

IPS RADIO AND SPACE SERVICES

FACTS ON SPACE WEATHER-INDICES



Australian Government
Department of Industry
Tourism and Resources

In any science, if we are going to progress, we need to make quantitative measurements. Scientists sometimes refer to these as meter readings, since many sensors used to measure quantities have a meter to display the quantity of interest. Averages of these readings in a particular environment may be referred to as indices. They are then used to describe the state of that environment.

In terrestrial meteorology, there are several environmental parameters of which we are aware. These include temperature, pressure, humidity, wind speed and direction, and precipitation. These values change with time and with place. Averages of these values help us judge climate trends and overall conditions. In space weather there are also indices which help us to judge and monitor the state of the space environment.

Space weather indices include sunspot number, geomagnetic indices, solar wind parameters (density and speed), flare index, solar x-ray flux and many more. As our knowledge of space weather progresses new indices will undoubtedly arise and old indices will be consolidated.

Two of the most used space weather indices are smoothed sunspot number (SSN) and the geomagnetic planetary A index (A_p). You may also hear mention of the solar ten centimetre radio flux F10.7. This is closely related to SSN. Both SSN and F10.7 give an indication of the overall level of solar activity. SSN ranges from zero to over 300. Although this value is said to indicate solar activity, it does not always mean activity with regard to flares and coronal mass ejections. It might be regarded as similar to a space weather temperature, but we must be careful with such analogies.

The A_p index, and its logarithmic cousin K_p , give a measure of the storminess of the Earth's magnetic field. A_p may range from 0 to about 400. The table below indicates the level of activity as the values of SSN and A_p change:

Solar 'Activity'	
SSN	Level
>250	Extreme
150-250	Very High
80-150	High
40-80	Moderate
20-40	Low
0-20	Very Low

Geomagnetic Activity	
A_p	Level
>100	Severe Storm
50-99	Major Storm
30-49	Minor Storm
16-29	Active
8-15	Unsettled
0-7	Quiet

The following conversions between A_p and K_p and between SSN and F10.7 are sometimes useful:

A_p	0	3	7	15	27	48	60	140	240	400
K_p	0	1	2	3	4	5	6	7	8	9

SSN	0	25	50	75	100	125	150	175	200	250
F10.7	67	83	102	124	148	172	196	219	240	273

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