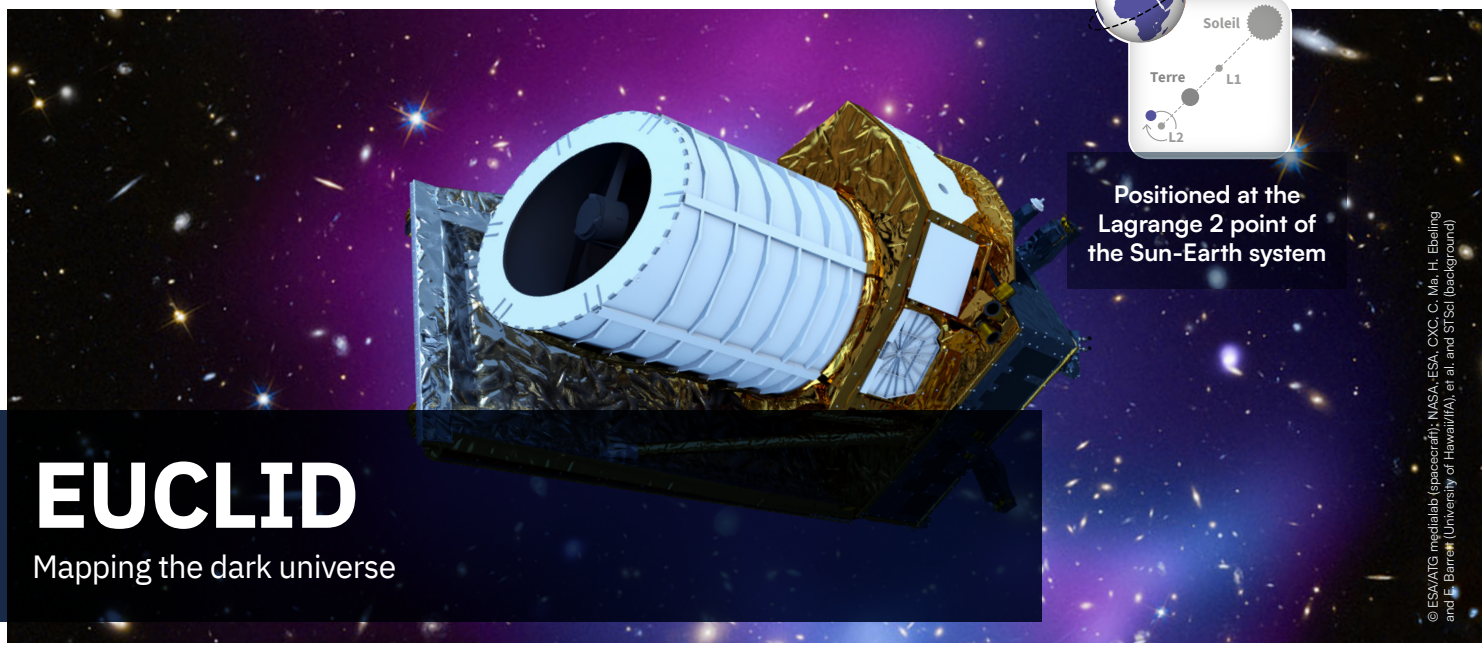
Dark matter and dark energy



EUCLID

Mapping the dark universe

Scientific leader: Stéphanie Escoffier (CPPM) *

Laboratories involved: APC (Paris), CC-IN2P3 (Lyon), CPPM (Marseille), IP2I (Lyon), LPSC (Grenoble)

Nature: European Space Agency (ESA) M-class mission

Status: project under construction, financed mainly by Europe

Website: https://www.euclid-ec.org/, https://euclid.cnes.fr/fr

Scientific objectives

Euclid aims to understand dark matter and dark energy, which is 95% of the energy content of the Universe, by mapping it over the last 10 billion years. Dark energy and gravity imprints will be tracked by observing galaxy clustering in a spectroscopic survey of 50 million galaxies. Dark matter will be mapped through the effects of gravitational shear observed in images of over 2 billion objects. Euclid will also explore galaxy evolution, strong lensing, transient objects and exoplanets.

Resources deployed

- Euclid uses a 1,2 metres telescope which, together with the service module, forms a unit 4.5 metres long with a diameter of 3.74 metres and a mass of 2.1 tonnes.
- Euclid was launched in 2023 and placed in a high-amplitude Lissajous orbit (about 1 million kilometres) around the L2 Lagrange point of the Sun-Earth system.
- Euclid has two instruments: VIS for visible light and NISP for infrared radiation. These instruments analyse the light collected and make it possible for scientists to deduce the morphometric, photometric and spectroscopic properties of galaxies.
- A European consortium of 200 laboratories from 17 different countries will be responsible for the very large volume of data generated by Euclid and its scientific exploitation.

200
international laboratories

2 000
consortium members

6
years of operation

17 **participating countries, 14 of which are European**

850GBits
of compressed data per day

IN2P3 CONTRIBUTIONS

- Design and development of the Near infrared spectrophotometer (NISP) instrument by integrating the individual detectors on the infrared focal plane, the largest to fly with this technology.
- Simulation, data reduction and analysis pipeline.
- The scientific axes explored by the IN2P3 teams revolve around the cosmological constraints that will be provided by studies of the distribution of galaxies, clusters of galaxies or cosmic voids, as well as cross-correlations with other cosmological probes such as the CMB or the gravitational shear.

Other french laboratories involved

IAP (Paris), IAS (Orsay), IRAP (Toulouse), IPhT (CEA Saclay), Irfu (CEA Saclay), LAM (Marseille), OCA (Nice), ObAS (Strasbourg), ObsPM (Paris), CNES (Toulouse)

2008 ESA defines a space mission to study dark energy

2011 Euclid is selected as part of ESA's Cosmic Vision programme

2012 ESA gives the Euclid Consortium responsibility for the mission

2015 Construction of the flight model begins

2020 Delivery of the NISP instrument by IN2P3

2023 Launch from Cap Canaveral, United-States

2026 First delivery of Euclid data planned

2029 End of the nominal Euclid mission

* Since 2021

April 2024