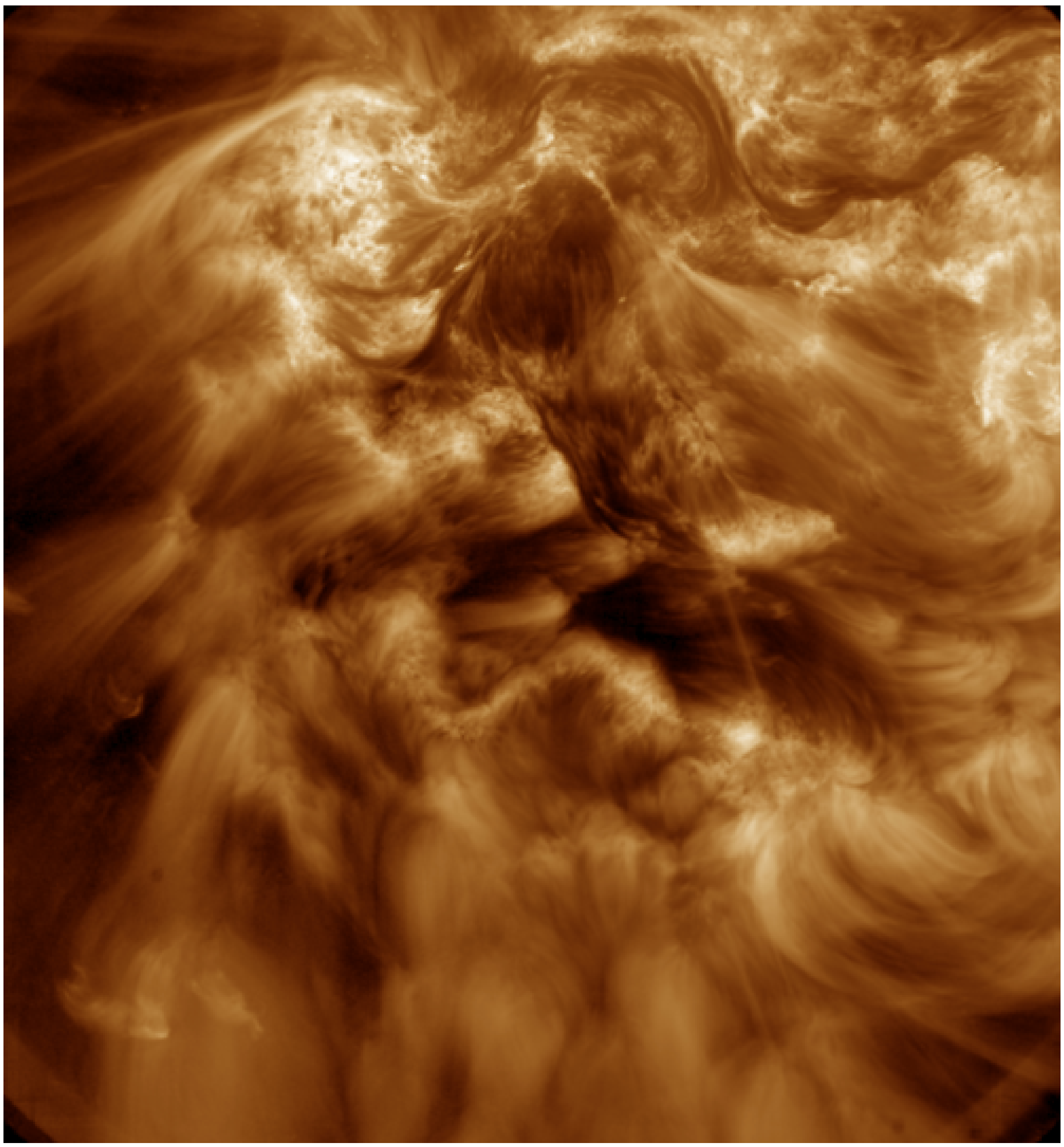
Solar moss shakes at 16,000 km an hour

June 23 2014, by Robert Massey



A High Resolution Coronal Imager (Hi-C) image of solar moss, as seen in Extreme Ultra-Violet light (a wavelength of 19.3 nm), where the observed material is at a temperature of between 1 and 2 million degrees Celsius. The region under observation is an area of high magnetic activity, with sunspots located underneath the coronal features. The moss structures are the brightest objects in the image and form the predominant component of the active region. However, the individual moss elements, with diameters of just 300 km, are relatively small compared to the size of the active region, which is around 300,000 km square. Credit: R. Morton / H. Morgan

(Phys.org) —Using a state-of-the-art ultraviolet camera, two astronomers from Northumbria University have obtained exceptionally sharp images of 'solar Moss', bright features on the Sun that may hold the key to a longstanding mystery. Dr James McLaughlin will present their findings at the National Astronomy Meeting (NAM 2014) from 23-26 June in Portsmouth.

The NASA-built High Resolution Coronal Imager (Hi-C) was first launched in July 2012 on a sounding rocket, operating for five minutes on its maiden flight. It observed the Sun at extreme ultraviolet wavelengths (far beyond the blue end of the visible spectrum) and in this light has produced the sharpest images of the outer atmosphere of the Sun - the corona - to date. Hi-C was designed to help scientists solve the longstanding mystery of why the tenuous corona (with a typical temperature of 2 million degrees Celsius) is so much hotter than the surface of the Sun beneath (typically 5500 degrees Celsius).

Hi-C's camera has five times the number of pixels as the latest generation of ultra-high definition (UHD) televisions. Images from it are sharp enough to allow the fundamental structures of the corona, which are strongly shaped by magnetic fields, to be resolved. During its flight, the camera was centred on a region where the magnetic field was particularly strong and where a phenomenon known as Moss is found. In the Hi-C images, the Moss appeared as some of the brightest features, forming net-like (reticulated) patches of emission.

Moss forms the lower sections of the hottest structures in the corona, the upper parts of which are invisible to the Hi-C camera as they predominantly emit X-rays. But studying its behaviour has allowed researchers to obtain key information on the underlying events that heat the corona. For example, there is significant evidence that the Sun's complex magnetic field, which pervades the entire solar atmosphere and provides the framework for its beautiful structures, plays a decisive role.

With his colleague Dr Richard Morton, Dr McLaughlin used the Hi-C data to measure the intrinsic properties of the Moss for the first time, discovering that its individual magnetic elements are highly dynamic; shaking back-and-forth at speeds of up to 16,000 kilometres (10,000 miles) per hour.

In the Hi-C images, a violent oscillating motion is seen, which can be interpreted in terms of swaying magnetic waves. Conceptually these are similar to those that are seen to move along a taut string or as an up-and-down wave on a rope. The magnetic waves are of great interest as they are particularly good at transporting energy along the magnetic structures and distributing it around the atmosphere of the Sun.

Dr McLaughlin said: "Our work shows that magnetic waves may play a key role in the heating of the corona. The short duration of the Hi-C data used in this pioneering study only gave us a tantalising glimpse of the hidden secrets of the Sun. They show the need for future instruments that will allow us to truly understand these intriguing phenomena."

Provided by Royal Astronomical Society

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