The Year Without a Summer

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Record breaking extremes of weather and climate merit special study for clues to the physical processes involved in more normal climatic variation. The year 1816, variously referred to as "eighteen hundred and froze to death," "the poverty year," and "the year without a summer," provides a reference date for climatic cycle analysis.

In the summer of 1816 frost occurred on Thomas Jefferson's estate at Monticello, Virginia and south to the Ohio River. It was recalled that on July 5th, ice had to be broken on a watering trough at Fort Dearborn on the present site of Chicago. Historical data of the weather in the Northeastern States that year along with its probable causes (solar or volcanic dust) and the economic consequences has been investigated by (Hoyt, 1948). Seasonal weather that year is summarized by (Ludlum, 1948) as follows:

> "The winter of 1816 had not been unusual and several months had temperature averages above normal. In April and May, however, cold and wet weather had prevailed over the northeastern states, with damaging frosts retarding plantings in the latter month. Early in June the first general inflow of warm tropical air penetrated to all parts of the Northeast, raising the hopes of farmers who had seen their plowing and planting go for naught in the frosty nights of May. At Salem, Massachusetts, this June heat wave was climaxed with a reading of 92° F. on June 5.
>
> "That very day, however, a cold front was sweeping southeastward across New England that was to make meteorological and economic history. As wind shifted into north and northwest, a cold polar air mass of record severity dropped temperatures abruptly. At Salem the fall was 49° in 24 hours with a reading of 43° the next morning. The next four days, June 6-9, there were severe frosts every night from Canada to Virginia except for the immediate seaboard. Snow fell in measurable depths in Ohio and across northern New York and northern New England. Ice was reported in the suburbs of Philadelphia. Throughout the rest of the season each month averaged considerably below normal, and there was a dearth of precipitation."

Hoyt has pointed out that 1816 was only one of a series of cold years, 1812-1818, 1817 being the coldest.

The weather abnormality of 1816 was not limited to North America. Negative temperature deviations from the 1743-1860 normals at Zwannerburg, Netherlands in Centigrade degrees were: February -1.56, March -0.59, May -1.56, June -2.65, July -1.37, August -2.05, September -1.05, November -2.25, December -0.26, and for the year, -1.23. At Rome, Italy negative deviations from 1811-1924 means were: March -0.5, May -0.4, June -0.6, July -1.8, August -1.6, September -0.9, October -0.4, December -1.4, and for the year, -0.5. At Milano precipitation expressed as perecentages of 1764-1924 means was: February 28.1, March 78.7, April 87.5, May 85.8, August 96.1, September 61.6, October 57.3, December 21.0, and for the year 86.7% (Clayton, 1927).

The abnormally cold and dry weather of the year 1816 was associated with an aphelion and out-of-alignment configuration of the planets such as would cause weak suntides and presumably be accompanied by low solar radiation (Bollinger, 1957).

The planets have a high degree of recurrent alignment at intervals of 249.4874708 years and are out of phase at half period, or 124.7437354 years before and after.

360° Period 249.4874708 Years	Revolutions	180° Half Period 124.743754 Years	Revolutions
Earth	249.487	Earth	124.73876
Venus	405.5322	Venus	202.76614
Jupiter	21.0321	Jupiter	10.51605
Mercury	1035.82	Mercury	517.93130
Saturn	8.46934	Saturn	4.23467
Uranus	2.96962	Uranus	1.48481
Neptune	1.51394	Neptune	0.7597
Mars	132.64331	Mars	66.32166

At half period: Earth, Venus, Saturn, and Neptune are 90° out of phase with Jupiter, Uranus, and Mercury, and suntides are in neap phase and of minimum amplitude. On May 8, 1941 Earth, Mercury, Venus, Jupiter, and Uranus were in approximate alignment near the longitude of Mercury's perihelion position, and the suntide index had a near optimum value of 7.485265. Oklahoma state average precipitation in 1941 was 47.07 inches, or 143% of the 1901-1944 average. Rainfall in crop district, Southwest Oklahoma, May 168%, June 246%. Assuming planetary orbits remained constant, by circular orbit calculation of positions, 124.7437354 years earlier, or on August 9, 1816, the suntide index was only 4.3458639.

The variation in Jupiter's tide force $(\frac{M}{r^3})$ during one revolution or 11.86223 years is shown in Fig. 1. For configurations of May 8, 1941 and August 9, 1816, see Figs. 2 and 3.

An alteration at 124.743 year intervals in Nile flow at Cairo, Egypt (Hoyt, 1948) appears in the records of both the annual maximum and annual minimum levels back to 1192 A. D.

Phase Date	Suntides	Annual Minimum Levels, Meters Year —1	0	+1	3-Year Ave.
1192.8804	+	12.50	12.56	12.11	12.39
1317.6318	—	11.01	11.55	9.19	10.58
1442.3755	+	12.14	—	—	—
1567.1192	—	Record Missing - - - - - - - - - - - -			
1691.8630	+	Record Missing - - - - - - - - - - - -			
1816.6067	—	10.70	Record Missing		10.70
1941.3504	+	Record not Available - - - - - - - - -			
		Annual Maximum Levels			
1192.8804	+	18.04	17.74	17.77	17.85
1317.6318	—	17.86	17.95	17.53	17.78
1442.3755	+	18.66	18.66	18.66	18.66
1567.1192	—	Record Missing - - - - - - - - - - - -			
1691.8630	+	18.97	R. M.	17.88	18.43
1816.6067	—	18.15	18.70	19.51	18.78
1941.3504	+	Record not Available - - - - - - - - -			

Conclusions:

1. In the late summer of 1816 the aphelion orientation and out-of-align-

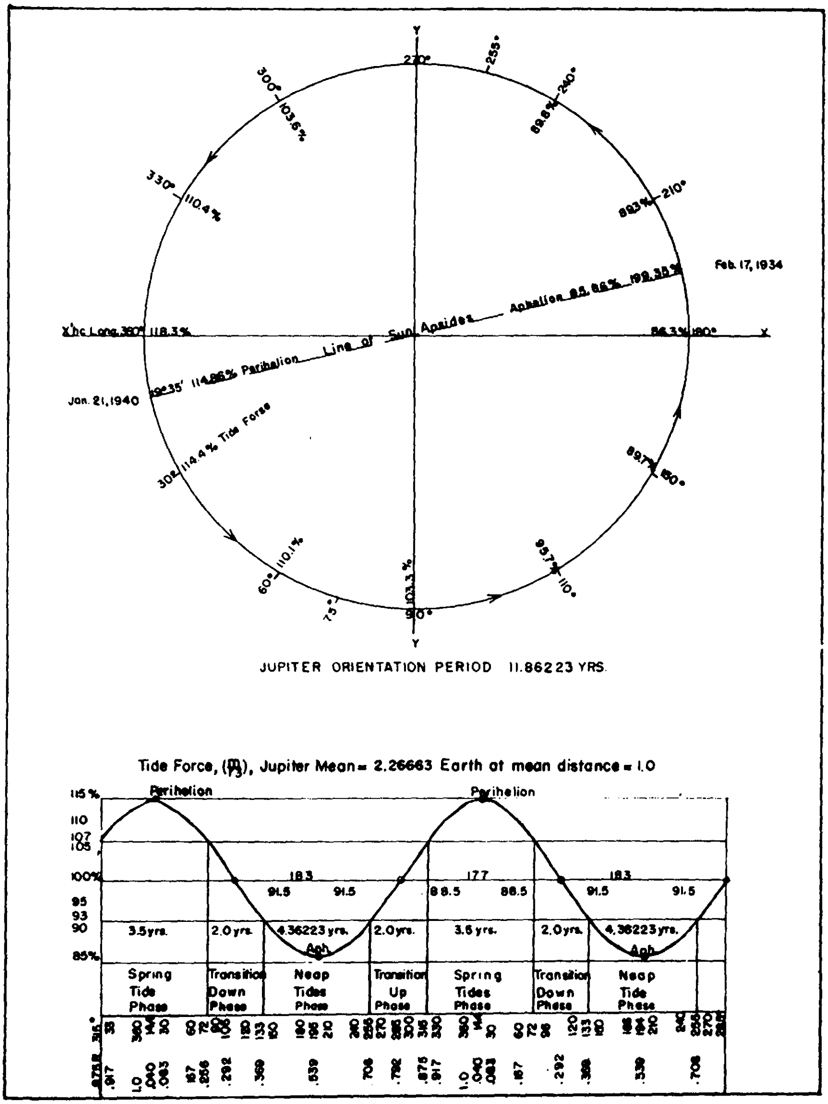
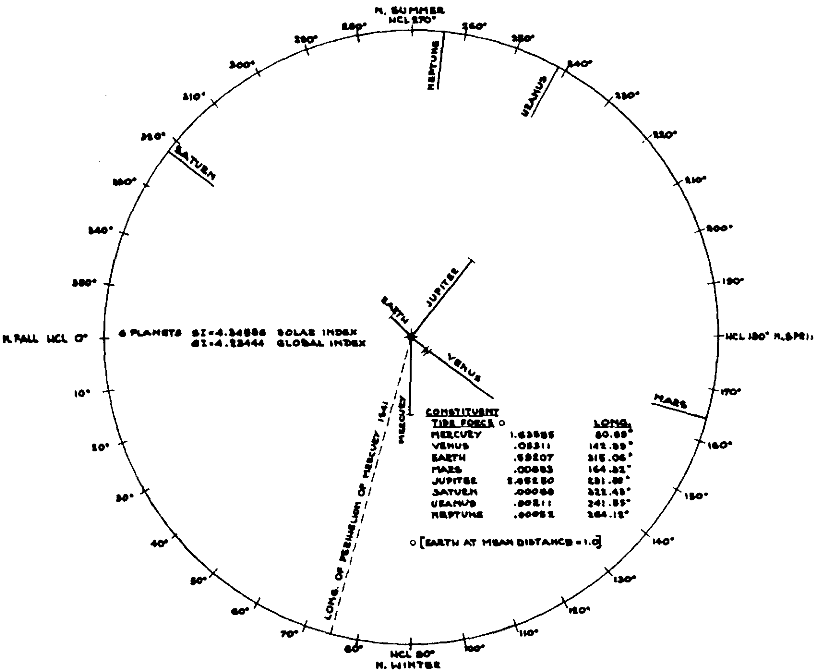

270°
255°
240°
89.6%
210°
89.3%
300°
103.6%
330°
110.4%
Feb. 17, 1934
Aphelion 85.86% 199.35°
Line of Sun Apsides
X'hc Long. 360° 118.3%
86.3% 180°
Jan. 21, 1940
19°35' 114.86% Perihelion
114.4% Tide Force
30°
150°
89.7%
60°
110.1%
75°
103.3%
90°
110°
89.7%
JUPITER ORIENTATION PERIOD 11.86223 YRS.
Tide Force, Jupiter Mean = 2.26663 Earth at mean distance = 1.0
Perihelion
Perihelion
115%
110
107
105
100%
95
93
90
85%
183
177
183
91.5
91.5
88.5
88.5
91.5
91.5
3.5 yrs.
2.0 yrs.
4.36223 yrs.
2.0 yrs.
3.5 yrs.
2.0 yrs.
4.36223 yrs.
Aph.
Aph.
Spring Tide Phase
Transition Down Phase
Neap Tides Phase
Transition Up Phase
Spring Tides Phase
Transition Down Phase
Neap Tide Phase

Figure 1



CONFIGURATION AUGUST 9, 1816.6067

[illegible]

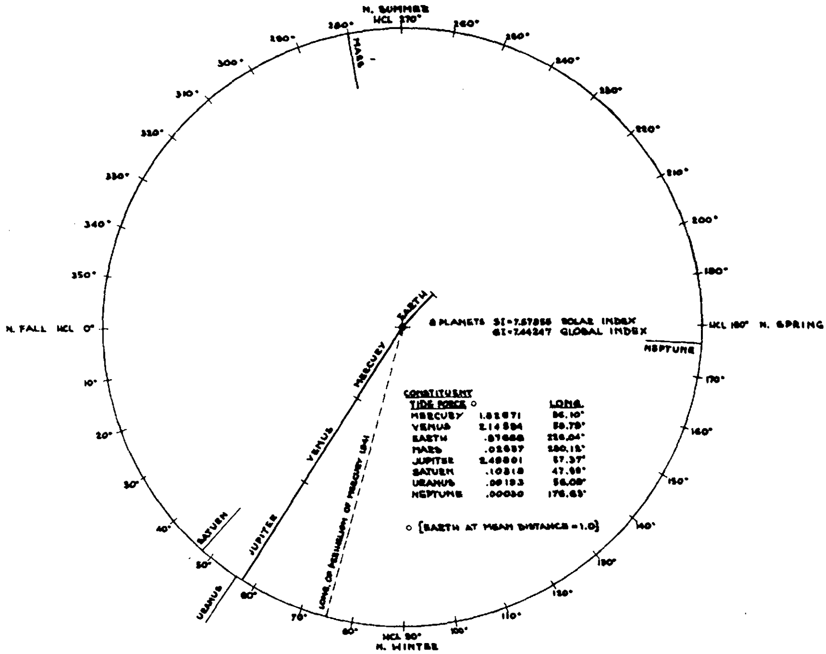
Figure 2

ment configuration of the planets caused a suntide index less than 75% of normal. Weak suntides appear to have been accompanied by low solar energy output.

2. Seasonal and longer range numerical weather prediction on the basis of computed suntide indices may be realized prior to complete understanding of the operation of all solar and geophysical processes involved in weather control.

3. Weather prediction will be analogous to terrestrial tide prediction which involves both "establishment of port" and analysis of local harbor conditions. It will involve terrestrial heat balance, general, monsoonal, and local circulations in the atmosphere as well as of oceanographic processes and the strength and seasonal timing of strong and weak suntides.

4. Tabulation of climatic data by Crop Reporting Districts is an aid in meteorological and climatological research.



CONFIGURATION MAY 8, 1941.3504

Figure 3

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