THE 'GREAT AMERICAN' ECLIPSE 2017:

SOLAR CHROMOSPHERE SPECTRUM

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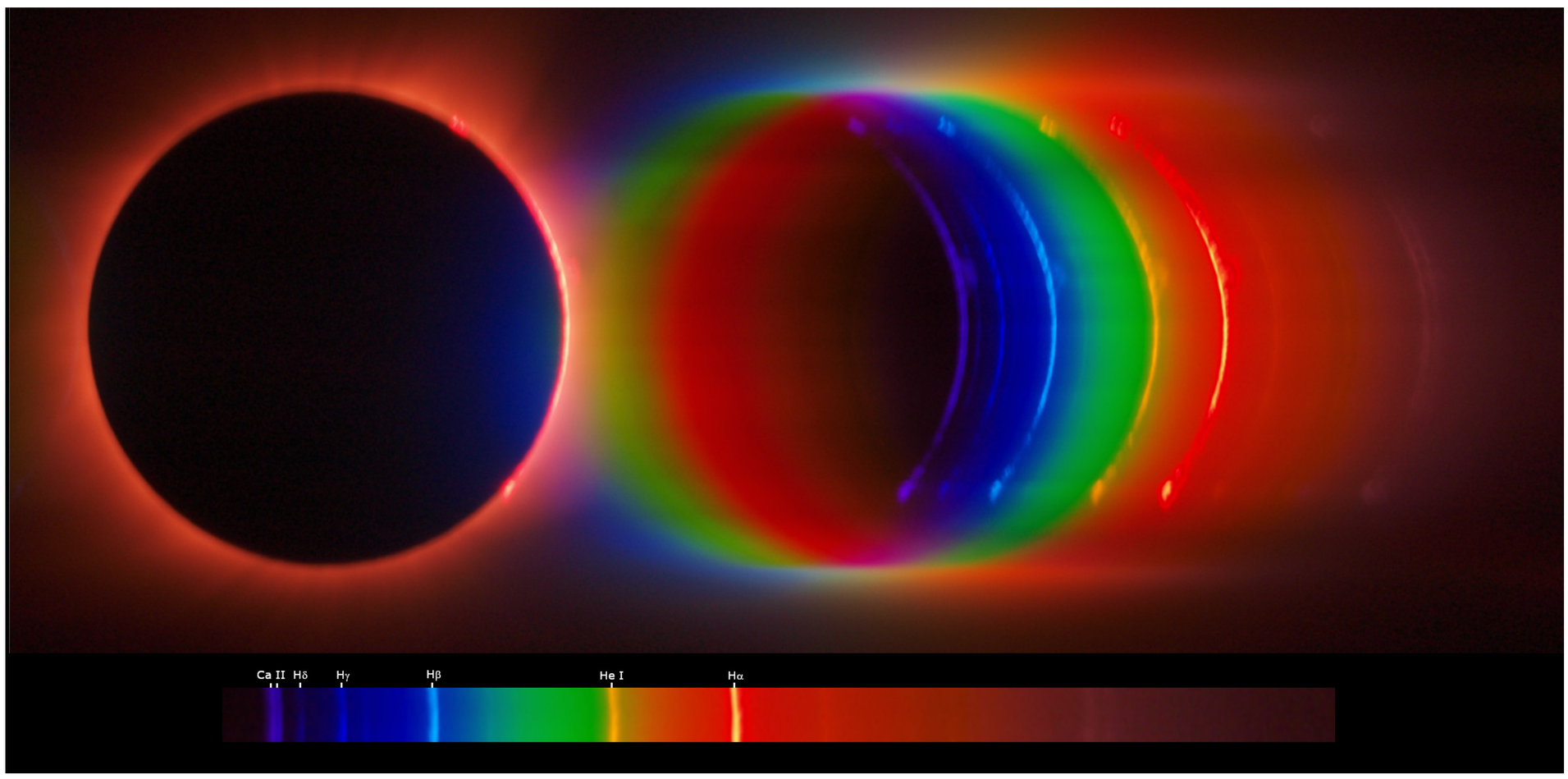
Total Solar Eclipses have been used historically to observe and measure separately different solar regions (Chromosphere and inner and extended Corona). The poster presents a Chromosphere Flash Spectrum captured during the Total Solar Eclipse occurred in USA on the Summer of 2017. It was imaged by the CESAR Expedition from Casper, Wyoming on August, 21st 2017 at 10:45 UTC.

The Chromosphere is the layer of the Sun Atmosphere directly above the turbulent surface of the Photosphere. It extents about 5000 km over and the temperature rises from 6000°C to about 20000°C. Due to this temperature variation it is a very dynamic region that presents several features like prominences, spicules, filaments, etc. Its spectrum is dominated by emission lines produced by different chemical elements. Due to its low density, 10000 times lower than the photosphere, the Chromosphere is normally invisible and it can be seen directly only during total eclipses.

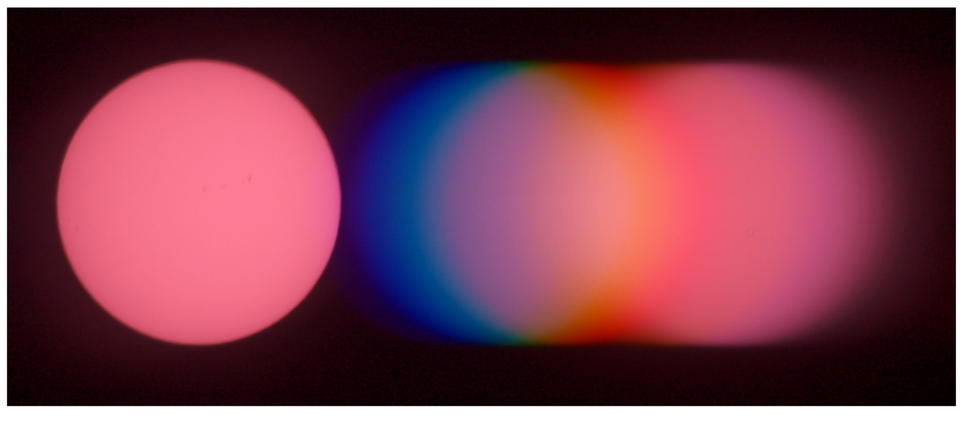
Together with other eclipse aspects, the CESAR team planned to capture a flash spectrum of the Chromosphere. It can be obtained with the last and first light of the solar limb just before and after the eclipse totality. These are the moments when only the Chromosphere is visible. As it has to be done in a very short time, this is the reason why it is called "flash spectrum".



The flash spectrum shown here was produced by the very first solar limb observable after the totality. The exposure to capture this image was exactly 1/30 s. At this moment the Sun's emission is split into a spectrum of colors, showing the fingerprint of different chemical elements of the Chromosphere. In addition, the continuous spectrum of another differentiated region of the solar atmosphere is observed in the background: the Corona.

This experiment was performed by French astronomer Pierre Janssen and others from India during the Total Eclipse on Aug. 18, 1868 trying to measure the spectrum of the prominences. The event marks the first discovery of an "extraterrestrial" element, as it had not yet been found on Earth. Initially the yellow line marked in the image was thought to be produced by Sodium. However, Janssen captured the line with more accuracy and it was concluded that it had to belong to some other element. It was later named Helium. This element was finally found and isolated on Earth by Scottish chemist William Ramsay on 1895.

For this experiment, a specific spectrograph was built at ESAC integrating a Maksutov-Cassegrain Teleojective 500mm together with a Blazed Diffraction Grating 207 lines/mm and an Olympus E-420 DSLR camera sensible to the near-infrared part of the Spectrum. In this device an image of the Sun is produced at left and the spectrum of each point of the Sun superposed at the right.



http://cesar.esa.int/index.php?Section=Total_Eclipse_2017