

### 3-day Space Weather Conditions (SUPARCO)

Friday, November 20, 2020, 14:59 PST



LOCAL CURRENT IONOSPHERIC CONDITIONS OVER PAKISTAN <sup>a</sup>								
DATE	20-Nov-20(noon)			21-Nov-20 (noon)			22-Nov-20 (noon)	
foF2	5.8 MHz			6.5 MHz			7.7 MHz	
h'F2	243 km			240 km			250 km	
TEC	20 TECU			18 TECU			21 TECU	
Maximum Usable Frequency (MUF) and Optimum Traffic Frequency (FOT) for various distances								
Distance (km)	100	200	400	600	800	1000	1500	3000
MUF (MHz) for 3 days (20, 21, and 22 Nov)	5.9	6.3	7.5	9.1	10.8	12.5	16.2	21.4
	6.6	7.0	8.4	10.2	12.2	14.1	18.3	24.1
	7.9	8.3	9.8	11.8	14.0	16.2	21.0	28.0
MUF (MHz) for 3 days (20, 21, and 22 Nov)	5.0	5.3	6.4	7.7	9.2	10.6	13.8	18.2
	5.6	6.0	7.2	8.7	10.3	12.0	15.6	20.5
	6.7	7.0	8.3	10.0	11.9	13.8	17.9	23.8
Local ionospheric conditions are nominal with slightly depressed MUF availability. It is advised to use a higher frequency band in case of HF communication difficulty.								
LOCAL GEOMAGNETIC CONDITIONS OVER PAKISTAN <sup>ab</sup>								
K-index	2			Quiet geomagnetic activity expected			Quiet to unsettled geomagnetic activity expected	
F	45404/50008 nT			45400±10 /49990±20 nT			45400±10/49990±20 nT	
D	0.94/1.8 degrees			0.96/1.8 degrees			0.96/1.8 degrees	
The local geomagnetic field is quiet at the moment.								
SOLAR CONDITIONS								
SN	11			13 (SSN-predicted)			13 (SSN-predicted)	
F 10.7	77 sfu			75 sfu			75 sfu	
V <sub>sw</sub>	377 km/sec (varied in the past 12 hrs between 362 & 398 km/s)			Moderate solar wind expected			Moderate to elevated solar wind expected	
Solar flares	B 2.2 (max. flare in the past 24 hrs: B 2.5 0902 UT Nov13)			Low levels of solar flare activity expected			Low levels of solar flare activity expected	

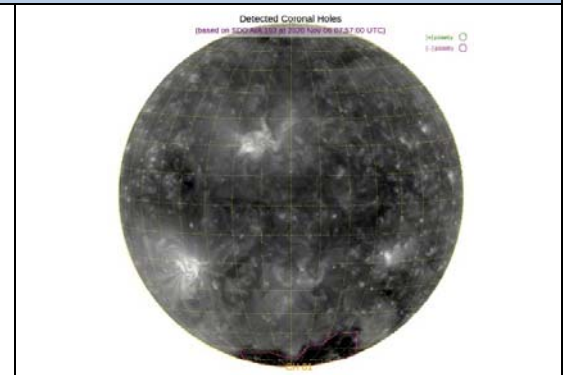
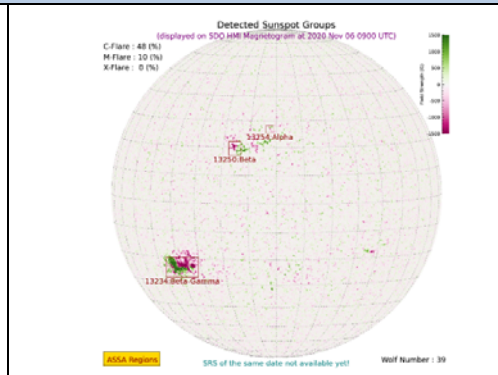
<b>IMF Bt</b>	3.7 nT (varied in the past 12 hrs between 2.9 & 6.0 nT)	Expected to vary between positive and negative sectors.	Expected to vary between positive and negative sectors
<b>Bz</b>	-1.7 nT (varied in the past 12 hrs between -4.1 & +2.0 nT)		

Solar conditions are at low levels with background X-ray flux at B-class levels. Local HF working frequencies are normal as compared to monthly average predicted values.

### Daily Sun: 20 November 2020

There are no active regions on the Sun capable of producing strong solar flares respectively.

01 large Coronal Hole (CH) is detected on the northern solar limb at the moment.



### 2-Day Conditions

Solar activity is expected to continue at low levels with a slight chance for C-class flares over the weekend.

The solar wind is expected to enhance to mildly elevated levels due to the approaching coronal holes effect. Quiet to unsettled geomagnetic conditions are expected due to CH HSS influences.

Slightly depressed HF conditions are expected for the next 2 days. It is advised to use the frequency ranges mentioned in the ionospheric region.

For information on radio blackout levels, please follow the link:

<http://www.swpc.noaa.gov/noaa-scales-explanation>

#### Acknowledgements:

Images source: Solar Dynamics Observatory-SDO) Both images showing the Solar disk and Coronal Holes have been processed at SUPARCO using Automatic Solar Synoptic Analyzer (ASSA), developed jointly by the Korean Space Weather Centre of the Radio Research Agency (RRA) & Space Environment Laboratory (SELab).

Data sources: The planetary indices and solar data are taken from the URLs below:

<http://www.spaceweather.go.kr>

<http://www.sws.bom.gov.au>

<http://www.solarmonitor.org>

<sup>a</sup>Sonmiani (SON): 25.2° N, 66.75° E

<sup>b</sup>Islamabad (ISB): 33.7° N, 73.13° E

ANNEXURE

DEFINITIONS OF TERMINOLOGIES USED IN THIS SUMMARY	
foF2	Maximum frequency of F2-layer of the ionosphere
h'F2	Virtual height of the F2-layer
MUF	Maximum usable frequency for 3000 km
K-index	Local index defining geomagnetic conditions
Declination	Planetary A index defining geomagnetic conditions, predicted value during geomagnetic unsettled conditions
F	Magnitude of the total geomagnetic field vector (unit in nano Teslas)
SON, difference	Sonmiani Geomagnetic Observatory mean value, <u>difference limit</u> from night time value of quiet conditions: 25-30 nT, max: 260 nT
ISP	Islamabad Geomagnetic Observatory mean value
SN	Relative sunspot numbers
Vsw	Solar Wind Speed (km/s)
F10.7	Solar radio flux at 2.8 GHz (10.7 cm wavelength)
sfu	Solar flux unit (defines the solar radio 10.7 cm flux )
Solar Flare	Could be B, C, M and X depending upon the intensity of x-rays being emitted (each type has further 10 classes based on amount of energy released by the flare)
IMF	Interplanetary magnetic field (the source of which is the Sun)
Bt	Total IMF (unit in nano Teslas)
Bz	Vertical component of IMF (could be north/upward/positive or south/downward/negative) (unit in nano Teslas)
AR	Active Regions on the sun currently in view
CME	Coronal Mass Ejection
CH	Coronal Hole
KASI	Korean Astronomy & Space Science Institute
SWFs	Short-wave fadeouts, caused by M/X class flares on the daylit side of the hemisphere absorbing lower frequencies and hampering HF communication.
SSN-predicted	Smooth Sunspot Number-it is an estimated value using a mathematical relation to forecast it.