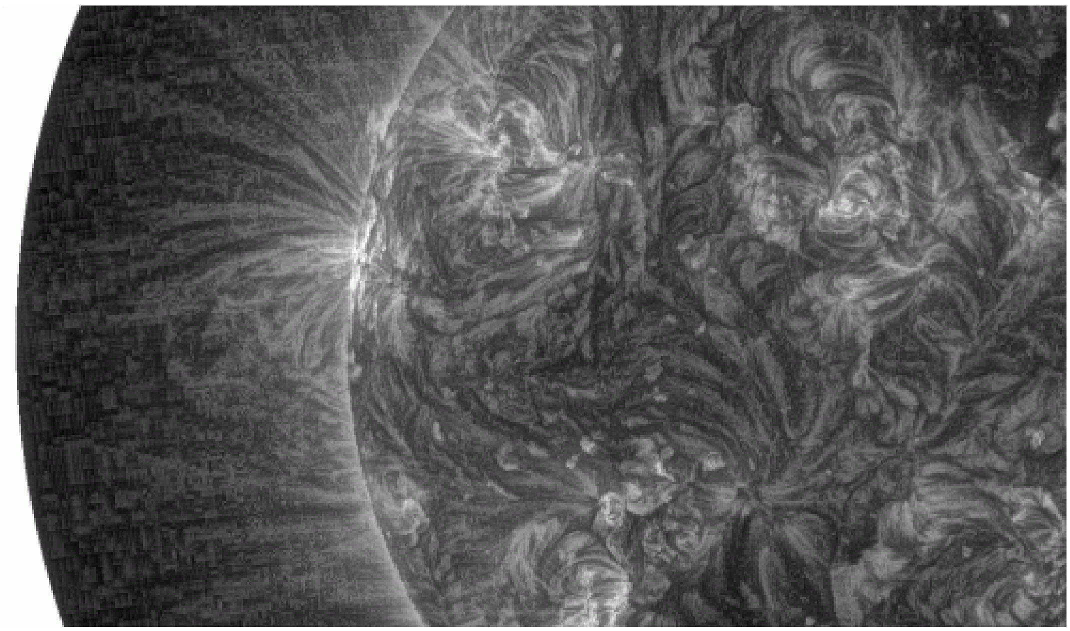
Puffing Sun gives birth to reluctant eruption

June 23 2014



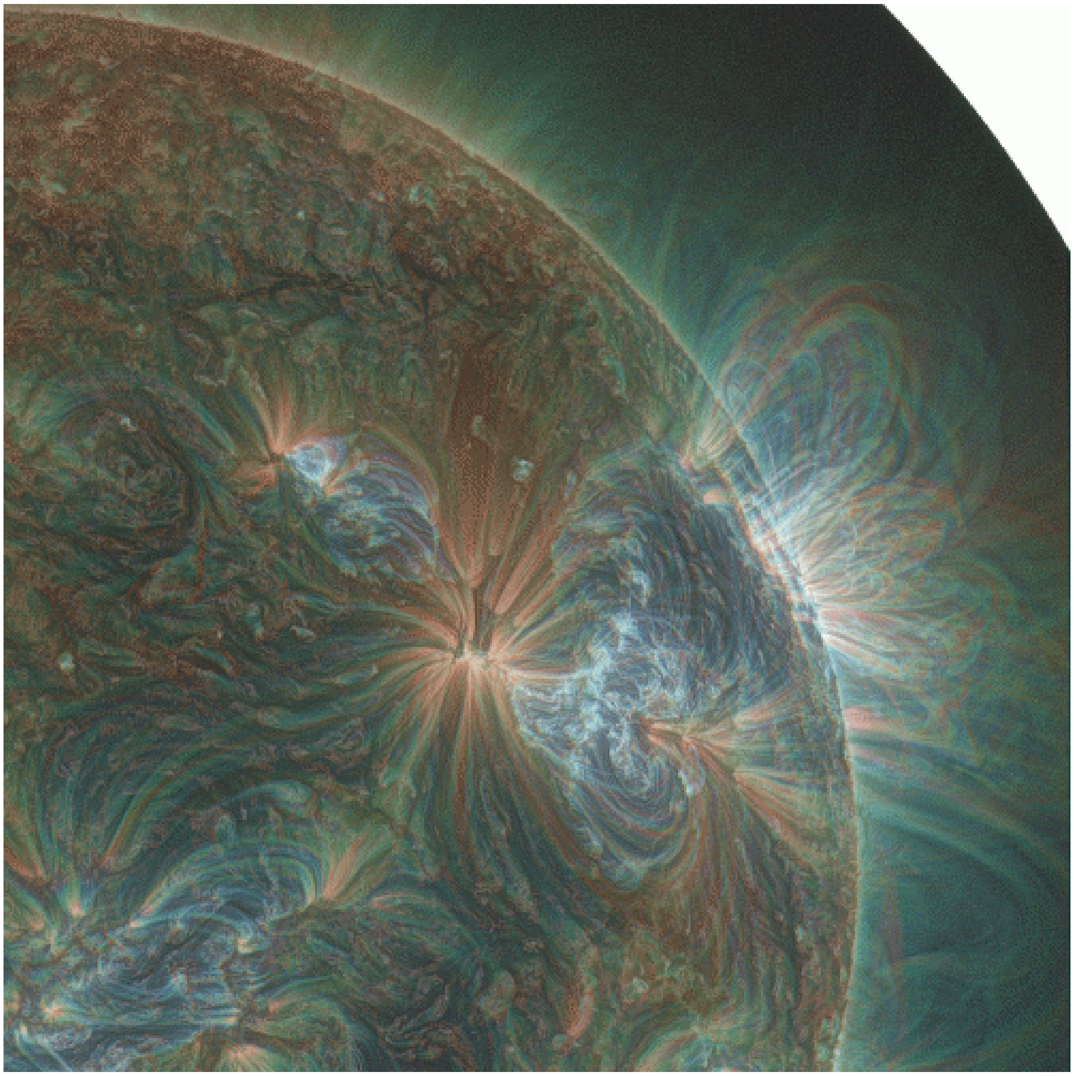
The same jet as in the previous image, this time viewed by the Extreme Ultra-Violet Imager (EUVI) onboard the STEREO mission. The combination of the two viewpoints enables a good idea of the 3D configuration of the events. Credit: STEREO/U. Aberystwyth.

(Phys.org) —A suite of Sun-gazing spacecraft, SOHO, STEREO and Solar Dynamics Observatory (SDO), have spotted an unusual series of eruptions in which a series of fast 'puffs' force the slow ejection of a massive burst of plasma from the Sun's corona. The eruptions took place over a period of three days, starting on 17 January 2013. Images and animations of the phenomena will be presented at the National Astronomy Meeting 2014 in Portsmouth by Nathalia Alzate on Monday

23 June.

The Sun's outermost layer, the corona, is a magnetised plasma that has a temperature of millions of degrees and extends millions of kilometres into space. The LASCO C2 coronagraph aboard the SOHO spacecraft observed puffs emanating from the base of the corona and rapidly exploding outwards into interplanetary space. The puffs occurred approximately once every three hours; after about 12 hours, a much larger eruption of material began, apparently eased out by the smaller-scale explosions. By looking at high-resolution images taken by SDO and STEREO over the same time period and in different wavelengths, Alzate and her colleagues at the University of Aberystwyth were able to focus down on the cause of the puffs and the interaction between the small and large-scale eruptions.

"Looking at the corona in Extreme UltraViolet light we see the source of the puffs is a series of energetic jets and related flares," explained Alzate. "The jets are localised, catastrophic releases of energy that spew material out from the Sun into space. These rapid changes in the magnetic field cause flares, which release a huge amount of energy in a very short time in the form of super-heated plasma, high-energy radiation and radio bursts. The big, slow structure is reluctant to erupt, and does not begin to smoothly propagate outwards until several jets have occurred."



One of the multiple jets that lead to the coronal 'puffs', observed by the Solar Dynamics Observatory (SDO). This image has three channels - red, green and blue, corresponding to three coronal temperature regimes ranging from ~0.8Mk to 2MK. Credit: SDO/U. Aberystwyth.

Because the events were observed by multiple spacecraft, each viewing the Sun from a different perspective, Alzate and her colleagues were able to resolve the 3D configuration of the eruptions. This allowed them to estimate the forces acting on the slow eruption and discuss possible mechanisms for the interaction between the slow and fast phenomena.

"We still need to understand whether there are shock waves, formed by the jets, passing through and driving the slow eruption, or whether magnetic reconfiguration is driving the jets allowing the larger, slow structure to slowly erupt. Thanks to recent advances in observation and in image processing techniques we can throw light on the way jets can lead to small and fast, and/or large and slow, eruptions from the Sun," said Alzate.

Provided by Royal Astronomical Society

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