

## Space Weather Forecast

Issued on Thursday, 30 December 2021 at 13:30 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: Slight chance of Minor Geomagnetic storm, mainly on 01 January**

#### **Analysis of Space Weather Activity over past 24 hours**

**Solar Activity:** Solar activity has been very low with no significant flare activity. There are five sunspot regions on the visible disc, with the largest of these in the southwest quadrant. The remaining regions are either stable or fading. No Earth-directed CMEs (coronal mass ejections) were observed on available imagery.

**Solar Wind / Geomagnetic Activity:** Solar winds started slow, but became elevated due to the potential effects of either a CME or a coronal hole fast wind. After a decline to slightly elevated levels, a further increase to elevated levels was observed later in the period. Total magnetic field strength briefly reached strong levels, but was otherwise weak or moderate. The important north-south component was generally weak, but also briefly varied strongly. These observations suggest the arrival of a CME, with the subsequent peak likely to be the coronal hole fast wind. Geomagnetic activity was Quiet (Kp 1-2).

**Energetic Particles / Solar Radiation:** No solar radiation storms were observed.

#### **Four-Day Space Weather Forecast Summary**

**Solar Activity:** Low or very low solar activity is expected through the next four days, with a slight chance of moderate activity due to AR2916 in the southwest quadrant.

**Solar Wind / Geomagnetic Activity:** Earth may experience a glancing blow from a CME on 30 December, although there is limited evidence to suggest that it may have already affected the Earth. A current coronal hole fast wind is expected to decline by 31 December with a further fast wind then likely to develop on 01 January, which may produce elevated speeds. Geomagnetic activity is expected to be mainly Quiet, with a slight chance of G1/Minor Storms due to either the effects of the CME on 30 December or the connection with the second fast wind on 01 January.

**Energetic Particles / Solar Radiation:** No solar radiation storms are expected.

**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                | 5                 | 10                | 5                 |
| 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 | No                     | 15                | 15                | 15                | 15                |
| Very Active  | R3 to R5 X    | No                     | 5                 | 3                 | 1                 | 1                 |

**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                 | 3                 | 3                 | 3                 |
| 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>)