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The Euclid survey: a new window on the last 10 billion years of cosmic history

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Observational cosmology has made incredible progress in the last couple of decades, thanks to, notably, very precise observations of the Cosmic Microwave Background fluctuations, supernovae, galaxy clusters and large galaxy surveys. We now have good evidence that we live in an ever-expanding, accelerating Universe, spatially very close to flat, and the main cosmological parameters have been determined with accuracy, even though some residual controversies may remain on H0 and others. However, the "elephant in the room"of this picture-perfect knowledge of our Universe is the massive presence of Dark Matter and Dark Energy (or vacuum energy), together accounting for ˜95% of the energy content of the Universe.
In order to better understand these mysterious components, the European Space Agency is implementing the Euclid mission, a 1.2 m space telescope with two focal instruments: the Visual Imaging Channel (VIS) and the Near-Infrared Spectrometer and Photometer (NISP). Each field of view is a 0.8 x 0.7 deg. tile with four dithers, with each dither in turn split into VIS imaging, NISP imaging and NISP spectrometry observations. VIS observes in a large unique visible band (0.55 −0.9 μm) with a 24.5 mag (10 σ ext.) sensitivity thanks to 36 4kx4k CCD arrays, and reaches a pixel size of about 0.1". NISP photometry consists of three wide near-infrared bands (Y: 0.9 −1.1 μm, J: 1.1 −1.4 μm, H: 1.4 −2 μm) with a sensitivity of 24 mag (5 σ point source) and 0.3"pixel size. The NISP slit-less spectrometer works in the 1.1 −1.85 μm range with a spectral resolution > 380 assuming a 0.5"aperture. Euclid will be launched in 2021 by Soyuz from Kourou, French Guiana, to the Sun-Earth L2 point.
In this presentation, I will explain how the Euclid survey will help bettering our knowledge of DM and DE, through a very large survey of galaxies, most of them at z < 3, and also through three deep fields that are targeting higher-redshift galaxies. I will also give some details on the way the Euclid team is building the survey and plans to operate it during the six years of Euclid lifetime.

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