

Offered Title: Studying the Sun's Corona

I know this part of the country will not get the totally awesome, totally spectacular, totally total eclipse, but, we still get a 65-70% eclipse. That can be cool to see. Just use protection, or one of the methods I outlined in previous total solar eclipse articles, or go to NASA's website, they have several options.

Just wait, in April of 2024 we will have our own total solar eclipse and it will be totally awesome, assuming it's not cloudy. No clouds allowed!

Beyond the sheer excitement of experiencing a total solar eclipse, there will be a lot of science going on. One area of study will be the Sun's corona and its unbelievably high temperatures. We're talking millions of degrees centigrade (C). No one knows why it's so hot but there are hypotheses to be tested. Just below the corona, in the chromosphere, temperatures are a measly 10,000 C. What gives?

Two new hypotheses suggest activity within coronal loops cause this dramatic jump in temperature.

A coronal loop is a plasma filled magnetic flux tube coming out of the Sun usually at a sunspot and re-entering the Sun in another sunspot. They're kind of like the water loops in some airports entertaining the crowd, or in town center play areas where kids can get wet without getting yelled at. Coronal loops are a result of the Sun's spinning, churning, and bubbling nature. All this causes its internal magnetic fields to get magnified and twisted and shoot out of the Sun in the form of plasma filled flux tubes. Most of the time they just drop back as a loop, due to the Sun's very strong gravity. Occasionally one will be so energetic it reaches escape velocity and becomes a flare or coronal mass ejection (CME). Look out!

One of the new hypotheses considers the possibility of undetected nanoflares (tiny) occurring within coronal loops as twisting flux tubes interact. Sometimes their magnetic polarity gets reversed and energy is released as nanoflares. Nanoflares can generate local coronal heating as high as 10 million degrees C. The nanoflares will need to be detectable and many in number (millions) to support this hypothesis.

Another new hypothesis proposes certain magnetic waves, called Alfvén waves propagating within coronal loops, but coming up from both ends. They interact within the loop and dissipate the energy as heat.

An older proposed possibility for heating the corona is magnetic field oscillations. All this shaking going on might cause the corona to heat up.

These hypotheses and others will be tested during the minutes of totality available.

A little trivia...The corona is actually better viewed by ground based telescopes at totality, than space based coronagraphs. This is because our atmosphere attenuates the extreme brightness.

What's in the Sky?

On a clear night go out around 9 pm and look straight up. The very bright (0 magnitude) star you see is Vega, alpha star of Lyra, the lyre.