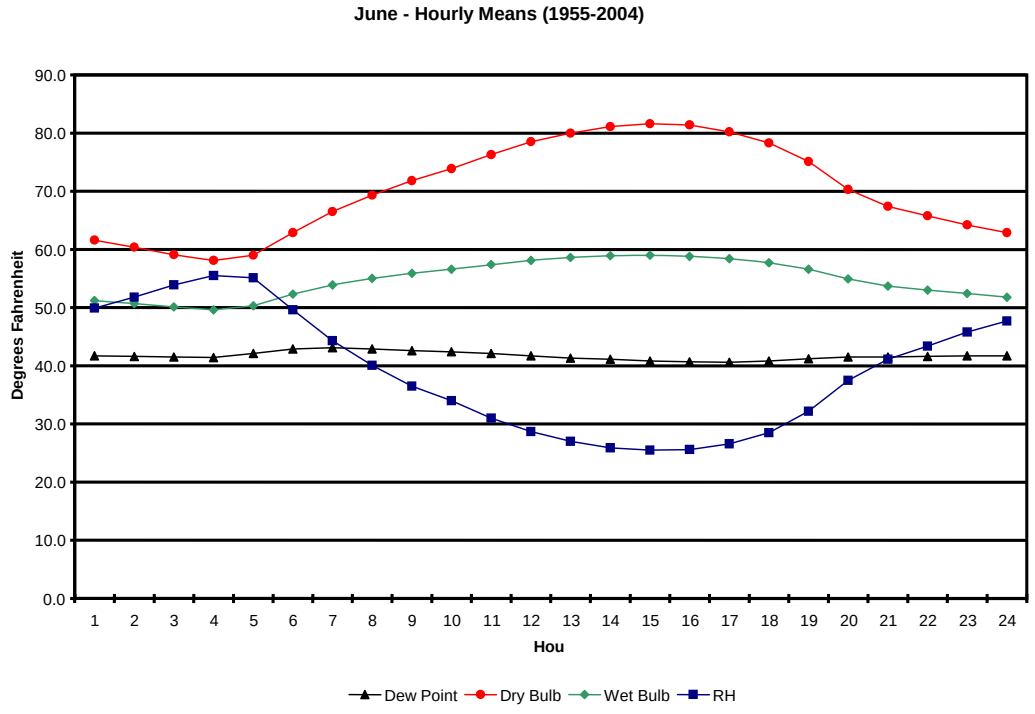

Figure 6.1. (contd)

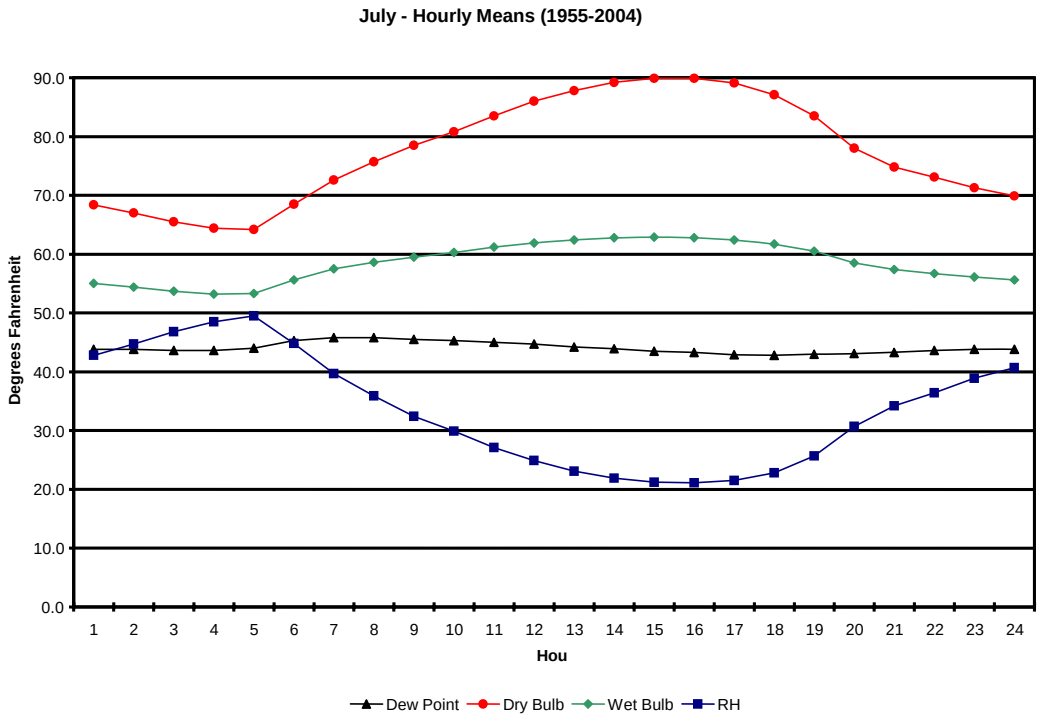

Figure 6.1. (contd)

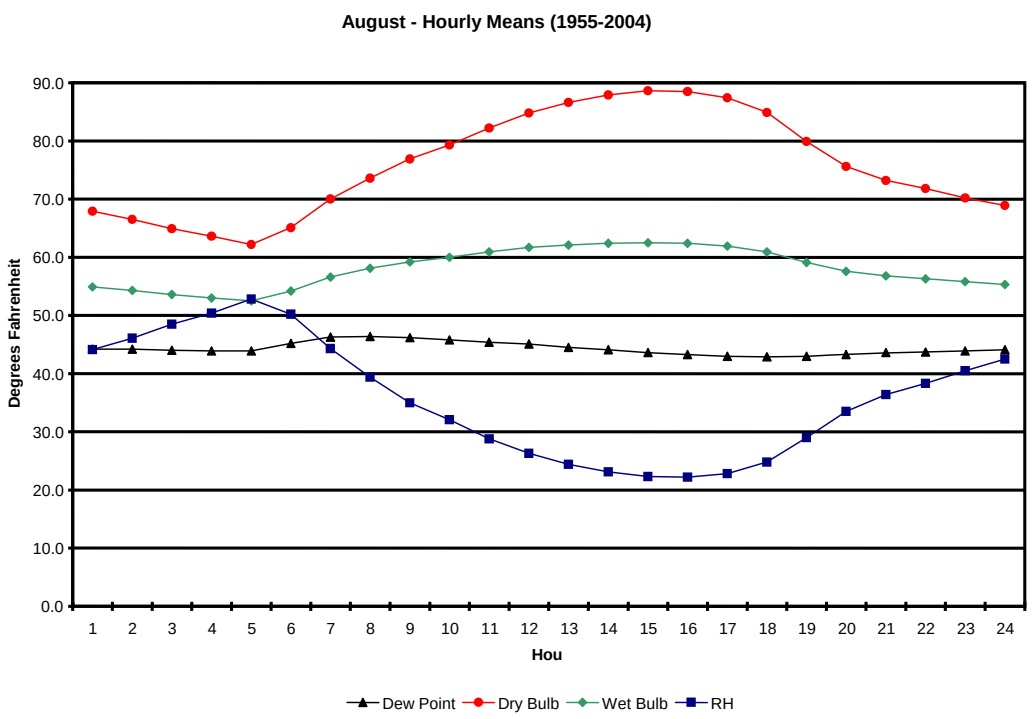

Figure 6.1. (contd)

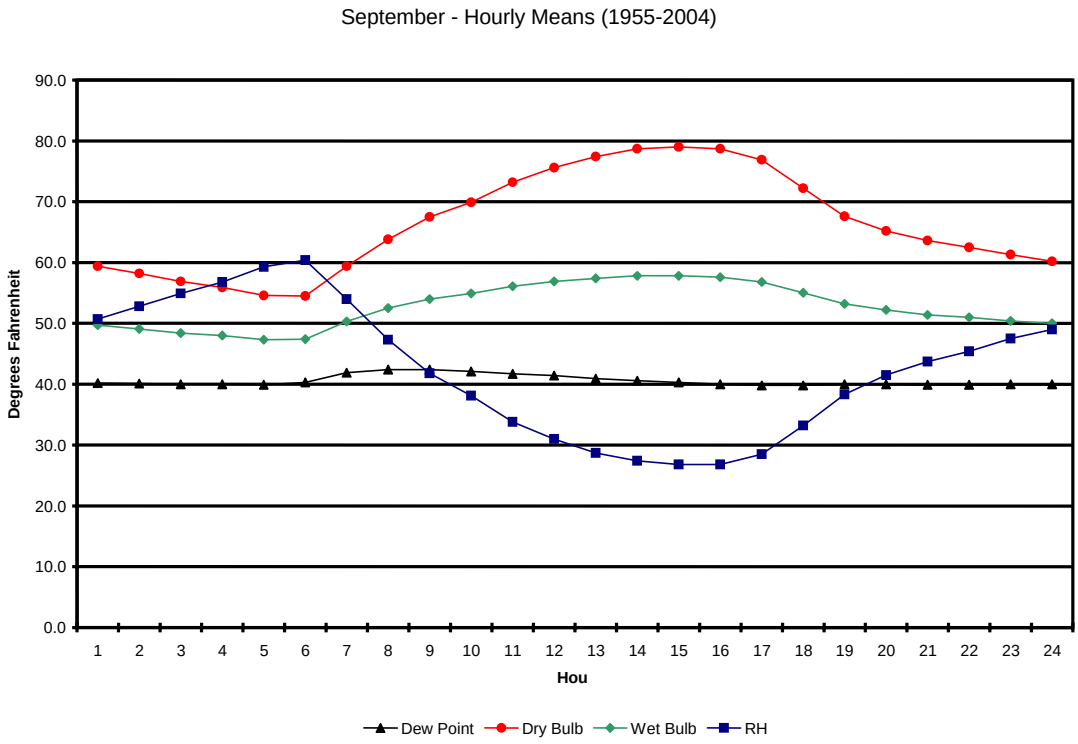

Figure 6.1. (contd)

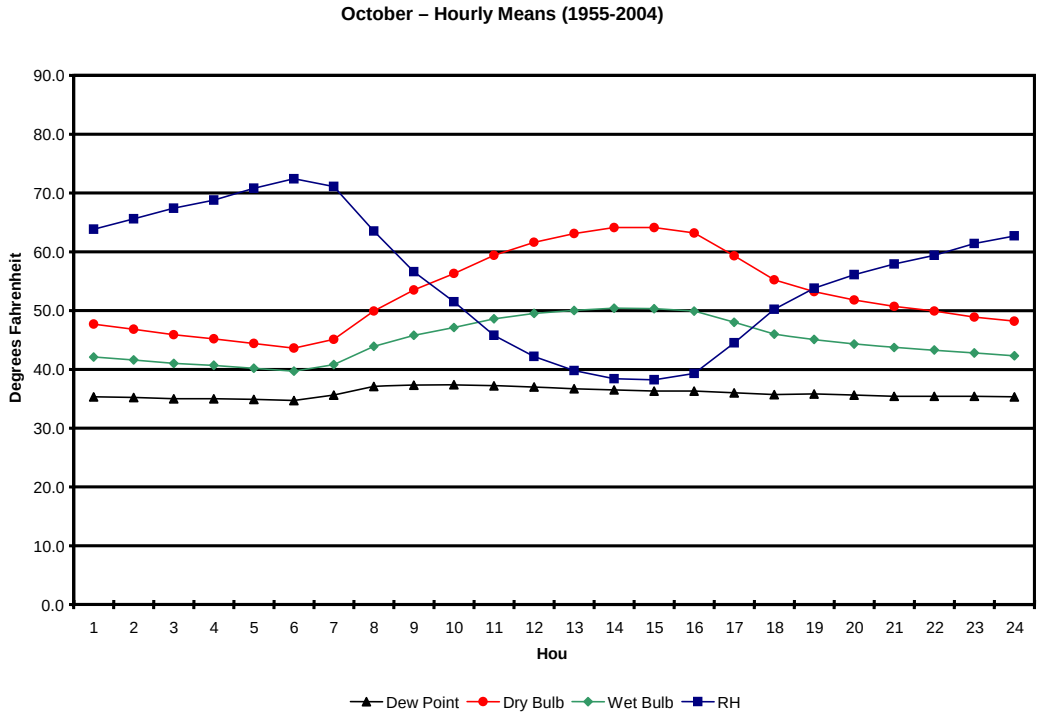

Figure 6.1. (contd)

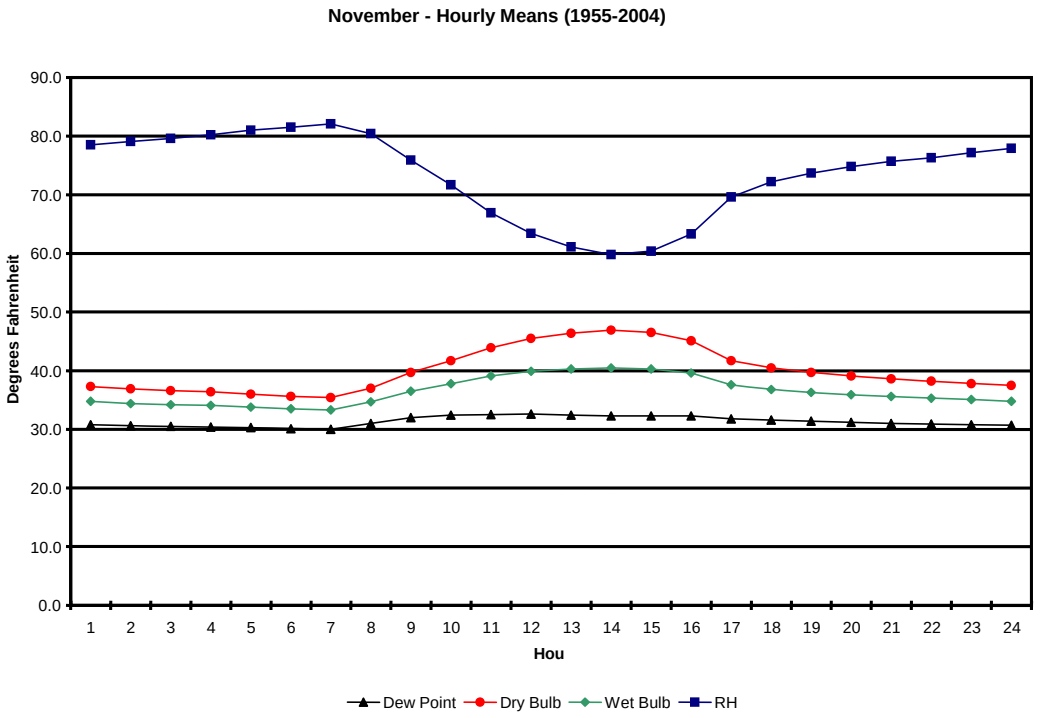

Figure 6.1. (contd)

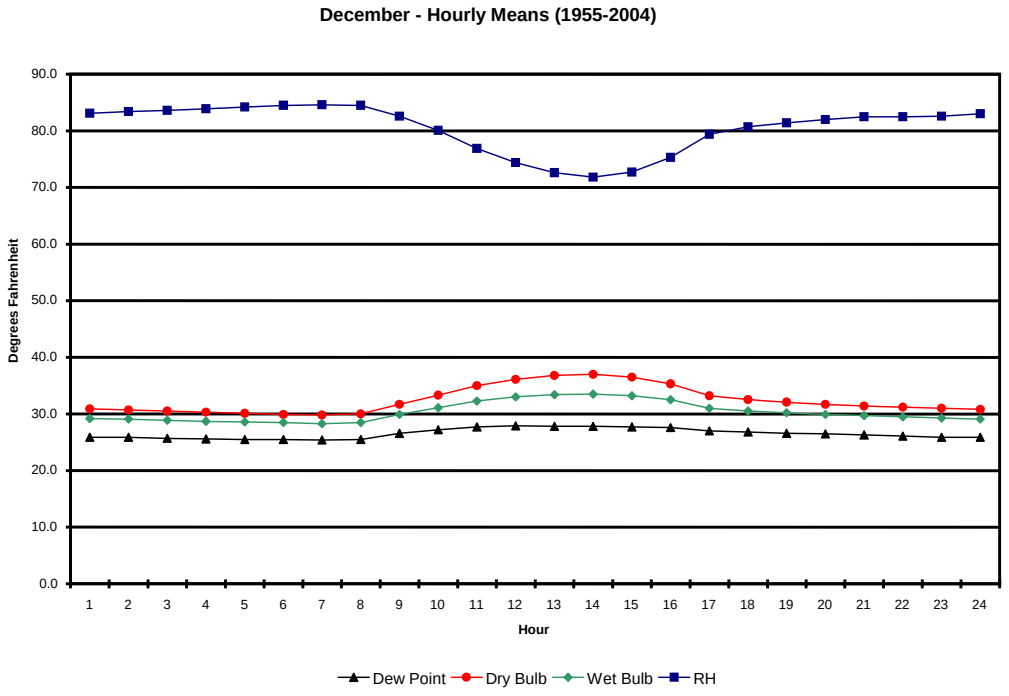

Figure 6.1. (contd)

Table 6.3. Monthly Averages and Extremes of Psychrometric Data, 1950 through 2004

Category[a]	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
	Monthly Averages												
Dry bulb	31.4	37.6	45.3	53.3	62.1	69.9	77.4	75.8	66.5	53.1	40.1	32.7	53.8
Wet bulb	29	34	39	44	50	55	58	58	53	45	36	31	44
Rel. hum.	77.6	70.7	56.6	47.5	43.0	39.6	33.3	35.7	42.1	56.1	73.6	80.4	54.6
Dew point	24.8	27.8	29.0	31.8	37.0	41.6	43.8	44.2	40.4	36.0	31.5	26.8	34.6
	Extremes of Monthly Averages												
Dry Bulb													
Highest	43.0	44.6	51.6	58.6	68.7	77.3	83.3	82.5	72.7	59.5	46.4	38.8	56.6
Year	1953	1991	1992	1987	1958	1992	1985	1967	1990	1988	1999	1953	1992
Lowest	12.9	25.8	39.6	48.3	57.0	64.2	71.3	70.6	58.9	48.1	25.7	21.9	50.2
Year	1950	1956	1955	1955	1984	1953	1986	1964	1985	1984	1985	1985	1985
Wet Bulb													
Highest	39	41	44	47	55	59	63	61	56	50	42	36	47
Year	1953	1956	1992	1992	1958	1992[b]	1998	1999[b]	1995[b]	1988	1999[b]	1991[b]	1992
Lowest	12	23	33	39	45	51	56	55	48	40	24	21	41
Year	1950	1956	1955	1955	1959	1983[b]	1986[b]	1980[b]	1970	1984	1978	1985[b]	1985
Relative Humidity													
Highest	88.8	86.9	69.1	64.5	61.9	53.5	45.6	47.8	55.5	74.2	88.7	90.5	58.9
Year	1960	1963	1993	1963	1948	1950	1993	1976	1977	1962	1979	1950	1978
Lowest	60.0	54.0	44.0	36.9	31.2	30.0	21.9	24.5	33.2	42.5	62.8	69.0	49.4
Year	1963	1967	1965	1966	1966	1949	1959	1967	1974	1952	1976	1968	1967
Dew Point													
Highest	34.4	36.7	37.2	37.1	43.9	47.5	50.1	48.4	45.4	43.5	38.3	34.3	37.7
Year	1953	1992[b]	1986	1992[b]	1998	1958	1975	1976	1963	1962	1954	1950	1958
Lowest	6.5	17.3	20.8	26.0	30.4	37.5	35.4	38.4	33.8	30.2	19.4	15.1	31.5
Year	1950	1956	1965[b]	1982	1964	1954	1959	1955	1970	1984	1985	1983	1955

(a) Dry bulb, wet bulb, and dew point temperatures in °F, relative humidity in %.
(b) Most recent of multiple occurrences.

Table 6.4. Average and Extreme Solar Radiation Daily Values (langley), 1953 through 2004

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average	105	184	316	446	544	604	628	535	402	252	124	82	352
Highest	277	422	542	704	838	821	808	721	591	434	295	196	838
Year	1969	1958	1968	1972	1977	1971	1974	1957	1970	1973	1971	1972	May 1977
Lowest	12	11	44	75	67	92	118	82	61	33	13	6	6
Year	2003	1995	1979	1974	1962	1992	1972	2003	1957	1974	2001	2002	Dec 2002

(a) Most recent of multiple occurrences.

Table 6.5 shows that thunderstorms occurred in every month of the year, except January and November. The thunderstorm season is essentially from April through September. The average number of thunderstorm days per year is 10; however, the total varies from a low of 3 in 1949 to a high of 23 in 1948. The largest number of thunderstorms in any single month was eight in July 1998, July 1983, June 1972, and August 1953.

Table 6.5. Average Number of Days of Various Meteorological Phenomena, 1945 through 2004

Phenomenon	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Thunderstorm	0	≤0.1	0.2	0.8	1.6	2.3	2.1	2.0	0.7	0.2	0	≤0.1	9.8
Dust or blowing dust	0.4	0.4	0.5	0.6	0.6	0.4	0.4	0.2	0.5	0.3	0.2	0.2	4.5
(Without Volcano)	0.4	0.4	0.5	0.6	0.5	0.3	0.3	0.2	0.5	0.3	0.2	0.2	4.2
Glaze	2.1	0.7	≤0.1	0	0	0	0	0	0	0	0.8	2.4	6.1

The criterion for both dust and blowing dust is that horizontal visibility be reduced to 6 miles or less. Dust is carried into the area from a distant source and may occur without strong winds. Blowing dust occurs when dust is picked up locally and occurs with stronger winds. Both dust and blowing dust occur at the HMS; however, in most cases, it is blowing dust. Table 6.5 presents the average number of days per month and year of dust and blowing dust during the period 1945 through 2004. The average number of days per year with dust or blowing dust is 5. The greatest number of such days in any year was 20 days in 1980; the fewest was 0 days in 1987 and earlier years. The greatest number of days with dust or blowing dust in any month was 9 days in May 1980. This peak in the number of days with dust or blowing dust (for either a month or a year) resulted from the eruption of Mount St. Helens on May 18, 1980, and subsequent dates.

Glaze is a coating of ice formed when rain or drizzle freezes on contact with any surface having a temperature that is below freezing. Table 6.5 provides data on the number of days per month and year with glaze for the period 1945 through 2004. The average number of days with freezing rain or freezing drizzle is 6 days. The highest number of days with glaze in any winter season was 18 days during the winter of 1969-1970; the least, 1 day during the winter of 1987-1988 and earlier winters. The greatest number of such days in any single month was 9 days in January 1970.

6.6 Atmospheric Pressure

Table 6.6 contains atmospheric pressure data for the period 1955 through 2004. This table lists both station and sea-level pressure, including extremes and years of occurrence. Atmospheric pressure may be indicated in several different units, including inches of mercury, millimeters of mercury, millibars, or Pascals; however, in this table, pressure is stated in inches of mercury. Station pressure is the barometric pressure measured at the HMS (at an elevation of 733 feet); sea-level pressure is the station pressure adjusted to sea level. Most are familiar with barometric pressure adjusted to sea level, which allows atmospheric pressures for all locations to be compared, regardless of the elevation of the station where the data are measured.

The highest sea-level pressure ever recorded at the HMS was 31.12 inches in January 1979; the lowest was 28.91 inches in December 2002.

Some rapid pressure changes occurred on November 3, 1958, falling 0.492 inch over a 6-hour period (0.082 inch per hour), including a 1-hour fall of 0.160 inch. On the same day, the pressure rose 0.554 inch during a 6-hour period (0.090 inch per hour), including a 1-hour rise of 0.145 inch. The greatest sea-level pressure change during a 1-day period was 1.02 inches (December 8, 1971).

Table 6.6. Average and Extreme Station and Sea-Level Pressure Data, 1955 through 2004 (inches of mercury)

	Station Pressure						Sea-Level Pressure			
Month	Average	High	Year	Low	Year	Greatest Daily Range	High	Year	Low	Year
Jan	29.32	30.23	1979[a]	28.18	1980	0.77	31.12	1979	28.94	1964
Feb	29.27	30.08	1956	28.23	1958[a]	0.86	30.97	1956[a]	28.98	1958[a]
Mar	29.20	29.92	1955	28.34	1995	0.85	30.79	1955	29.11	1995
Apr	29.19	29.91	1999	28.49	1962[a]	0.81	30.73	1999	29.26	1962
May	29.16	29.72	2003	28.61	1999	0.47	30.53	2003	29.38	1999[a]
Jun	29.14	29.60	1987[a]	28.67	1992[a]	0.54	30.40	1987	29.42	1992
Jul	29.14	29.56	1993[a]	28.80	2002[a]	0.48	30.34	1993[a]	29.55	2002[a]
Aug	29.13	29.55	1968	28.75	1980	0.39	30.32	1968	29.52	1980
Sep	29.18	29.79	1983[a]	28.48	1986[a]	0.56	30.60	1983	29.25	1986
Oct	29.25	29.86	1999	28.39	1962	0.74	30.68	1999[a]	29.15	1962
Nov	29.28	30.06	1979[a]	28.36	2002[a]	0.78	30.90	1979[a]	29.13	2002[a]
Dec	29.32	30.20	1978	28.15	2002	1.02	31.07	1978[a]	28.91	2002
Annual	29.22	30.23	Jan 1979[a]	28.15	Dec 2002	1.02	31.12	Jan 1979	28.91	Dec 2002

(a) Most recent of several occurrences.

6.7 Sunrise and Sunset Times for the Hanford Meteorological Station

Table 6.7 lists the sunrise and sunset times for the HMS in Pacific Standard Time (PST). The longest days of the year (period between sunrise and sunset) are June 22 and 23 at 15 hours and 50 minutes each. The shortest days of the year are December 19 through 23 at 8 hours and 34 minutes. Sunrise varies from 4:04 am PST (earliest) on June 11 through 14 to 7:42 am PST (latest) from December 28 through January 7. Sunset varies from 4:11 pm PST (earliest) from December 5 through 16 to 7:55 pm PST from June 22 through July 1.

Table 6.7. Sunrise and Sunset Times (PST) at the Hanford Meteorological Station

	Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sep		Oct		Nov		Dec	
	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set
Day	a.m.	p.m.	a.m.	p.m.	a.m.	p.m.	a.m.	p.m.	a.m.	p.m.	a.m.	p.m.	a.m.	p.m.	a.m.	p.m.	a.m.	p.m.	a.m.	p.m.	a.m.	p.m.	a.m.	p.m.
1	0742	1621	0722	1702	0639	1743	0538	1827	0444	1907	0409	1943	0408	1955	0438	1930	0517	1838	0557	1738	0640	1643	0721	1613
2	0742	1622	0722	1703	0637	1745	0537	1828	0443	1908	0408	1944	0409	1954	0439	1929	0519	1836	0558	1736	0641	1642	0722	1612
3	0742	1623	0719	1705	0635	1746	0534	1830	0440	1910	0408	1945	0410	1954	0440	1927	0520	1834	0600	1734	0643	1640	0723	1612
4	0742	1624	0719	1706	0632	1748	0532	1831	0439	1911	0407	1946	0411	1954	0442	1926	0521	1832	0601	1732	0643	1639	0725	1612
5	0742	1625	0717	1708	0631	1749	0530	1832	0439	1912	0407	1946	0411	1953	0443	1924	0522	1830	0602	1730	0646	1637	0726	1611
6	0742	1626	0716	1709	0529	1750	0528	1834	0436	1914	0406	1947	0412	1953	0444	1923	0523	1829	0602	1729	0647	1636	0727	1611
7	0742	1627	0714	1711	0628	1752	0526	1835	0435	1915	0406	1948	0413	1953	0446	1921	0525	1827	0604	1727	0648	1635	0728	1611
8	0741	1629	0714	1712	0626	1753	0524	1836	0434	1916	0406	1949	0414	1952	0446	1920	0526	1825	0605	1725	0650	1633	0729	1611
9	0741	1630	0711	1714	0623	1755	0522	1838	0432	1918	0405	1949	0414	1952	0449	1918	0527	1823	0607	1723	0652	1632	0730	1611
10	0741	1631	0710	1715	0622	1756	0521	1839	0431	1919	0405	1950	0415	1951	0449	1917	0528	1821	0609	1721	0652	1631	0731	1611
11	0740	1632	0708	1717	0619	1758	0519	1840	0429	1920	0404	1951	0416	1950	0451	1915	0530	1819	0610	1719	0653	1630	0732	1611
12	0740	1633	0707	1718	0617	1759	0517	1842	0428	1922	0404	1951	0417	1950	0452	1913	0531	1817	0611	1717	0656	1628	0733	1611
13	0739	1635	0705	1720	0616	1800	0515	1843	0427	1923	0404	1952	0418	1949	0453	1912	0532	1815	0613	1715	0657	1627	0733	1611
14	0739	1636	0704	1721	0613	1802	0513	1844	0425	1924	0404	1952	0419	1948	0455	1910	0533	1813	0614	1713	0659	1626	0734	1611
15	0738	1637	0702	1723	0611	1803	0511	1846	0424	1925	0405	1953	0420	1948	0456	1908	0535	1811	0615	1712	0700	1625	0735	1611
16	0738	1638	0701	1724	0610	1805	0510	1847	0423	1926	0405	1953	0420	1947	0457	1907	0536	1809	0617	1710	0702	1624	0735	1611
17	0737	1640	0659	1726	0608	1806	0508	1848	0422	1927	0405	1953	0421	1946	0458	1905	0538	1806	0618	1708	0703	1623	0736	1612
18	0736	1641	0657	1727	0605	1808	0506	1850	0421	1929	0405	1954	0422	1945	0500	1903	0538	1805	0619	1705	0704	1622	0737	1612
19	0736	1642	0656	1729	0604	1809	0504	1851	0420	1930	0405	1954	0423	1944	0501	1901	0541	1802	0621	1705	0706	1621	0738	1612
20	0735	1644	0654	1730	0602	1810	0503	1852	0419	1931	0405	1954	0424	1944	0502	1900	0542	1800	0622	1703	0707	1620	0739	1613
21	0734	1645	0652	1732	0600	1812	0501	1854	0418	1932	0405	1954	0426	1943	0503	1858	0543	1758	0624	1701	0708	1619	0739	1613
22	0733	1647	0651	1733	0558	1813	0459	1855	0417	1933	0405	1955	0427	1942	0505	1856	0544	1756	0625	1659	0710	1618	0739	1613
23	0732	1648	0649	1735	0555	1815	0457	1856	0416	1934	0405	1955	0428	1941	0506	1854	0546	1754	0626	1658	0711	1617	0740	1614
24	0731	1649	0647	1736	0554	1816	0455	1858	0415	1935	0406	1955	0429	1939	0507	1853	0547	1752	0628	1656	0712	1617	0740	1615
25	0730	1651	0646	1737	0552	1817	0454	1859	0414	1936	0406	1955	0430	1938	0508	1851	0548	1750	0629	1654	0714	1616	0741	1616
26	0730	1652	0544	1739	0549	1819	0452	1900	0413	1937	0406	1955	0431	1937	0510	1849	0551	1748	0631	1653	0715	1615	0741	1616
27	0728	1654	0642	1740	0548	1820	0450	1902	0412	1938	0407	1955	0432	1936	0511	1847	0551	1746	0632	1651	0716	1615	0741	1617
28	0727	1655	0640	1742	0546	1821	0449	1903	0412	1939	0407	1955	0433	1935	0512	1845	0553	1744	0633	1650	0718	1614	0742	1618
29	0726	1657	0639	1743	0543	1823	0448	1904	0411	1940	0408	1955	0434	1934	0513	1844	0554	1742	0635	1648	0719	1614	0742	1618
30	0725	1658			0542	1824	0445	1906	0410	1941	0408	1955	0436	1932	0515	1842	0556	1740	0635	1647	0720	1613	0742	1619
31	0724	1700			0540	1826			0410	1942			0437	1931	0516	1840			0638	1645			0742	1620