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First Solar Orbiter observation of a Dark Halo in the solar atmosphere

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Dark halos (DHs) are regions of reduced emission compared to the quiet Sun that are observed around active regions (ARs) at various wavelengths and wavebands, corresponding to chromosphere, transition region (TR) and corona. While in the chromosphere DHs are associated with the $H\alpha$ fibril vortex around the AR cores, in the upper atmospheric layers the origin of their dark emission is still unknown. Because of their different spatial appearances, it is not even clear if the DHs observed at the different layers are related to each other. In this work we present the first Solar Orbiter's observation of a DH in the solar atmosphere which includes EUV, SPICE and PHI data taken on the 19 March 2022, when Solar Orbiter was approaching its fourth perihelion. We take advantage of Solar Orbiter's proximity to the Sun to study the temporal evolution of the 174 \AA DH's fine structure with unprecedented spatial resolution. We also show cospatial and cotemporal intensity maps of SPICE's cooler spectral lines to reveal the DH's response to TR temperature increase. Finally, we spatially correlate the DH observed with EUV and SPICE to the PHI's BLOS magnetogram in order to shed light on the dark nature of DHs.

Primary author: LEZZI, Serena Maria (Istituto Nazionale di Astrofisica (INAF))

Co-authors: Prof. LONG, David M. (School of Physical Sciences, Dublin City University, Glasnevin Campus, Dublin D09V209, Ireland); ANDRETTA, Vincenzo (Istituto Nazionale di Astrofisica (INAF)); BAKER, Deborah (UCL/MSSL); Dr DOLLIU, Antoine (Institut d'Astrophysique Spatiale, Bâtiment 121, Rue Jean Dominique Cassini, Université Paris Saclay, 91405 Orsay, France); MURABITO, Mariarita (Istituto Nazionale di Astrofisica (INAF)); PARENTI, Susanna (Institut d'Astrophysique Spatiale, CNRS/Université Paris-Saclay); Dr ZAMBRANA PRADO, Natalia (University College London, Mullard Space Science Laboratory, Holmbury St. Mary, Dorking, Surrey, RH5 6NT, UK)

Presenter: LEZZI, Serena Maria (Istituto Nazionale di Astrofisica (INAF))

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