

**Space Weather Forecast**

Issued on Wednesday, 22 December 2021 at 13:31 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>**

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**Space Weather Forecast Headline: Chance of Minor Geomagnetic Storm on day 2 (23rd) due to a coronal mass ejection (CME). Moderate solar activity likely 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 flares observed. A moderate-class flare was also observed in the last 6 hours from a region in the southwest quadrant. Two plasma eruptions from the eastern half of the Sun are awaiting analysis, but are not expected to have produced any Earth-directed CMEs. The recent moderate-class flare appears to have produced a CME, which is also awaiting analysis once further imagery becomes available.

There are 11 sunspot regions on the visible disc, with much of the solar activity and hence flare risk concentrated in three regions in the southwest quadrant, the middle of which was responsible for the most recent moderate-class flare. A further region close to the southeast limb of the Sun is in a position which makes it difficult to analyse and could present a higher flare risk once a detailed analysis is undertaken. The remaining regions are assessed as generally benign and stable and therefore present a limited flare risk.

**Solar Wind / Geomagnetic Activity:** Solar winds have been mainly elevated throughout due to a coronal hole fast wind. The total magnetic field has been weak with the important north-south component also varying weakly. Geomagnetic activity has been Quiet to Unsettled.

**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 mainly moderate, due mainly to the three complex active regions in the southwest quadrant and the newly emerging region close to the southeast limb. A CME which left the Sun on 20 December from 2908 is forecast to arrive at Earth on late on 23 December, or early on 24 December.

**Solar Wind / Geomagnetic Activity:** The CME which left the Sun on 20 December is expected to arrive at Earth on 23 December, or perhaps early on 24 December. Solar wind speeds are expected to remain elevated through day 1 (22 Dec) and much of day 2 (23 Dec), due to a coronal hole fast wind. A decline towards background levels is then forecast on days 3 and 4. Any decline in speeds is subject to the CME arrival which could briefly elevate wind speeds. Geomagnetic activity is expected to be mainly Quiet through day 1 and much of days 2 and 3, although Unsettled to Active intervals are possible. There is a slight chance of Active or G1/Minor Storm intervals on 23 or 24 December due to the 20 December CME. Quiet to Unsettled conditions are then likely on day 4.

**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	No	10	30	20	10
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	40	40	40	40
Very Active	R3 to R5 X	No	2	2	2	2

**Solar Radiation Storms - (High Energy Protons):**

Radiation Storms	Level (cm <sup>-2</sup> sr <sup>-1</sup> s <sup>-1</sup> )	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	5	5	5	5
Very Active	≥ S3 *	No	1	1	1	1

\* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = cm<sup>-2</sup>sr<sup>-1</sup>s<sup>-1</sup>)