
Space Weather Forecast

Issued on Wednesday, 22 December 2021 at 01:21 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 Storm on day 2 (23rd). Occasional Moderate flares 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 X-ray flares observed and two Moderate class flares at 21/0750 UTC and 21/1144 UTC. A previous moderate class flare at 20/1136UTC, from an active region in the southern hemisphere of the Sun, produced a weak coronal mass ejection (CME). Analysis of this CME indicates an arrival time on day 3 (23 Dec). Meanwhile, a couple of plasma eruptions have been observed on the visible disc, these will be analysed further for any potential Earth-directed CMEs, once imagery is available.

There are currently ten sunspot regions on the Earth facing disc. The most complex of these are a series of three regions in the southern central disc, however, the most recent moderate class flares have been from a new sunspot region, which is rotating onto the disc from beyond the eastern limb of the Sun. These flares may have generated CMEs, but given their location are unlikely to have any Earth-directed component. All other regions visible are small and simple with limited flare risk, but with the potential for further development.

Solar Wind / Geomagnetic Activity: Solar winds have been elevated to strong throughout as a result of a high speed stream from a coronal hole. The Interplanetary Magnetic Field Strength (IMF), Bt has weak throughout. The all important north-south component (Bz) has also remained weak. Geomagnetic activity has been Quiet to Active (Kp 1-4), as a result of a fast wind from a coronal hole.

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 predominantly Moderate, with further common class and occasional moderate class flares likely - mainly from AR2907, AR2908 and AR2909, and also the new region AR2916 rotating onto the eastern limb.

Solar Wind / Geomagnetic Activity: A coronal mass ejection (CME) which left the sun on the 20th as result of a Moderate-class flare originating from AR2908 is expected to arrive at Earth on day 2 (23 Dec). Solar winds are expected to remain elevated on day 1 (22 Dec) due to a fast wind from a coronal hole, before gradually easing from day 2 (23 Dec). Geomagnetic activity is expected to be Quiet to Unsettled on day 1 (22 Dec) and Quiet to Active on days 2 and 3 (23-24 Dec), with a slight chance of a G1/Minor Storm on the 23rd due to the chance of a glancing blow from a CME. Quiet to Unsettled conditions likely on day 4 (25 Dec).

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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	30	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 ⁻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	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⁻²sr⁻¹s⁻¹)