Do ripples on the surface of the sun tell us that a flare is coming?

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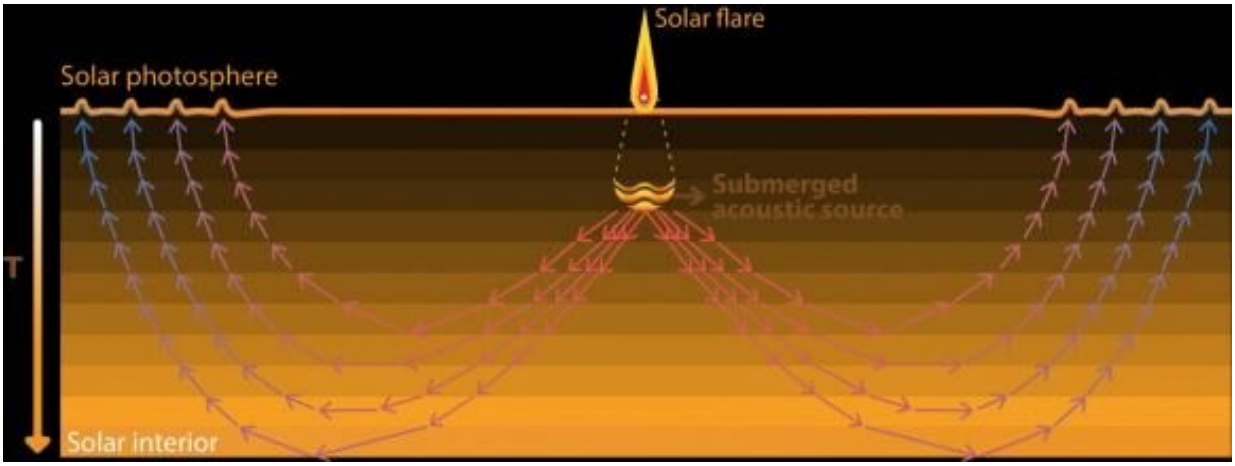

Solar flares produce waves with paths that bend up to the surface, revealing themselves as ripples on the surface. Credit: UC Berkeley/Juan Camilo Buitrago-Casas

Flares from the sun are some of the nastiest things in the solar system. When the sun flares, it belches out intense X-ray radiation (and sometimes even worse). Predicting solar flares is a tricky job, and a new research paper sheds light on a possible new technique: looking for telltale ripples in the surface of the sun minutes before the blast comes.

The sun's magnetic fields are usually nice and calm, but they can become tangled up with each other. When they do, they store a massive amount

of energy. And when they finally snap, it's like a giant Earth-sized rubber band reaching the breaking point. These events are known as solar flares, and they are one of the most energetic events in the solar system.

To give you some sense of scale, a typical solar flare equals the energy released from more than ten million volcanic eruptions.

These flares can cause havoc in the solar system, and sometimes get even worse in the form of coronal mass ejections, forcing satellites to shut down and astronauts to find shelter.

Over the past few decades, astronomers have gotten better at staring at the sun. They've noticed in those observations that the sun is constantly shaking and quaking, ringing like a bell from all the tumultuous energies rippling through it.

And some of those "sunquakes" are distinctly connected to solar flares.

When a flare goes off, a huge amount of energy is released above the surface of the sun, and a corresponding huge amount of energy is released below the surface. Like setting off an underground nuclear bomb, it triggers seismic waves that travel in all directions.

But the seismic waves that travel downwards meet resistance in the hotter, denser parts of the sun's interior. This causes them to refract, bending back upwards to the surface. When they arrive, they reveal themselves as a set of sunquakes centered on the flare.

Usually these ripples appear up to 20 minutes after the flare, but new research has found that most of the energy driving the ripples comes from deep below the surface. This means that whatever magnetic forces are powering the flares, they start deep down.

Not every release of magnetic energy leads to a flare. And we do not understand the exact relationship between magnetic release and flare appearance. This means that it might be possible to hunt for the sunquakes as a forewarning of a flare, not as a consequence, helping future solar weather monitoring systems prepare the system for another disaster.

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