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SHORT NOTE

SUDDEN PHASE ANOMALIES OBSERVED ON 20–21 AUGUST AND ON 14–20 SEPTEMBER, 1979 INTERVAL AT TOYOKAWA

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In the McMath plage regions from 16208 to 16239 August 1979, Hα solar flares were observed at many observatories. Associated with these Hα flares, some solar X-ray bursts at 2-10 Å by SOLRAD 11 satellite and successive SPA events were observed on 20-21 August 1979 interval. As the X-ray photometer data by SOLRAD 11 are sporadic, so the point whether SPA events observed correspond one to one with solar X-ray bursts or not can not be examined precisely this time. But conversely speaking, the successive solar X-ray bursts at 1-8 Å can be expected from the successive SPA events, because it is known by our statistical results that SPA events and solar X-ray bursts at 1-8 Å have almost the one to one correspondence.

Observational results of the events for relative sunspot numbers (R_Z), Hα solar flares, solar X-ray bursts and SPA are shown in Table 1. The progress of phase variations of SPA events is shown in Fig. 1 for NWC(22.3 kHz) signal by the scale of phase height.

In Fig. 1, a solid smooth line which take the data of 12 August as an exsample indicats the typical diurnal phase height variation for NWC signal without disturbances. It is found from Fig. 1 that the normal phase height is lowered owing to the successive SPA events. This fact corresponds to the lowering of the D region.

During this interval, many solar proton events were also associated with these Hα flares as indicated in Table 1. Owing to these solar proton events, the N.DAKOTA circuit which has a polar pass was disturbed all day and no data was obtained.

In order to broaden the monitoring area, we exchanged the monitoring station from TSUSHIMA to REUNION(20°58'S, 55°17'E) from September 1979.

Table 1. Observational results of 20∿21, August 1979 for relative sunspot numbers(Rz), Hα solar flares, solar X-ray bursts and SPA events.

Date	Start Time	Rz	Hα Flare	X-ray Bursts	SPA					
					ALDRA 11.3kHz	TUSHIMA 11.3kHz	HAIKU 11.3kHz	N.DAKOTA 11.3kHz	NPG 18.6kHz	NWC 22.3kHz
	UT		IMP	SOLRAD 11	-Δh km	-Δt μs	-Δh km	-Δh km	-Δh km	-Δh km
August 20	0052	187	SB			(3.1)	2.7		1.1	2.7
	0213							All day Disturbed	0.2	0.4
	0241		SB	o		(1.0)	1.1		0.4	1.1
	0503		SB			(2.1)	0.7		0.3	1.8
	0721		1B			(2.1)				1.9
	0815		1B McMath16239	o						
	0905		2B	ProtonEvent	5.8	(12.6)				5.8
	2110		SB				1.6			
	2337		SB			(2.5)	2.8		1.4	1.7
21	0138	218	McMath16239 SN	ProtonEvent	4.1	(5)	5.9	All day Disturbed	3.6	5.2
	0304					(2.1)	1.0			
	0335								0.2	0.3
	0610		McMath16218 1B	ProtonEvent						0.5
	0736								1.7	
	0836			o ProtonEvent		(3.1)				1.0

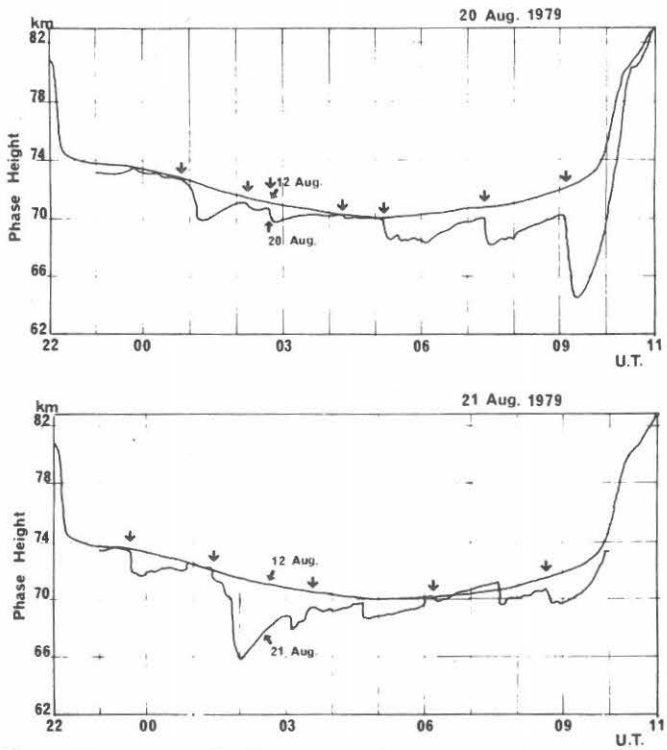

Fig. 1. The progress of phase variations of SPA events for NWC(22.3kHz) signal by the scale of phase height.

By this exchange, we can monitor almost a hemisphere of the earth at Toyokawa. Fig. 2 shows the propagation paths, of which the phase observations are carried out at present.

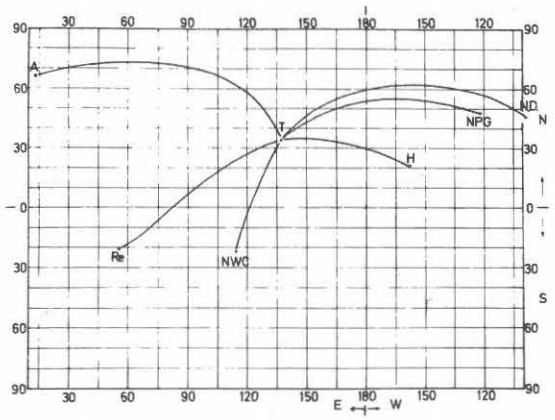

Fig. 2. The propagation paths, of which the phase observations are carried out at present.

In the McMath plage regions from 16273 to 16298 September 1979, Hα solar flares were also observed at many observatories. The progress of Hα solar flares, solar X-ray bursts and SPA events are similar to the August interval. But, what is specially noteworthy in this interval is to exsist numerous active X-ray bursts beyond the energy flux of $5*10^{-3}$ergs/SQ.cm/sec. Associated with these active solar X-ray bursts, prominent SPAs are observed. Observational results of these prominent SPAs are shown in Table 2.

Table 2. Prominent SPAs from 14 to 20 September 1979.

		ALDRA 11.3kHz		REUNION 11.3kHz		HAIKU 11.3kHz		N.DAKOTA 11.3kHz		NPG 18.6kHz		NWC 22.3kHz	
DATA	START TIME UT.	Δt μsec	Δh km	Δt μsec	Δh km	Δt μsec	Δh km	Δt μsec	Δh km	Δt μsec	Δh km	Δt μsec	Δh km
14	0325	19	3.4	48	6.5	24	5.5	18	5.5	6	1.8	12	4.6
14	0652	42	7.6	94	12.6	5	1.1	11	3.1	1.3	0.4	17	6.8
16	0102	30	5.4	62	8.3	52	11.6	56	8.5	19.5	6	21	8.4
16	0802			58	7.8							10	4
16	0935			95	12.7							3.5	1.5
19	0403	28	5.0	60	8.1	24	5.5	17	5.2	6.5	1.9	14.7	5.9
19	2300	34	6.2	39	5.2	75	16.7	70	10.7	34.3	10.3	25.5	10.3
Total Observed Number of SPA during this Periods													
14		2		6		6		5		8		7	
15		1		3		1		1		1		2	
16		1		4		4		1		3		8	
17				4								4	
18				2		2		1		2		2	
19		2		3		4		2		4		3	
20				3		4				2		6	

In Table 2, figures with an under-line show the value of the maximum lowering of phase height by active solar X-ray bursts. It is found from the starting time that these maximum lowerings of phase height occurred on the circuit passing through the region with a high solar zenith angle.

Total occurring numbers of SPA in Table 2 show that the sun's activity is very high during this interval.

These results show that the continuous observation of SPA is very important for monitoring the solar X-ray bursts at ground level.