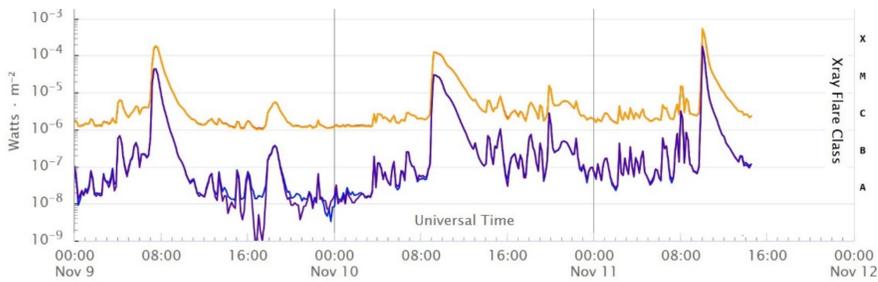


Rythmic flaring regions at the maximum of solar cycle XXV

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INTRODUCTION & AIM



Three solar flares from AR 4274 X1.7, X1.2 and X5.1 in November 2025 (GOES X-Rays)

Is it possible to predict a major solar flare?

Under particular circumstances it is possible to the nearest hour, as for the M3.1 of 16 November 2025, which produced an aurora seen from Ely, MN.



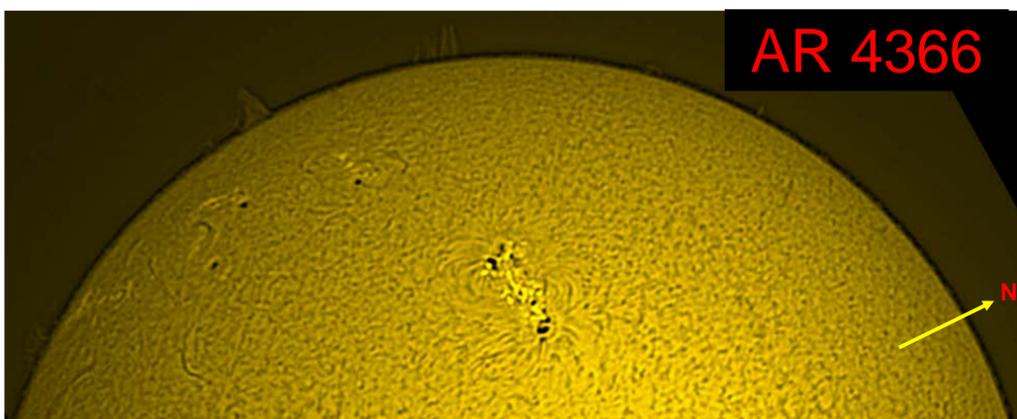
METHOD

The observation of the Sun in X-rays through GOES satellite and in H α through dedicated telescopes has been conducted during the maximum phase of the current XXV solar cycle, namely after May 2024.

The Active Regions under particular scrutiny were the **superflaring regions**.

	Flares class			Area max (MH)
AR 3664 May 2024	39C	61M	12X	2400
AR 3697 June 2024	88C	27M	6X	410
AR 4274 November 2025	135C	15M	5X	1100
AR 4299 December 2025	12C	5M	1X	220
AR 4366 February 2026	77C	71M	6X	1100

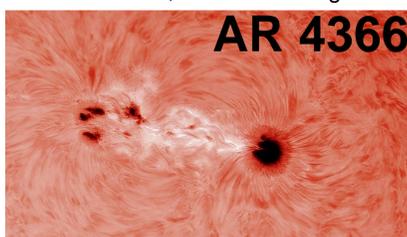
The same color indicates the same region after one rotation.



The region **AR 4366**, again in the Northern hemisphere, was the most active region in the unit time, releasing all six X-class flares in five days, from 1 to 5 February 2026. Since 25 February it reappeared as AR 4378, ongoing during the IOCU3 meeting. Photo: ICRANet Observatory, Rome, taken on 2 February 2026 12:42 UT. The AR 4366 was in between two major X-class flares, showing many Ellermann bombs. The image below is of 5 Feb at 14:10 UT after all 6 X-class flares. Photo Virginio and Luca Oldani, St. Ast. Sozzago.

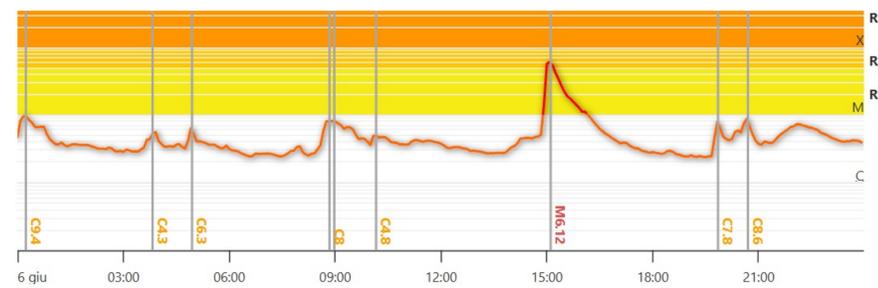
Selection Criteria

- 1) The flaring activity shows a recursive time pattern for the largest events
- 2) The major events have been predictable within a few hours
- 3) The regions were active for most of the time of their visibility
- 4) The same region after a solar rotation



RESULTS & DISCUSSION

The **superflaring region AR 3664** in May 2024 reappeared after a solar rotation as **AR 3697** in the Southern solar hemisphere. It produced aurorae down to Mediterranean regions on 10/11 May 2024 and the GLE (Ground Level particle Event) of 8 June 2024.



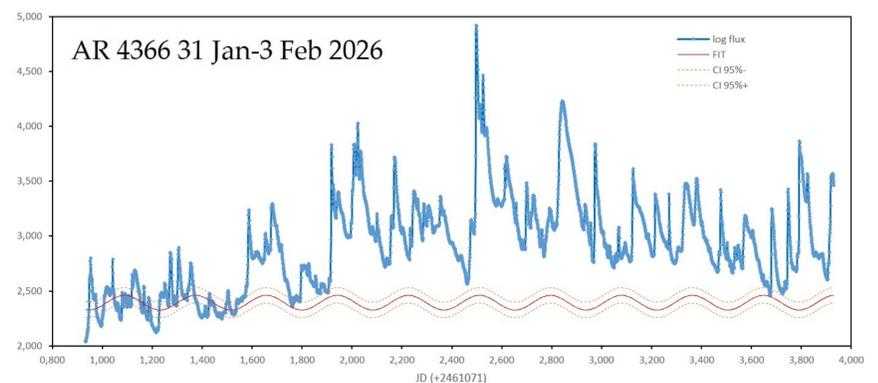
A flaring rythm preceded and followed the M6 flare of 6 June 2024.

A **charging time** characterizes the repetition of a strong flaring event.

Region **AR 4274** appeared in the Northern hemisphere in November 2025 and reached an area of 1200 MH, releasing five major X-class flares and the strongest particle storm measured at Ground Level (GLE) of this solar cycle XXV so far. It reappeared much smaller as **AR 4299** in December, maintaining a significant activity, although not as intense as before.



The M1.1 flare of 8 December 2025, started on AR4294 in the large complex appeared in 2025, triggered AR 4299 to flare C4.8 after 1 hour. Photo: ICRANet Observatory, Lanciano (CH). This sympathetic dynamics occurred regularly between 6 and 9 December.



AR 4366 in February 2026 showed a flaring repetition each 7-10 hours (from FFT).

CONCLUSION

The Flaring machines during the peak of cycle XXV have their own characteristics: they are the nearly predominant active region (exciting some sympathetic flares around) on the Sun at the moment; they have a charging time, and they show repeatability. We have identified three regions AR 3664-97, AR4274-99 and AR 4366 with the characteristic of having a flaring rythm, repeating similar patterns in the flares structure.

FUTURE WORK / REFERENCES

- Solar flares analysis in all selected ARs will be done to find also similar triggering patterns.
- [Near-continuous tracking of solar active region NOAA 13664 over three solar rotations](#) A&A, 704, A105 (2025)
 - [ATel #16635: Naked eye observations of Aurorae at low magnetic latitudes](#) (2024)
 - [ATel #17494: X-flaring active region at the solar western limb: possible SEPs event](#) (2025)
 - [ATel #17644: Superflaring region AR14366: observing opportunities](#) (2026)