Space

Astronomers have spotted inexplicably bright light coming from the sun

Extraordinarily high-energy gamma rays have been found emanating from the sun, and none of our theoretical models can explain why there are so many of them

By Leah Crane

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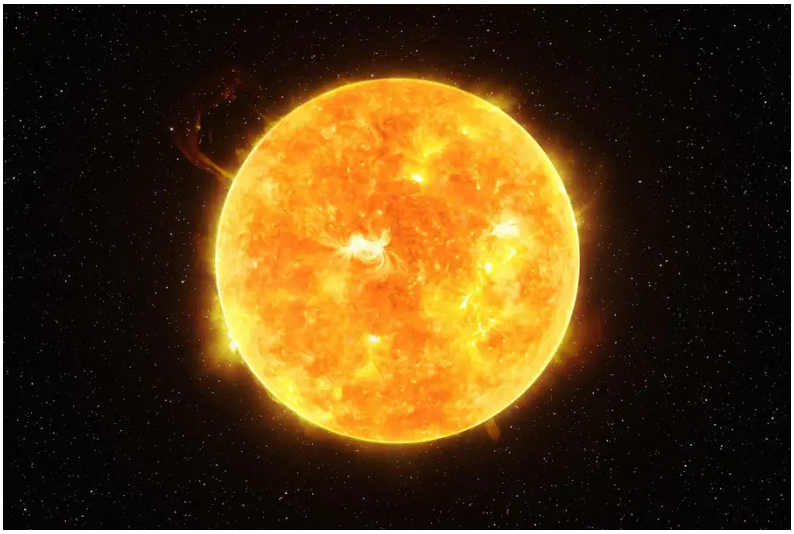

Some of the light from the sun is more energetic than it should be
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The highest-energy sunlight is too bright. Astronomers have detected gamma rays coming from the sun that are more energetic than any we have seen before, and there are more of them than any of our models of the sun can account for.

Many of the gamma rays we see coming from the sun are produced by cosmic rays, which are charged particles that hurtle through space at incredible speeds. When cosmic rays hit the sun, the …

magnetic fields there can turn them around and blast them towards Earth – but in the process, the cosmic rays collide with the particles in the sun's atmosphere, creating gamma rays.

We have known for about a decade that the sun produces some gamma rays with energies higher than expected, but now data from the High-

Altitude Water Cherenkov (HAWC) observatory in Mexico has shown evidence of even higher-energy light. The gamma rays that Mehr Un Nisa at Michigan State University and her colleagues found when they analysed more than six years of observations from HAWC were in the teraelectronvolt (TeV) range, similar to the energy of the particles that are smashed together at the Large Hadron Collider.

"This is completely unprecedented – people did not think that the sun was going to be this bright in TeV gamma rays," says Nisa. "This light is a trillion times more energetic than the light from a normal light bulb."

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Light at such high energies is difficult to produce, especially since the sun's magnetic field is expected to completely repel cosmic rays with extremely high energies. This should minimise the chances of the cosmic rays interacting with the sun's atmosphere to generate gamma rays. The researchers spotted some signs of high-energy cosmic rays being repelled during the peak of the sun's 11-year cycle of magnetic activity, but clearly some of the high-energy cosmic rays must be reaching the sun.

"Given what we know about the sun's atmosphere, how dense it is, what those magnetic fields are like, the numbers don't add up to get this amount of high-energy radiation," says Nisa. "There are exotic ideas – like dark matter being captured in the sun that can annihilate to produce particles that could eventually be emitted in the form of gamma rays – however those are just ideas at the moment."

Many of those ideas don't match up to what HAWC detected. For example, any explanation invoking new particles inside the sun wouldn't naturally produce variations in the amount of high-energy gamma rays over the course of a solar cycle. For now, how the sun is producing so much high-energy light remains a mystery.

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