

Space Weather Forecast

Issued on Monday, 20 December 2021 at 13:27 Local

This forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales <https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales>

Space Weather Forecast Headline: Chance of Minor Geomagnetic Storms day 2 (21st). Slight chance of Moderate flares throughout.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar Activity has been Moderate over the past 24 hours, with a number of common class X-ray flares observed and one moderate flare at 20/1136 UTC. There are currently eight sunspot regions on the Earth facing disc. The most complex of these are a series of three regions in the southern central disc, which have been the main source for solar activity during the past 24 hours. All other regions are either small unipolar or bipolar regions, with limited flare risk, but with the potential for further development. No Earth-directed coronal mass ejections (CMEs) have been observed in available imagery.

Solar Wind / Geomagnetic Activity: Solar winds rose since 19/1210 UTC from background levels of around 350km/s to become elevated at 520-560 km/s from 20/0110 UTC. This enhancement was accompanied by a dense region of solar wind that also had a notable magnetic field, becoming strong for a time. This included the north-south component, which, whilst varying between northward and southward directions, also became strong around 19/2030 UTC. However, since 20/0110 UTC the field strength has become weak. These parameters are likely the result of Earth connecting to coronal hole 36 and lead to Quiet to Active (Kp 2-4) geomagnetic activity, with a G1/Minor Storm interval recorded 19/2100-2400 UTC.

Energetic Particles / Solar Radiation: The count rate of energetic particles (high energy protons) remained at background with no solar radiation storms occurring.

Four-Day Space Weather Forecast Summary

Solar Activity: Solar activity is expected to be mostly Low, with a slight chance (20%) of isolated Moderate flares, predominately from the more complex sunspot regions on the disc, but cannot be ruled out from the other sunspot regions on the disc given the possibility of further development.

Solar Wind / Geomagnetic Activity: There are currently no Earth-directed CMEs in the forecast. Elevated solar winds are expected to persist through days 1-3 (20th-22nd) due to coronal hole enhancements, before gradually easing on Day 4 (23rd). Geomagnetic activity is forecast to be Quiet to Unsettled through days 1-3 (20th-22nd), with Active intervals possible. These are most likely to occur early on day 2 (21st), when there is a chance of a Minor Geomagnetic Storm. On day 4 (23rd), geomagnetic activity is likely to become mostly Quiet.

Energetic Particles / Solar Radiation: The count rate of energetic particles (high energy protons) is forecast to stay at background with no solar radiation storms expected. Any significant flares could lead to this count rate increasing, but are still expected to stay below radiation storm level.

Geomagnetic Storms:

Geo-Magnetic Storm	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Minor or Moderate	G1 to G2	Yes	10	30	10	1
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 M Class	Yes	20	20	20	20
Very Active	R3 to R5 X	No	2	2	2	2

Solar Radiation Storms - (High Energy Protons):

Radiation Storms	Level (cm ⁻² sr ⁻¹ s ⁻¹)	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	≥ S1	No	2	2	5	5
Very Active	≥ S3 *	No	1	1	1	1

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = cm⁻²sr⁻¹s⁻¹)