SECTION F, GEOGRAPHY

Planetary Configuration in the Wet and Dry Phases of the 1929-1941 Climatic Cycle

CLYDE J. BOLLINGER, University of Oklahoma, Norman

Theoretical Planetary Climatology is an infant science based on celestial mechanics and the laws of Kepler and Newton in which planetary configurations are assumed, through tidal influence on the sun, to cause cycles in total radiation and hence climate. The idea was conceived by ancient scholars but could not be demonstrated because of the then existing deficiency of astronomical and climatological data and lack of efficient tools for rapid mathematical computation. Accordingly, theoretical Planetary Climatology became a field for pseudo-scientists and charlatans, and most specialized modern scientists, perhaps to retain their scientific respectability, have ignored this field. The only climatic cycles given general scientific recognition are the obvious daily cycle and the annual cycle of the seasons. The 1344-page Compendium of Meteorology (Malone, 1951) has a 14-page, 3-column index in which the word cycle does not appear.

Rhythmic fluctuations, according to Dewey (1961A), is a characteristic of 36 different disciplines.

Geographers and Ecologists looking for order in landscape variations, and desirous of placing their disciplines on a firm scientific foundation, have, or should have, a special interest in this field. Significant contributions have been made by Huntington (1922), Abbott (1939), Clayton (1943), Tannehill (1947), Dewey (1961A), Willett (1961), and many other researchers. The Directory of Cycle Research Scientists (Dewey, 1961B) lists 380 names.

In the absence of a rigorous over-all working hypothesis of cyclic climatic variation, climatologists and hydrologists have had no better tools than random probability statistics as a basis for climatic analysis and forecasting.

A complete knowledge of all of the relevant and desirable solar, oceanographic, and meteorologic processes involved in climatic variation is not, fortunately, required for progress in this field. In fact, planetary Sun-tide cycle-data and analyses may well serve as a guide to researchers in solar physics, geophysics, oceanography, meteorology and hydrology.

Planetary configuration in the wet and dry phases of the 1929-1941 climatic cycle is here taken to illustrate the nature of the problem. This cycle included the devastating "dust bowl" years in the Great Plains. Attention is directed principally to the 12-year Jupiter-Venus-Earth constituent Sun-tide configuration cycle, and its relation to high-sun seasonal rainfall in Oklahoma.

The eccentricity of the planetary orbits as well as the degree of alignment is important in determining the strength of sun-tides as shown in Table I.

It will be noted that only Venus has a circular orbit and unvarying tide force. The combined tide forces of Earth, Jupiter and Venus at mean distance is 83.084% of the 7 major planet total (Bollinger, 1960).

When two planets are in conjunction or opposition their tide forces are added.

TABLE I

	Sidereal Period Years	Perihelion Mean	Long	Tide Force = m/r^3 Perihelion	Aphelion
Earth	1.00004	102°	08″	1.0518809	0.9481191
Jupiter	11.86223	13°	34″	2.5861234	1.9377547
Venus	0.6125	130°	55″	2.1332278	2.13322735

The mean hemisynodic period of Jupiter and Venus, the planets with strongest tide force, is 118.5 days. Thirty-seven mean Jupiter-Venus hemisynods = 12.004 years corresponding to: 12.00346 Earth revolutions, 1.011946 Jupiter revolutions and 19.511946 Venus revolutions.

In successive 12-year cycles, the heliocentric positions of the phases of Jupiter and Venus advance 4.3° relative to earth. The cosine of 4.3° is 0.9972 indicating persistence of the cycle with only slight change. Earth-Jupiter-Venus constituent Sun-tide indices for every 8th day, 1900-1959, were computed by the following expression: EJVSI = m/r^3 J + m/r^3 V cos (lV-lJ) + m/r^3 E cos (lE-lJ) etc. and are given in Bollinger's (1960) *Atlas of Planetary Solar Climate.*

Jupiter, Venus and Earth configurations on extreme low and high Sun-tide index phases of the 1929-41 12-year cycle, with minimum in 1933 (Fig. 2A) and the maximum 1941, (Fig. 2B) are illustrated. The Jupiter-Venus-Earth constituent suntides for these dates are given in Table II along with precipitation for March, April, May and June in the U.S. as a whole (after Tannehill, 1947).

TABLE II

	Sun-tide Index JVE	Precip. U.S. % of 1886-1945 means March	April	May	June	Ave. %
May 2, 1929	5.604	114	119	128	91	113.0
May 29, 1933	2.486	104	103	120	50	94.3
May 11, 1941	5.580	85	117	94	133	107.3

A positive correlation in the months of April, May and June is evident in Fig. 1.

	Global Index (7 Planets)					Precip. Oklahoma				
	March	April	May	June	Ave.	March	April	May	June	Total
1929	87.7	130.5	121.6	94.7	109.4	3.42	2.90	7.67	3.44	17.33
1933	120.0	98.5	77.0	86.0	85.6	2.38	3.05	4.70	0.42	10.55
1941	86.9	110.7	132.8	102.4	108.2	0.92	5.94	4.79	6.30	17.95

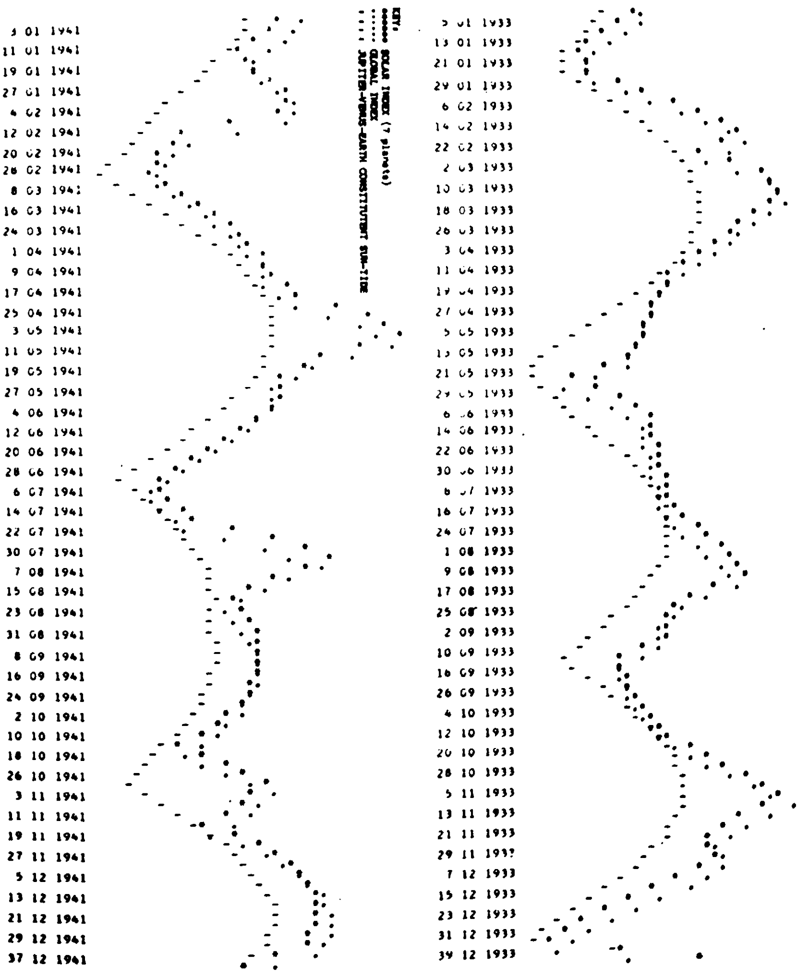

Figure 1

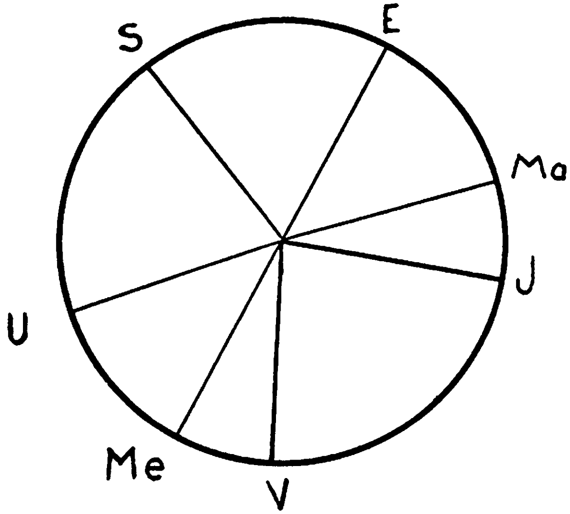

Fig. 2. A. Weak Suntide Configuration
May 29, 1933 Global Index 3.02

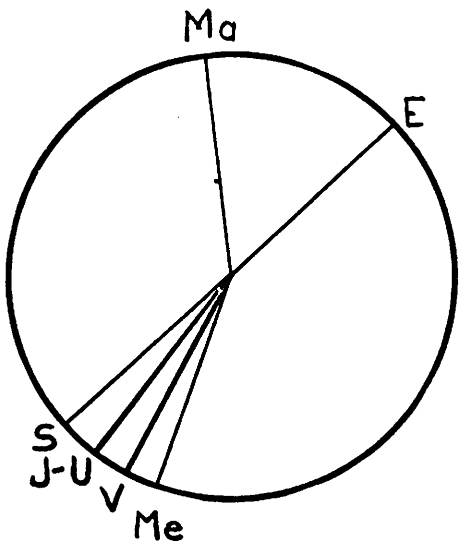

Fig. 2. B. Strong Sun Tide Configuration
May 11, 1941 Global Index 7.38

TABLE III

12 Yr. Cycle Pattern in
Theoretical Cloudless Sky Insolation gm-cal-day (Q+q)O Lat. 45N Budyko — Okla. State Precip. Inches, Ave. Per Mo.

Cy Yr	Weight (1) Yr	548 Apr.	647 May	691 June	656 July	584 Aug.	gm cal./day Ave.	Dev.	Apr.	May	June	July	Aug.	Ave.	Dev.
1	1924	465	649	539+	665	426-	609	-14	4.27	2.44	3.40	2.94	2.44	3.10	-.345
2	25	331	690	830+	651	514	611	-12	4.50	2.39	2.13	4.03	1.67	2.94	-.505
3	26	420	677	823	573	618	622	-1	2.74	3.06	4.08	4.07	4.06	3.60	+.115
4	27	529	764	694	502	557	629	+6	6.34	2.72	4.56	5.18	5.15	4.79	+1.34
5	28	647	805+	636	523	543	662	+39	4.33	3.93	6.30	4.06	3.18	4.46	+1.015
6	29	715	737	675	663	602	683	+65	2.93	7.67	3.49	2.30	0.80	3.54	+.095
7	1930	664	703	814	771+	642	680	+57	2.90	6.36	3.73	1.00	1.77	3.15	-.295
8	31	575	610	537	723	672	635	+12	3.07	2.91	2.01	3.03	2.86	2.78	-.665
9	32	541	512	573-	602	676	598	-25	2.34	2.13	7.43	2.62	2.65	3.44	-.005
10	33	541	504-	594	634	633	581	-42	3.08	4.70	0.43	3.17	5.25	3.33	-.115
11	34	507	533	561	615	533	571	-52	2.65	2.62	2.47	0.67	2.51	2.13	-1.265
12	1935	495	523	741	713	390	595	-33	2.36	7.42	6.30	0.93	2.61	4.03	+.585
	Mean	540	653	693	643	534	623	Mean	3.5	4.04	3.90	2.80	2.91	3.445	
1	1936	467	610	732	794+	415	613	-14	1.03	4.49	1.93	0.73	0.22	1.60	-1.892
2	37	443	646	805	745	695	627	-0	2.34	3.43	3.73	2.05	3.05	2.92	-.652
3	38	475	643	826+	604	620	633	+6	2.89	5.95	4.33	2.67	2.06	3.59	+.013
4	39	547	767	745	542	643	649	+22	2.49	3.76	5.34	1.65	2.67	3.13	-.392
5	1940	610	824	745	483	658	676	+49	5.03	3.87	3.47	3.42	3.45	3.86	+.238
6	41	607	859	703	602	652	686	+59	5.97	4.79	6.39	2.26	3.65	4.61	+1.033
7	42	633+	721	641	630	665	668	+41	3.30	2.21	6.69	1.51	4.75	4.69	+1.118
8	43	607	598	573	759+	643	636	+9	2.33	10.27	2.79	0.95	0.73	3.43	-.142
9	44	624	468	542	743	618	600	-27	4.03	4.11	3.66	3.03	3.43	3.66	+.088
10	45	573	454	573	674	573	571	-56	3.93	2.37	6.36N	4.17	2.61	3.99	+.413
11	46	534	512	572	615	534	573	-54	2.90	5.92	2.99	0.85	3.05	3.14	-.432
12	1947	469	611	752	650	695-	595	-33	6.85N	6.83	3.72	1.96	1.19	4.11	+.538
	Mean	550	648	697	658	534	627	Mean	4.01	4.83	4.33	2.10	2.58	3.572	
	Trend	+10	-5	-1	+15	0	+4.0	Trend	+.51	+.79	+.43	-.73	-.33	+.127	

"Dust Bowl" Phase

Conclusions: (Some of them tentative)

1. The Jupiter-Venus-Earth Sun-tide crests and troughs normally recur 9.7 days earlier on successive years.
2. When Jupiter is in the first heliocentric quadrant, two months with high index and above normal rainfall may be expected in the 3-month period April-June.
3. When Jupiter is nearing aphelion or in the third heliocentric quadrant, two or three months with below normal rainfall may be expected in the 3-month period April to June.
4. Above normal insolation in the period March to June strengthens the general and monsoon circulations and increases evaporation from the Caribbean Sea and Gulf of Mexico, the chief source regions of Oklahoma rainfall.
5. Varying insolation, according to season, influences the latitude of convergence between cold polar and warm tropical air masses with which cyclonic rainfall is associated.
6. Above normal insolation increases instability, in the high sun hemisphere wind movement and cloudiness, and paradoxically, causes cooler than normal weather in summer.
7. A summary of monthly April-August theoretical insolation computed by multiplying monthly global indices by monthly cloudless sky direct and diffuse insolation (Q + q = O), by Budyko, et al., (1954) is given in Table III along with April-August precipitation

in Oklahoma through two 12-year solar cycles (1924-1946). A secular upward trend of 4 gm. calories per day was accompanied by an 0.127 inch per month increase in Oklahoma precipitation. In the 23-year period 1924-1946 the coefficient of correlation between the two variables is +0.446 ±.02858. The positive correlation is 15.6 times the probable error and establishes a significant relationship.

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