

# Astronomy & Cosmology in Spain

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# Roque de los muchachos Observatory

## La Palma -Islas Canarias

### WILLIAM HERSCHEL TELESCOPE



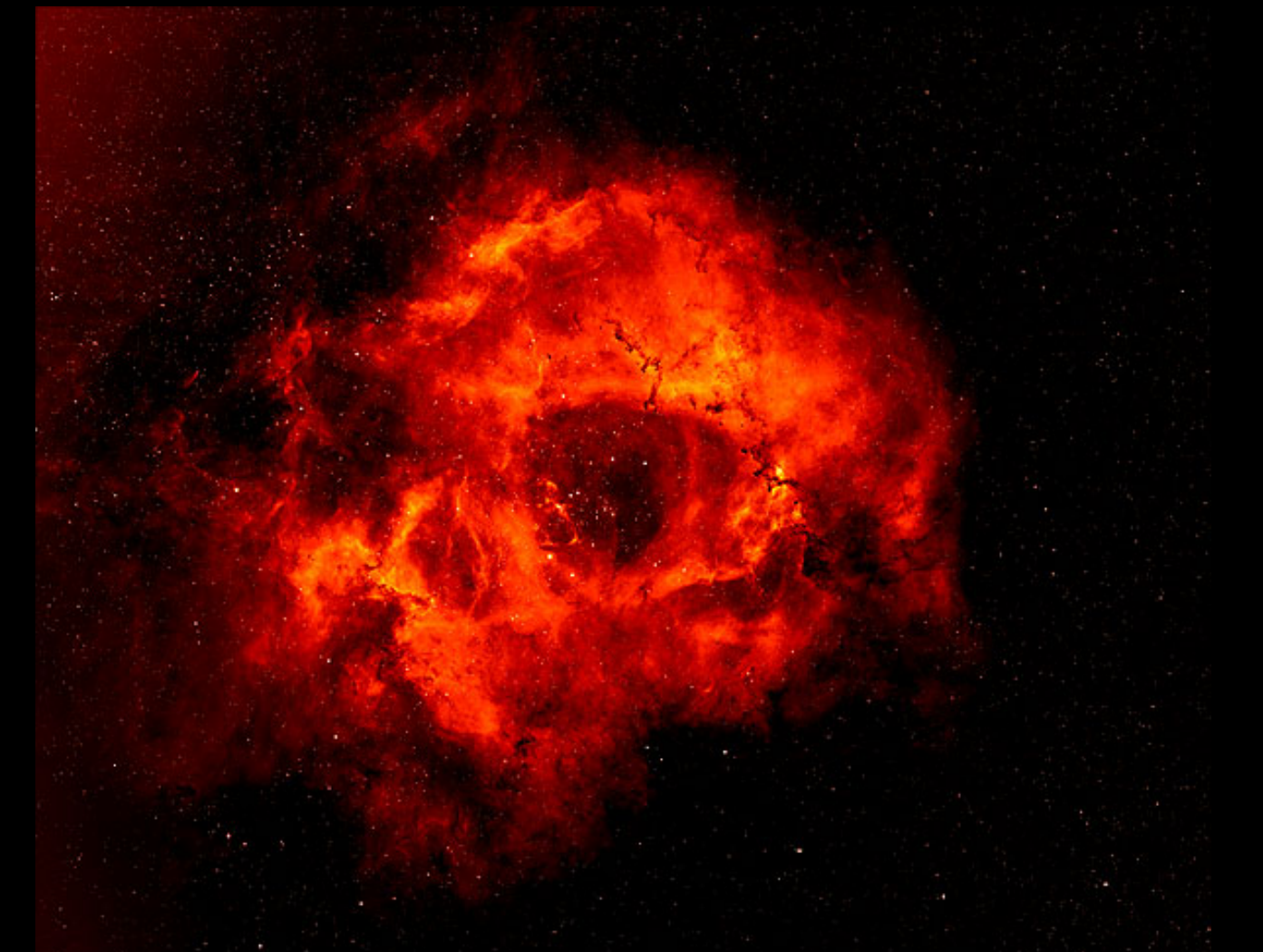
- ★ Part of the Isaac Newton Group of Telescopes (ING)
- ★ Largest optical telescope in Europe
- ★ Superb sky quality
- ★ One of the most scientifically productive telescopes in the world

### ★ HIGHLIGHTS

- ★ 1990s discovered the most distant supernovae ever allowing scientist to conclude that we live in an accelerating Universe
- ★ Discovery of the first brown dwarf



M43, part of the Great Orion Nebula, M42, separated by an impressive, turbulent dark lane.



Rosette Nebula (NGC 2237) thought to be the most-detailed image ever

# Calar Alto Observatory

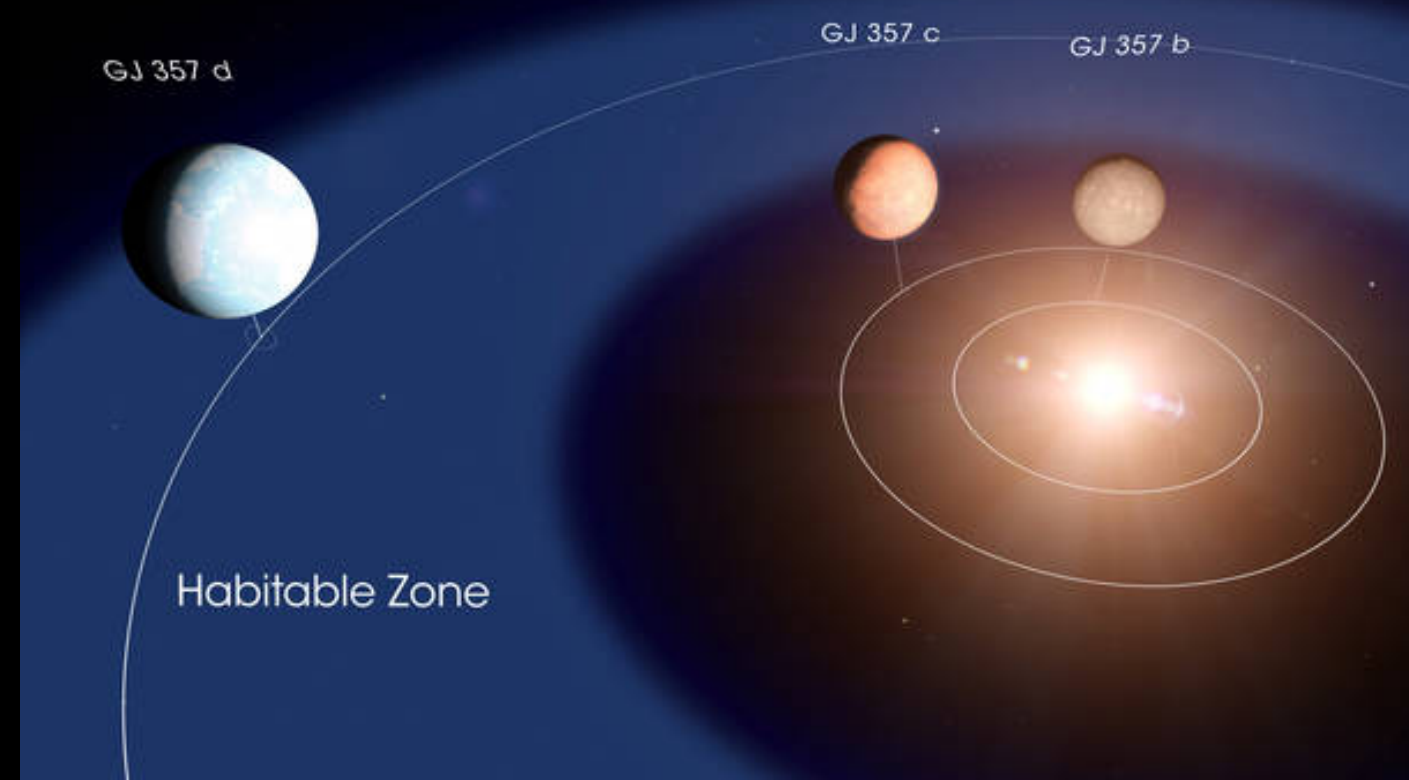
Almería - Andalucía

## CARMENES INSTRUMENT



- ★ Designed to find small exoplanets around cool dwarf stars
- ★ It can also detect satellites and moons of exoplanets.

- ★ **HIGHLIGHTS**
- ★ A giant exoplanet around a tiny star that “should not exist”
- ★ The two most Earth-like planets ever found (around an ultra cool dwarf)
- ★ Two super-earths (one habitable) in the GJ 357 system



The GJ 357 system  
31 light-years away in the Hydra constellation



Hot super-Earth Gliese 486b. Artistic impression.  
Only 26 light-years away from our Sun.

# Calar Alto Observatory

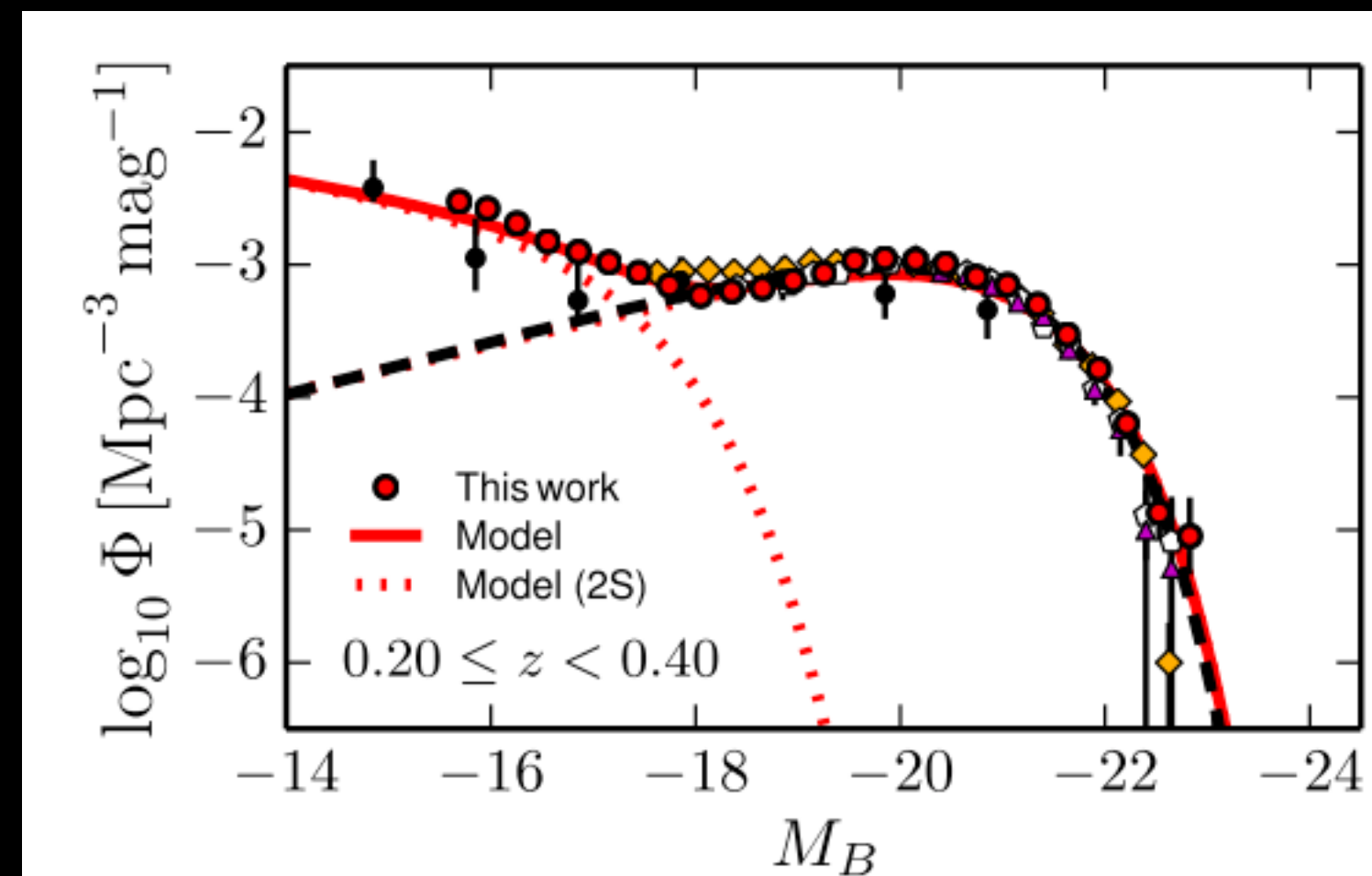
Almería - Andalucía

## ALHAMBRA SURVEY

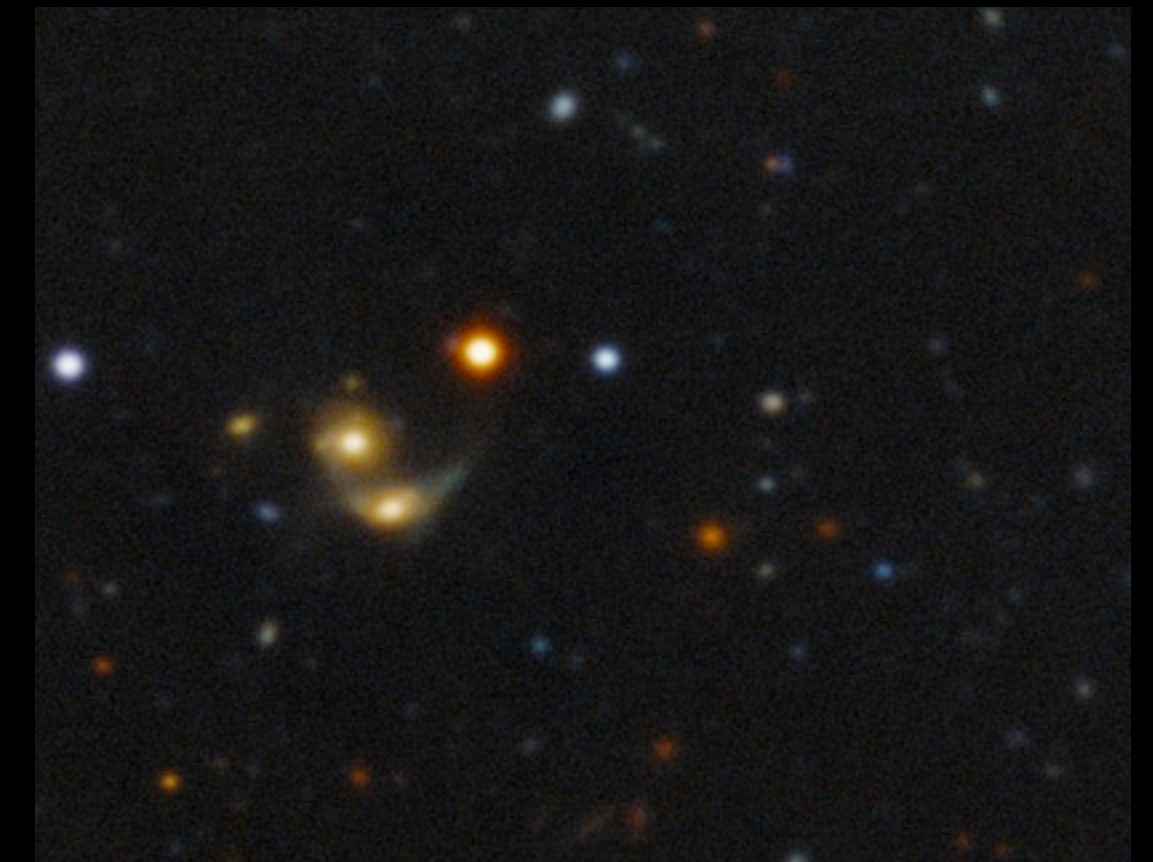


- ★ Main goal is to probe Cosmic Evolution
- ★ Large area coverage and good depth
- ★ Identify populations of objects
- ★ Clustering of galaxies

- ★ HIGHLIGHTS
- ★ Galaxy CATALOGUES with very narrow slices in the radial direction.
- ★ Strong evidence for two types of red (passive) galaxies!



Lopez-Sanjuan + 17.  
Luminosity function of quiescent galaxies.  
Evidence of a faint quiescent population  
mimicking the active galaxies luminosity function.



Merging galaxies.

# Institut de Ciències de l'Espai

Barcelona - Catalunya

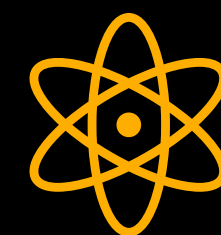
## THE MICE SIMULATION



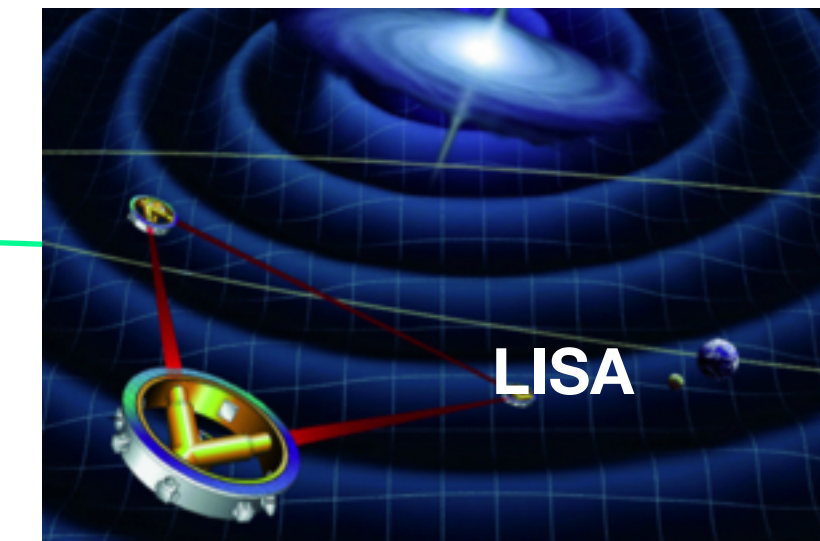
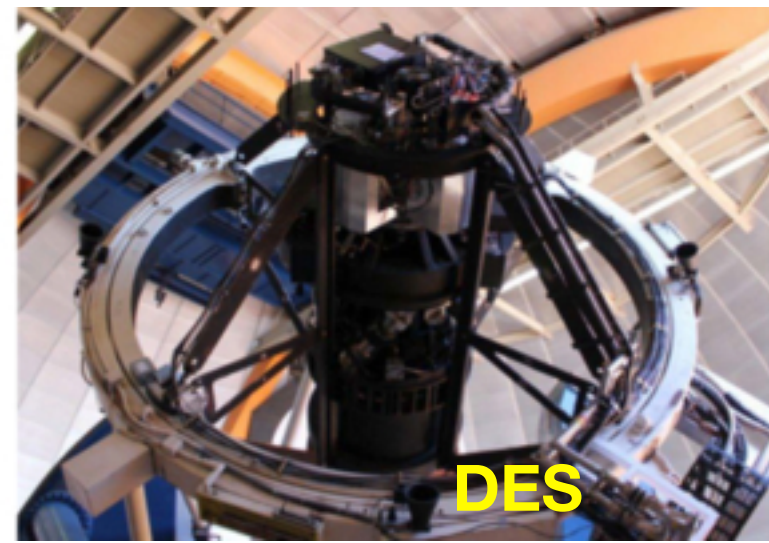
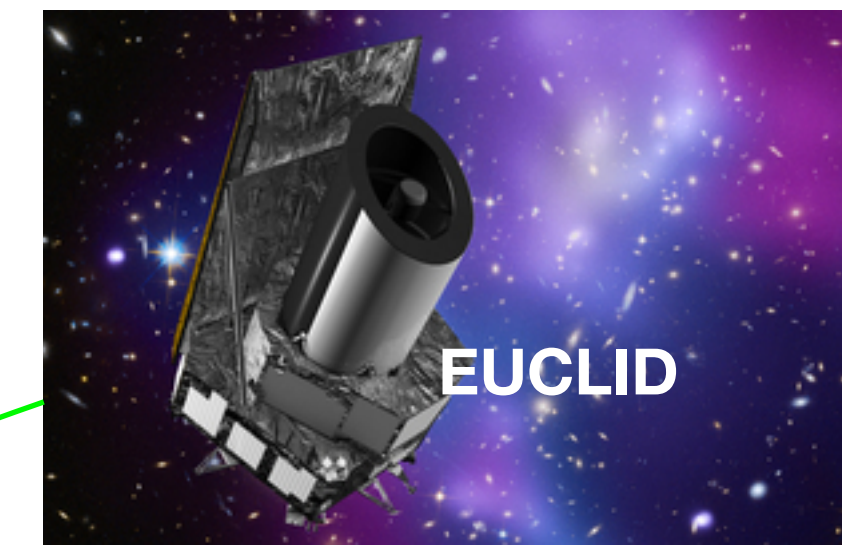
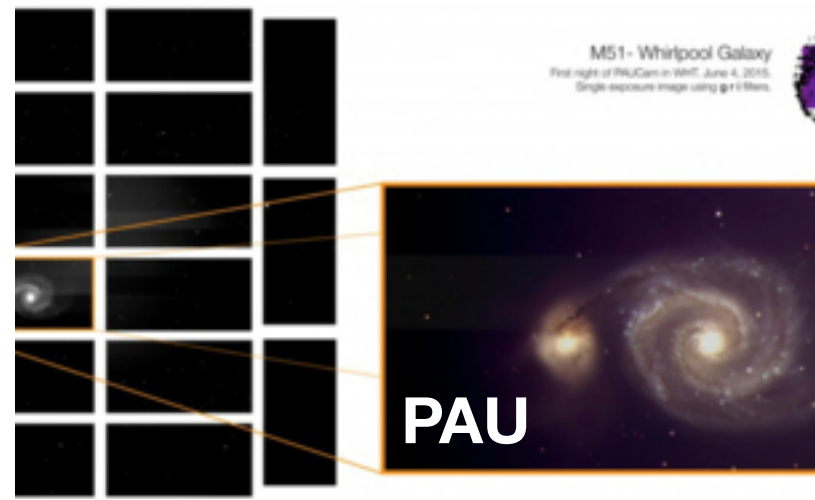
- ★ Simulation of the large-scale structure of the universe.
- ★ Run GADGET on the Marenostrum supercomputer.
- ★ Barcelona supercomputer centre.

### ★ HIGHLIGHTS

- ★ Marenostrum one of the most powerful supercomputers in Europe!
- ★ Largest cosmological dark matter simulations to date!
- ★ Unprecedented detailed history of the Universe.



- ★ How did the large-scale structure of the Universe form?
- ★ Is gravity responsible for it?
- ★ How is this affected by Dark Energy?
- ★ How well astronomical surveys can answer these questions?



**Many more!**



**INTERNATIONAL COLLABORATIONS**

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