THE 'GREAT AMERICAN' ECLIPSE 2017:

SOLAR CORONA POLARIZATION

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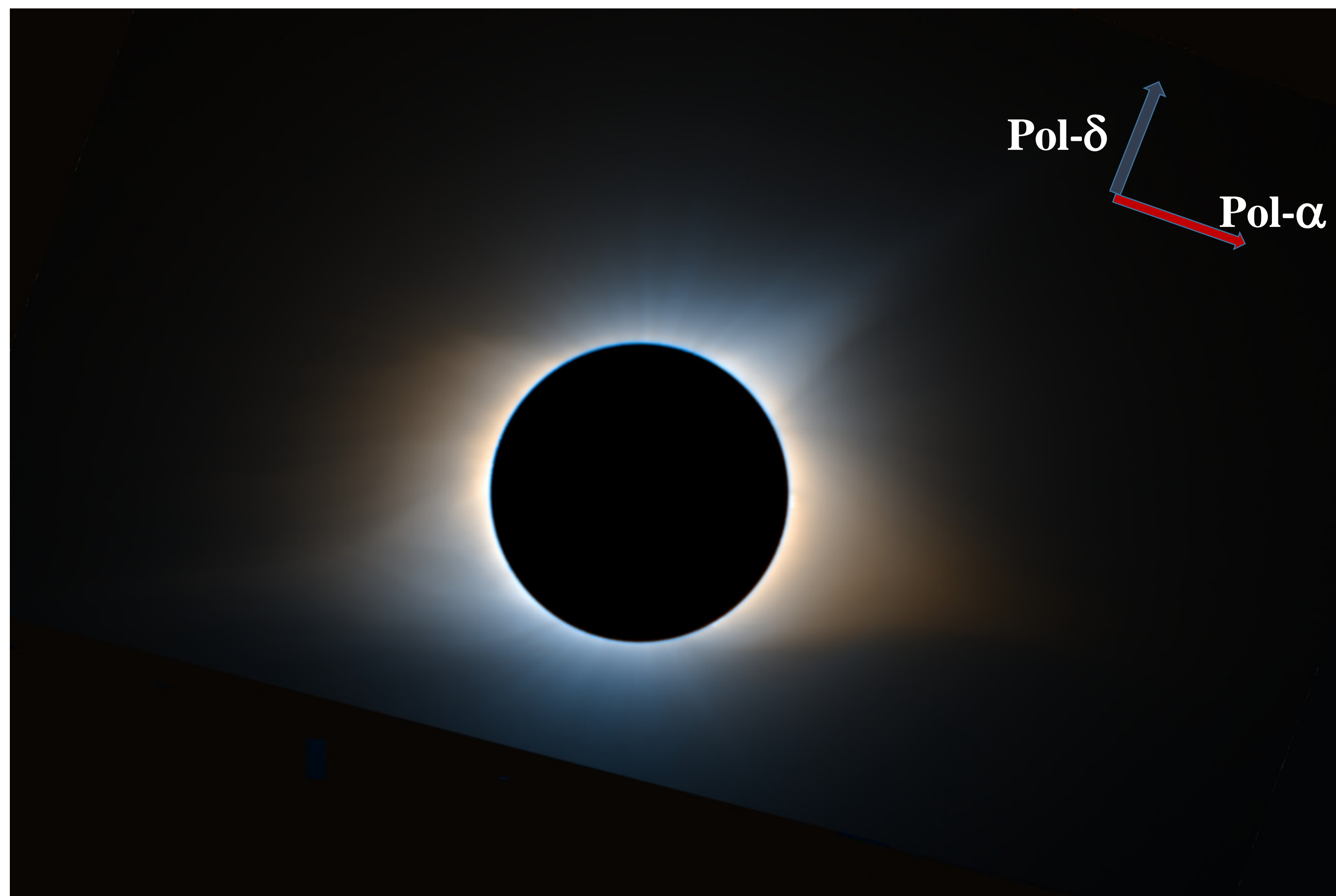
Total Solar Eclipses have been used historically to observe and measure separately different solar regions (Chromosphere and inner and extended Corona). Polarization images of the Corona observed during the Total Solar Eclipse occurred in USA by the CESAR Expedition from Casper, Wyoming on August, 21st 2017 at 10:45 UTC.

The Solar Corona is the outer layer of the Sun Atmosphere. It is composed by plasma and it extends million of kilometers into the space. Due to its low density the Corona is masked by the Sun Photosphere. Although the Outer Corona is observable with coronagraphs, the Inner Corona can be seen directly only during total eclipses.
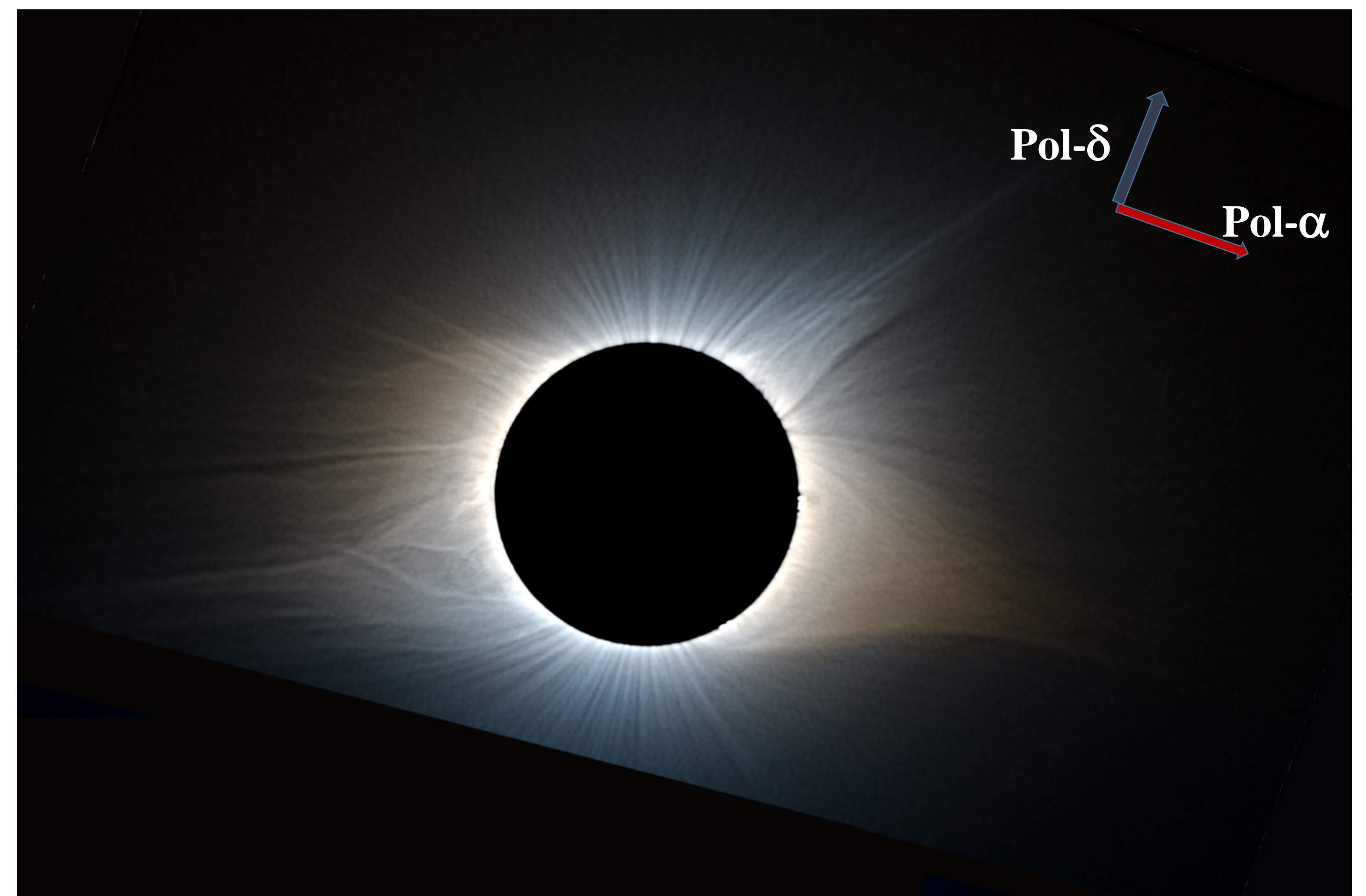
The Solar corona displays a continuous emission spectrum and is found to be strongly polarized (K-corona). It arises out of photosphere light that is scattered by the free electrons (Thomson scattering) of the coronal gas as they are oriented by the Sun magnetic field. Other contributions to corona brightness are produced by diffraction of dust near the observer (F-corona) and hence it is un-polarized.

The polarization of coronal emissions is an excellent tool to diagnose key plasma parameters (e.g., magnetic fields, densities, temperatures, velocities, etc.) to better understand complex coronal phenomena, such as the solar activity, coronal heating and the acceleration of the solar wind. Therefore, together with other eclipse aspects, the CESAR team planned to capture images of the Solar Corona in different polarizations. For this purpose, a double imaging ensemble was built integrating 200mm Teleobjectives with Canon DLSR cameras and two horizontal polarizers, one oriented in right ascension and another in declination.
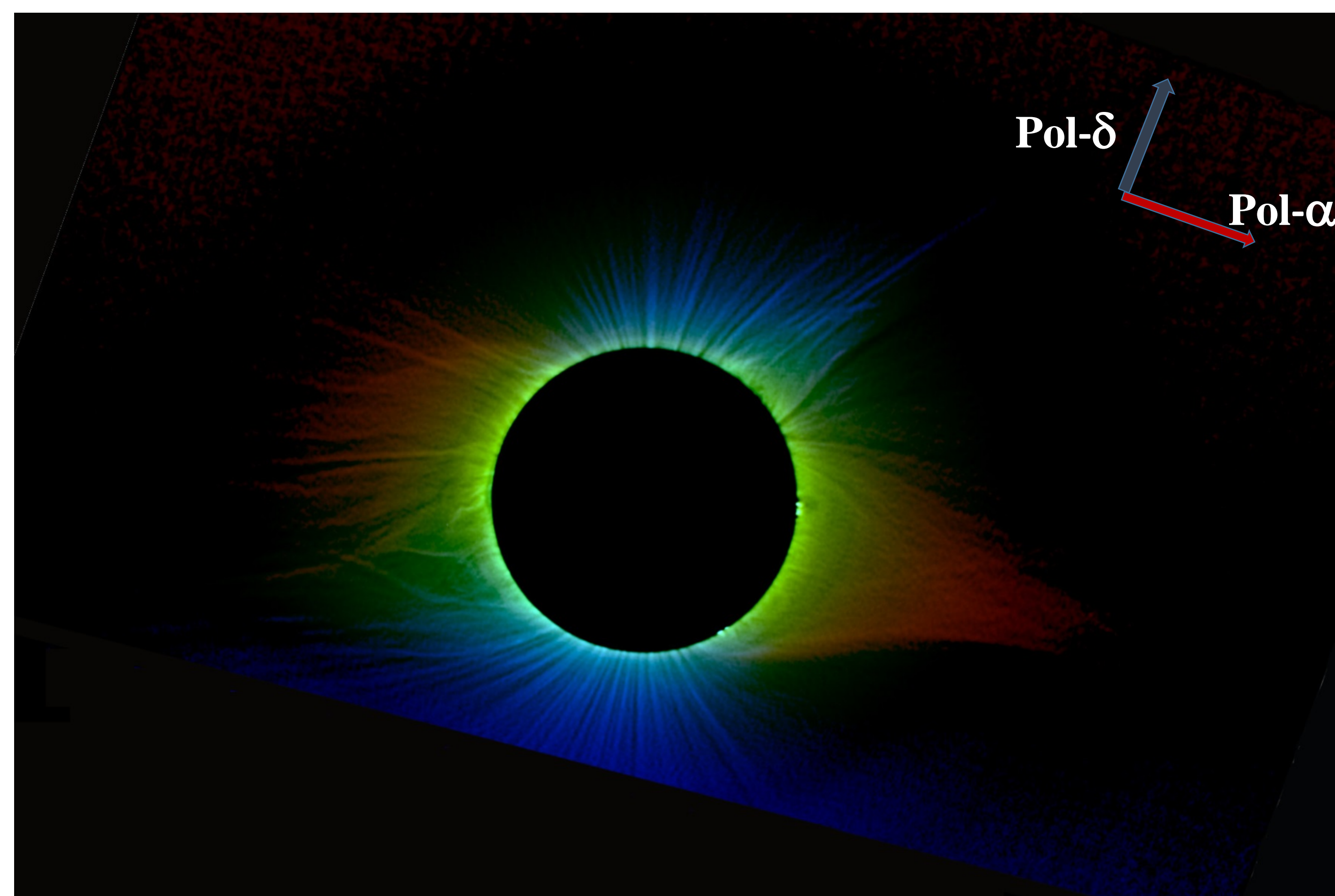
The following images are false color combinations of the obtained polarized images and their rotational gradients.

R: Pol-α G: Pol-α+Pol-δ B: Pol-δ

R: Pol-α G: Pol-α+Pol-δ B: Pol-δ L:RotGrad(Pol-α+Pol-δ)

R: Pol-α/(Pol-α+Pol-δ)   G: Pol-α+Pol-δ B: Pol-δ/(Pol-α+Pol-δ)   L:RotGrad(Pol-α+Pol-δ)

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