Australian Government

Bureau of Meteorology

SPACE WEATHER SERVICES

SOLAR

AND

GEOPHYSICAL

SUMMARY

September 2018

Solar Activity

Solar activity was at very low levels this month. No M or X class flare events were observed. Several solar coronal holes were observed.

DATE	FLARES		FLARE MAX	FADEOUT POSSIBLE ON DAYLIGHT CIRCUIT
	CLASS M	CLASS X		
None observed.				

FLARE ALERT	SWF ALERT
None issued.	

PROTON ALERT

BEGIN		END		ENERGY THRESHOLD
DATE	TIME	DATE	TIME	
None issued.				

Ionospheric Activity

The deepest ionospheric depression for the month was observed on 24 September in association with coronal hole induced geomagnetic activity. Generally MUFS were near predicted monthly values.

Ionospheric depressions listed below are calculated using foF2 data from the SWS ionosonde network.

IONOSPHERIC DISTURBANCES (MUFs for the Australian region)

19 Sep 18: Northern region MUFs Depressed by 15%
20 Sep 18: Northern region MUFs Depressed by 15%
21 Sep 18: Northern region MUFs Depressed by 15%
23 Sep 18: Southern region MUFs Depressed by 15%
24 Sep 18: Southern region MUFs Depressed by 25%
25 Sep 18: Southern region MUFs Depressed by 15%
27 Sep 18: Southern region MUFs Depressed by 20%
29 Sep 18: Northern region MUFs Depressed by 15%
Southern region MUFs Depressed by 15%
30 Sep 18: Southern region MUFs Depressed by 15%

RADIO COMMUNICATIONS WARNINGS

DATE	Nº.	BEGIN	END
11 Sep 18	09	11 Sep 18	12 Sep 18

Geomagnetic Activity

The strongest disturbance for the month was observed on 11 September with a local A index of 16 reached. This activity was associated with the Earth's entry into a high speed solar wind stream induced by a coronal hole.

Disturbances with Australian A indices greater than or equal to 16 are reported below.

DATE	GEOMAGNETIC DISTURBANCES (for the Australian region)
11 Sep 18:	Quiet to Active with some Minor Storm periods

GEOMAGNETIC WARNINGS AND ALERTS				
DATE	Nº.	BEGIN	END	ISSUED
10 Sep 18	19	10 Sep 18	11 Sep 18	Warning
11 Sep 18	20	12 Sep 18	12 Sep 18	Warning
22 Sep 18	21	22 Sep 18	24 Sep 18	Warning

Solar And Geophysical Indices

DATE	10cm FLUX	AUSTRALIAN A-INDEX	AUSTRALIAN T-INDEX	DATE	10 cm FLUX	AUSTRALIAN A-INDEX	AUSTRALIAN T-INDEX
01 Sep	68	2	4	16 Sep	69	2	1
02 Sep	68	2	6	17 Sep	68	7	5
03 Sep	68	3	3	18 Sep	68	5	2
04 Sep	68	6	7	19 Sep	68	2	-4
05 Sep	68	8	7	20 Sep	67	0	-4
06 Sep	68	3	1	21 Sep	67	3	-6
07 Sep	68	4	-1	22 Sep	68	15	5
08 Sep	69	4	3	23 Sep	68	8	-7
09 Sep	68	4	4	24 Sep	69	6	-16
10 Sep	69	11	4	25 Sep	68	13	-9
11 Sep	69	16	6	26 Sep	69	5	-9
12 Sep	70	6	0	27 Sep	67	5	-12
13 Sep	70	11	6	28 Sep	69	4	-7
14 Sep	69	10	7	29 Sep	69	8	-13
15 Sep	69	4	4	30 Sep	68	3	-8

DATE	10cm FLUX	AUSTRALIAN A-INDEX	AUSTRALIAN T-INDEX	SUNSPOT NUMBER		FLARES
	Monthly Average	Monthly Average	Monthly Average	Monthly Average	13-month smoothed	>M1.0
Oct 17	76.4	6.9	4.6	13.2	16.6	1
Nov 17	72.2	7.1	-5.6	5.7	15.4	0
Dec 17	71.7	5.8	-9.2	8.2	15.1	0
Jan 18	70	4.8	-6.5	6.7	14.3	0
Feb 18	72.1	5	-0.9	10.6	12.6	0
Mar 18	68.4	5.4	2.4	2.5	9.9	0
Apr 18	70.1	4.4	6.5	8.9	8.0	0
May 18	70.9	4.3	4.4	13.2	7.8	0
Jun 18	72.5	4.4	6.5	15.9	7.8	0
Jul 18	69.7	3.2	5.8	1.6	7.7	0
Aug 18	69.1	6.4	1	8.8	7.4	0
Sep 18	68.3	5.8	-0.9	3.3	7.2	0
					Predicted sunspot numbers	

SPECIAL NOTE
In June 2015, WDC-SILSO, Royal Observatory of Belgium, Brussels, adjusted their original observed sunspot numbers (Version 1.0) to a Version 2.0 series in which the sunspot numbers are higher. In the Version 1.0 data series, some of the sunspot numbers were weighted. The new (Version 2.0) sunspot numbers are unweighted sunspot number counts (for more information see: www.sidc.be/silso/home). The Bureau of Meteorology SWS solar cycle prediction is now based on the Version 2.0 values. As a result of this recalibration, the observed monthly and observed and predicted smoothed sunspot numbers are higher in the monthly table and solar cycle graph.

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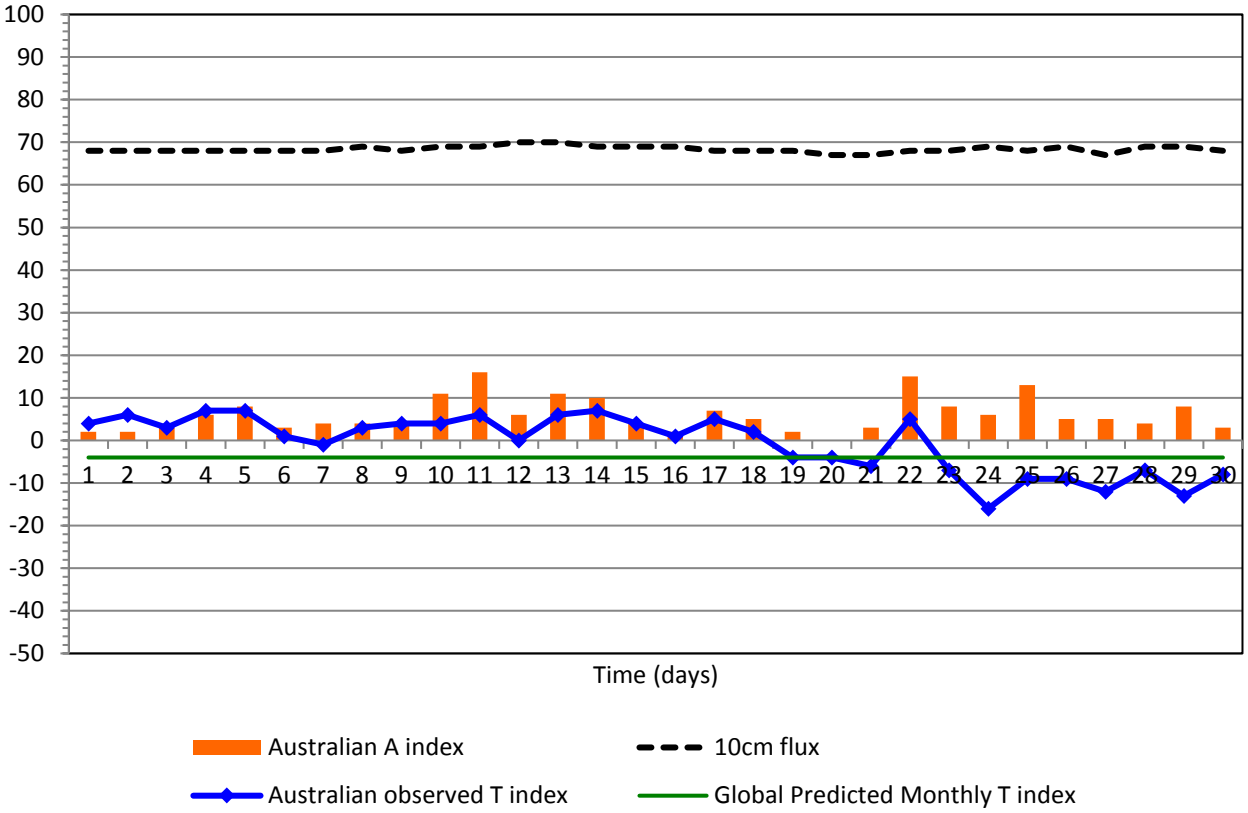
SWS WORLD T-INDICES

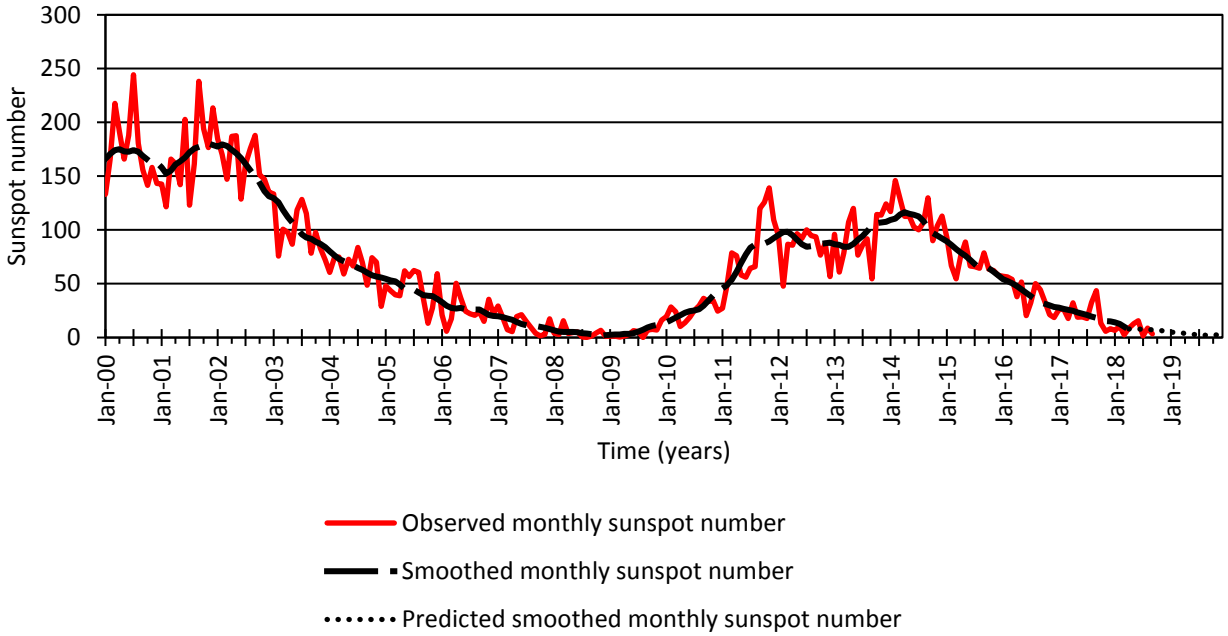
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2013	74*	62*	69*	84*	92*	82*	81*	76*	68*	76*	86*	90*
2014	91*	108*	130*	114*	96*	84*	86*	81*	90*	94*	98*	103*
2015	92*	101*	91*	97*	85*	79*	71*	48*	40*	43*	53*	50*
2016	52*	57*	46*	30*	34*	28*	26*	25*	28*	17*	12*	10*
2017	14*	19*	11*	8*	2*	2*	0*	3*	16*	13*	5*	6*
2018	8*	3*	3*	-2*	-7*	-3*	-3*	-9*	-7*	-5	-5	-5
2019	-5	-4	-4	-5	-4	-4	-3	-3	-2	-1	0	1
2020	3	5	7	9	11	14	17	20	23	26	28	32
2021	35	38	40	42	44	46	49	50	51	52	54	55

SWS predicted T-index * New observed data. T-index value may have changed

Solar and Geophysical Indices - September 2018



Solar Cycle



Observed monthly sunspot numbers courtesy of WDC-SILSO, Royal Observatory of Belgium, Brussels (www.sidc.be/silso/home)

NOTES - notes - NOTES - notes - NOTES - notes

a. Times quoted in this publication are all Universal Time (UT).

b. The values of all indices are provisional. Final values are not available for several months.

c. M or X class flares refer to the X-ray classification system for solar flares. In this system, X class flares are more energetic than M class flares.

FLARE CLASS	X-RAY FLUX DENSITY	
	Ergs/cm^2/sec	W/m^2
M	0.01-0.1	10^{-5} to 10^{-4}
X	>0.1	> 10^{-4}

d. Class M flares, particularly the less energetic ones, are likely to cause a fadeout on only the lowest frequencies. Class X flares are likely to cause a fadeout over the entire HF spectrum. It should be noted that a fadeout will only occur on those circuits having a reflection point in the daylight hemisphere of the earth. Circuits having only night hemisphere reflection points will not be affected no matter the energy of the solar flares.

e. The 10cm flux is the radio power of the sun at a frequency of 2800 MHz (wavelength 10.7 cm). This flux is a good indicator of solar activity and is widely used in place of the sunspot number. The values are measured by the Penticton radio observatory, Canada. Unlike the sunspot number, the 10cm flux never drops to zero even during solar minimum. With no sunspots visible on the solar disk, the 10cm flux will still have a value of around 67. The table below gives a (statistical) comparison between 10cm flux and sunspot number. The 10cm flux is measured in solar flux units (10^{-22} W m^{-2} Hz^{-1}).

SUNSPOT No.	10 cm FLUX
0	67
20	78
40	93
60	110
100	147
150	195
200	243

f. Ionospheric disturbances refer to measurements made across Australia, but are generally applicable to mid-latitude Southern Hemisphere conditions. Spread F conditions indicate tilts in the ionosphere, which may result in multipath fading on some HF circuits.

g. The magnetic A-indices are for the Australian region. Large values for the A index correspond to disturbed conditions. Levels of magnetic disturbances are described in the following terms.

A INDEX VALUE	DESCRIPTION
0 up to 7	Quiet
8 up to 15	Unsettled
16 up to 24	Active
25 up to 35	Minor Storm
36 and above	Major Storm

h. The Australian daily T-index is a measure of the average of the ionospheric critical frequencies available on a particular day - the higher the value of the T-index, the higher the ionospheric critical frequencies (and Maximum Usable Frequencies on HF circuits) for that day. The T-index is based on data from Australian ionospheric stations and so is most applicable to HF circuits with reflection points in the Australian region.

i. The SWS monthly observed T-index is derived from the observed monthly median values of foF2 for each hour from ionospheric stations worldwide.

The predicted smoothed monthly T-indices are computed by using a statistical analysis of the observed monthly T-indices for all solar cycles since 1938.

The SWS T-indices may not be updated each month but only when sufficient new data becomes available.

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