GEOMAGNETIC INDICES BULLETIN AUG 1989

NATIONAL GEOPHYSICAL DATA CENTER
Solar-Terrestrial Physics Division (E/GC2)
Telephone (303) 497-6346

325 Broadway
Boulder, Colorado 80303 USA

THE GEOMAGNETIC FIELD. The geomagnetic field measured at any point on the Earth's surface at any time is a combination of the MAIN field internal to the planet, of fields arising from electrical currents flowing in the ionized upper atmosphere, and of fields induced by currents flowing within the Earth's crust. The main field component varies slowly in time and can be grossly described as that of a bar magnet with north and south poles deep inside the Earth and field lines that extend well out into space.

The main field creates a cavity in interplanetary space called the magnetosphere, where the Earth's magnetic field dominates any field carried by the charged particles of the solar wind. The magnetosphere is shaped somewhat like a comet because of the pressure of the solar wind. It is compressed on the side toward the sun and tail-like on the side away from the sun. The magnetosphere deflects the flow of some solar wind particles around the Earth while the geomagnetic field lines guide most charged particles that penetrate inside the magnetosphere.

Charged particles flowing inside the magnetosphere and in the ionosphere form current systems, which cause variations in the intensity of the Earth's magnetic field. These EXTERNAL currents in the ionized upper atmospheric layers vary on a much shorter time scale than the INTERNAL main field. They may create magnetic changes as large as 10% of the main field.

Some regular magnetic field changes arise from current systems that follow solar radiation changes throughout the day and year. Other irregular current systems produce magnetic field changes from interaction of the solar wind with the magnetosphere, from the magnetosphere itself, from interactions between the magnetosphere and ionosphere, and from the ionosphere itself. Magnetic activity indices, including those below, are designed to describe variations in the geomagnetic field caused by these irregular currents.

MONTHLY SUMMARY OF GEOMAGNETIC ACTIVITY FOR AUGUST 1989

Day			Rank	Kp Three-Hour Indices								Kp			sc					aa		Provisional		
Cal	#	Bart	Q/D	1	2	3	4	5	6	7	8	Sum	Ap	Cp	(UT)	Afr	An	As	Am	N	S	M1	M2	
1	213	9	Q4	2-	1+	1-	1	1+	2-	2-	2+	12-	6	0.2		5	12	9	10	10	8	7	11	CC
2	214	10	Q6	3-	2-	2+	1	1-	1-	1	2-	12-	6	0.3		7	14	11	12	12	9	15	6	CC
3	215	11	Q3	2	2	2-	2-	1+	1	1	0+	11	5	0.2		7	12	9	10	12	7	10	9	CC
4	216	12		1-	1	2-	2+	3-	3+	2	2+	16	8	0.5		5	17	12	15	18	16	13	21	K
5	217	13	Q1	1	1-	0	0+	0+	0+	0+	1	4	2	0.0		2	5	3	4	4	2	3	4	CK
6	218	14	Q10A	1	1+	1	1	2-	2+	3+	3-	14+	8	0.4		7	16	10	13	16	9	8	18	KK
7	219	15		2	2+	2	2	2	3-	3+	2	18+	9	0.5		10	20	14	17	24	13	17	20	
8	220	16	Q9A	2	2+	2+	3-	1+	1	2-	2-	15	7	0.4		11	17	13	15	16	12	18	10	
9	221	17		2-	1+	1-	1	2-	2-	4+	3+	16-	10	0.6	1832	11	21	14	17	21	13	9	25	
10	222	18	D4	4-	4-	6	6-	4+	4+	4	5	37-	41	1.5	0727	29	65	54	59	47	58	60	46	
11	223	19		5+	5-	3	4	4+	3+	2	2+	29	25	1.2		24	41	39	40	38	43	54	27	
12	224	20		3	2+	2	2-	2+	1-	1+	2+	16-	8	0.4		9	18	16	17	17	14	18	13	
13	225	21		3	3-	2+	2	3-	1+	2	2	18	9	0.5		10	18	16	17	19	16	18	17	
14	226	22	D2	3+	4	7-	6	7-	3+	4	5	39	55	1.6	0613	54	90	62	76	73	58	82	49	
15	227	23	D1	7-	7-	6	4+	6+	4	5	7-	46-	77	1.8		61	101	90	95	93	72	83	84	
16	228	24	Q2	6-	5	3	2+	3+	3-	3+	4-	29	26	1.2		28	47	44	46	32	31	39	25	
17	229	25	D5	3+	3-	3+	3-	5+	6-	5-	5	33-	34	1.3		24	51	41	46	52	44	30	66	
18	230	26		5	4	4-	5	3-	3-	4+	4+	32-	29	1.3		25	48	39	43	50	32	51	32	
19	231	27		4	5-	2+	1	1	2-	3	1	19-	14	0.8		12	21	19	20	22	10	20	12	
20	232	1		2+	3-	5	5	5	4	2-	2-	27+	26	1.2		20	45	36	41	40	38	44	35	
21	233	2		2	1+	1	1	3+	4	5+	5	23	21	1.1	1415	12	28	31	30	33	33	10	57	
22	234	3		4+	3+	3+	3-	1+	1+	1+	1+	19	12	0.7		12	22	21	21	23	15	29	9	
23	235	4		3	3+	3-	3	5	5-	5+	4-	31-	28	1.2	0047	16	43	41	42	52	41	31	63	
24	236	5	Q5K	3	1	1	1-	2-	1+	1	2-	11+	6	0.3		5	13	10	11	15	8	11	11	C
25	237	6	Q2	1-	1	1+	1-	1+	1	1+	2+	10-	5	0.2		5	12	7	10	11	8	7	12	CC
26	238	7	Q8	1-	2+	2	3-	2	2-	1-	1-	13-	6	0.3		8	14	11	12	15	9	16	8	K
27	239	8		2	4+	3	3-	4	3+	6-	4+	29+	26	1.2	1337	24	50	39	45	48	38	28	58	
28	240	9		3-	1	1-	2	2	2+	4	7-	21+	22	1.1		12	32	31	32	40	30	11	59	
29	241	10	D3	7	7+	6-	4	4-	4	4-	2+	38-	58	1.7		43	79	78	79	68	63	91	39	
30	242	11		2	4+	2	3	3+	4	3	3-	24+	17	0.9		16	28	27	28	34	24	25	33	
31	243	12	Q7	2	1+	1	0+	1	3-	2-	2+	12+	6	0.3		6	12	11	12	16	8	7	16	C
Mean													20	0.8		17	33	28	30	31	25	28		

Column headings defined on back side.

Definitions of Column Headings

Kp PLANETARY 3-HOUR RANGE INDEX. K-indices are defined to measure effects of solar particles on the geomagnetic field. They classify the 3-hour range of the most active horizontal field component at an observatory into disturbance levels from 0 = least to 9 = most disturbed. The levels are related almost logarithmically to the disturbance amplitude range after removal of an estimated quiet-day variation produced by regular ionospheric currents. Kp indices are the average of K indices measured at 12 (or 13) sub-auroral zone observatories located mainly in Europe.

A EQUIVALENT AMPLITUDE A-INDEX. The A-index ranges from 0 to 400. The A indices are daily averages of "a" indices, which convert K-values to a linear scale in field units. Ap is the daily average of the eight "ap" indices derived from 3-hourly Kp indices. Similarly, An and As are daily means derived from "an" and "as" indices obtained from groups of Northern Hemisphere (12) and Southern Hemisphere (10) observatories, respectively.

Dst DISTURBANCE AMPLITUDE-STORM TIME. Dst tracks variations in the solar-induced electric currents flowing about 5.6 Earth radii above the equatorial region. Each hourly value is the average symmetric disturbance amplitude, projected onto the equator, of the horizontal component recorded at 4 mid-latitude stations. Values are given in nT and are near 0 during quiet times. A storm sudden commencement (ssc) is seen as a sharp positive peak in Dst before the main phase of the global storm produces large negative values of Dst.

NUMBER. The day number is a simple count of the days of the year, where January 1 = 1 and December 31 = 365 (non-leap year). It is often mistakenly called the "Julian Day".

Bart DAY NUMBER OF BARTELS 27-DAY CYCLE. The recurrence of geomagnetic activity every 27 days reflects the solar source. J. Bartels defined a series of 27-day periods to aid tracking times of unsettled magnetic conditions. He started the sequence in January 1833.

Q/D MAGNETICALLY QUIET AND DISTURBED DAYS. The following criteria are used to rank the 10 most quiet days of the month from most (Q1) to least quiet (Q10) and the 5 most active days from the most (D1) to least disturbed (D5). Criteria used in the rankings include the sum of the eight Kp values, the sum of the squares of the eight Kp values, and the greatest Kp value.

aa aa INDEX. The aa indices are 3-hourly values computed from K indices of two roughly antipodal observatories (invariant magnetic latitude 50). They provide a quantitative characterization of the global level of magnetic activity. Half-daily and daily values compare closely with the global "ap" and "am" indices (see above). The aa indices are computed for the following cases: N = daily values for the Northern Hemisphere; S = daily values for the Southern Hemisphere; and M1, M2 = half-daily values of aa for the UT day.

NUMEROUS WORLDWIDE INDICES. What is an index and why are there so many for terrestrial magnetism? An index continuously summarizes a complex measurement; its discrete values simplify and clarify the variations. Ideally each geomagnetic index should follow a single class of magnetic disturbance; in reality few do. The bewildering array of magnetic indices reflects many attempts to define measurements that isolate a single source of variation.

The subscript "p" means planetary and designates a global magnetic activity index. The following 12 observatories, which lie between 46 and 63 north and south geomagnetic latitudes, now contribute to the Kp indices: Lerwick (UK), Eskdalemuir (UK), Hartland (UK), Ottawa (Canada), Meanook (Canada), Fredericksburg (USA), Sitka (USA), Eyrewell (New Zealand), Canberra (Australia), Lovo (Sweden), Brorfelde (Denmark), and Witteveen (Netherlands).

SOURCES. The aa Provisional numbers and the An, As, and Am indices are prepared monthly by M. Menvielle, International Service of Geomagnetic Indices, Tour 14, Institut de Physique du Globe de Paris, 4, Place Jussieu, 75252 Paris CEDEX 05, FRANCE. These and other indices are published annually in the IAGA Bulletin No. 32 series.

The Kp and related indices and the quiet and disturbed days are taken from a monthly report prepared by M. Siebert, Institut fur Geophysik, Gottingen University, Herzberger Landstrasse 180, Gottingen, FRG.
