Probabilistic Proton Forecasts

SHINE2018 Events

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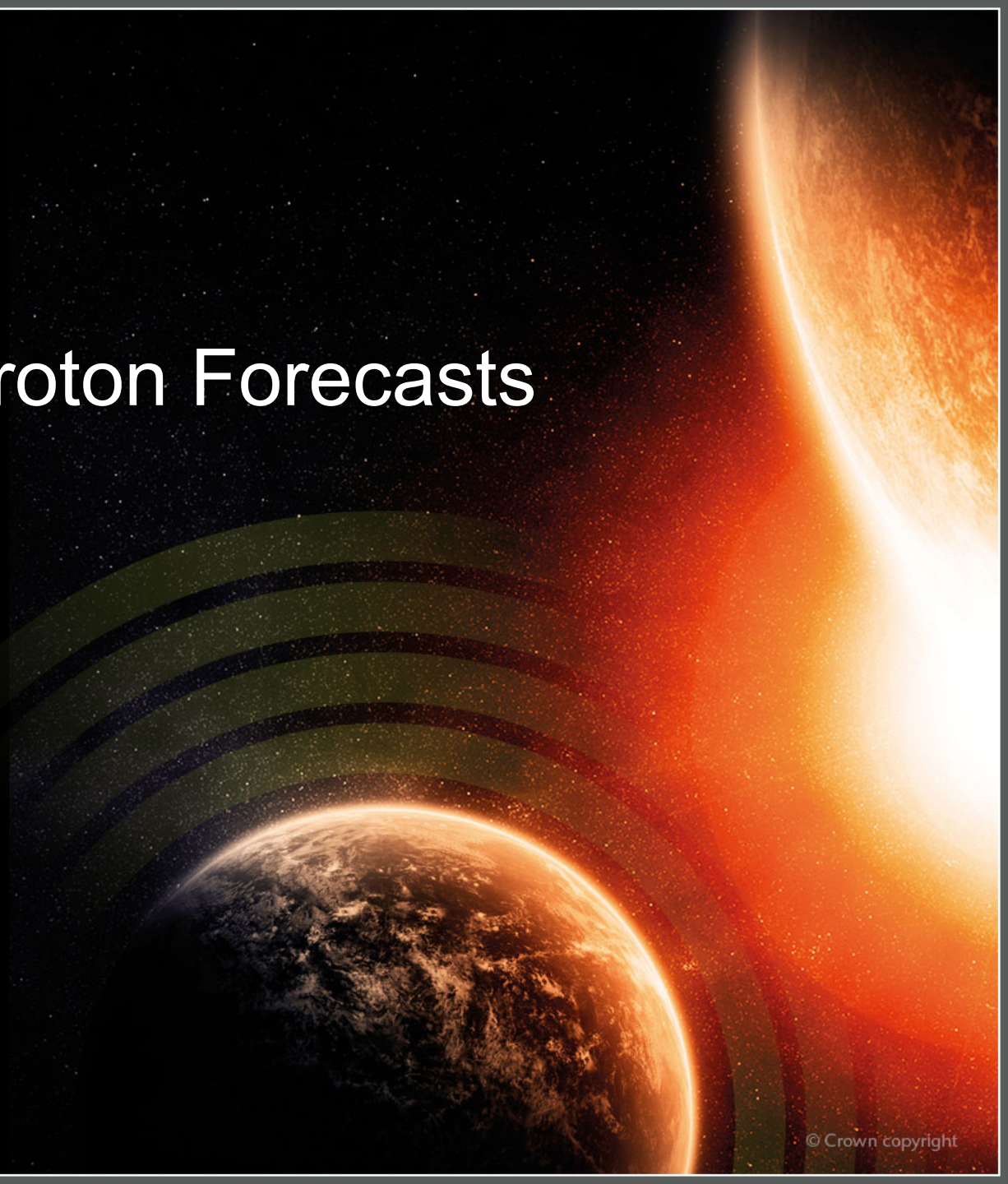

Brief Description of the Model

Human forecaster intervened forecast

The results of a sunspot analysis undertaken by the Space Weather Advisor are used as input into an empirical model, which uses flaring probability based on AR class (cf. Bloomfield et al, 2012) and combines this with proton event probability based on the input flaring probability (cf. Dierckxsens et al, 2015).

The end result is a probabilistic risk of an S1 or higher solar radiation storm given the size, complexity and position of all of the active regions on the disc. **Using this value as a starting point**, the Space Weather Advisor will assess whether this percentage needs to be adjusted up or down given the current activity and stability of the sunspots.

Model results: 4 September 2017

GOES Integral proton flux:
>10 MeV Exceeds 1 pfu at 2017-09-04T23:00Z. Peak of 210 pfu at 2017-09-05T19:30Z

Forecast @ 4 September 00Z

The high energy proton flux (greater than 10 MeV) is expected to remain at background levels over the next four days, with no solar radiation storms expected. However there is a very slight chance (5%) of S1 proton storms, due to the large sunspot AR2674 and complex AR2673, should they produce significant flare activity.

Radiation Storms Probability (Exceedance)	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) (%)
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 = $cm^{-2}sr^{-1}s^{-1}$)						

Model results: 6 September 2017

GOES Integral proton flux:
>10 MeV Ongoing SEP event ~25pfu. 352 pfu at 2017-09-07T04:55Z. Peak of 844 pfu at 2017-09-08T00:35Z
>100 MeV Exceeds 0.1 pfu at 2017-09-06T12:35Z. Peak of 0.63 pfu at 2017-09-06T13:05Z

Forecast @ 6 September 00Z

The high energy proton flux (greater than 10 MeV) is currently at S2 due to the M-class flaring from AR2673. This is expected to only slowly decline during day 1 and 2 (5th/6th Sep), initially falling to S1 before subsiding by day 4. However, there remains a risk of further significant flares from AR2763, leading to a chance (25%) of S3 Strong Solar Radiation storms.

Radiation Storms Probability (Exceedance)	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) (%)
Active	**≥ S1**	Yes	100	90	60	20
Very Active	**≥ S3 ***	No	25	10	5	2
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

Model results: 10 September 2017

GOES Integral proton flux:
>10 MeV Exceeds 1 pfu at 2017-09-10T16:25Z. Peak of 1490 pfu at 2017-09-11T11:40Z.
>100 MeV Exceeds 0.1 pfu at 2017-09-10T16:20Z. Peak of 68 pfu at 2017-09-10T22:15Z.

Forecast @ 10 September 00Z

The flux of high energy protons has fallen gradually through the last 24 hours. The source of the recent proton storms AR2673 is moving toward the western limb and should move across the horizon in the next 36 hours*.

The forecast is therefore for a slight chance of the S1 threshold to be reached on day 1 (10 Sep) in response to any activity from 2673, with a sharp fall in the chance from day 2 onwards.

Radiation Storms Probability (Exceedance)	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) (%)
Active	≥ S1	No	20*	10	1	1
Very Active	≥ S3 *	No	5	2	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

*In this case the forecaster determined that the >S1 forecast for the 10th was reduced compared to the previous day, due to assessment that the AR class was decaying and the AR rotating over the limb.

Model results: 14 July 2017

GOES Integral proton flux:
>10 MeV Exceeds 1 pfu at 2017-07-14T04:00Z. Peak of 22 pfu at 2017-07-14T23:20Z

Forecast @ 10 September 00Z

AR2665 continues to move into an increasingly geoeffective position through the period and this brings an elevated, albeit small risk (5%) for a S1 or greater event

Radiation Storms Probability (Exceedance)	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) (%)
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 = $cm^{-2}sr^{-1}s^{-1}$)						