

EXO Earths

EXtra-solar planets
and stellar astrophysics:
towards the detection
of Other Earths

New worlds in the cosmos Towards other Earths

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Some history

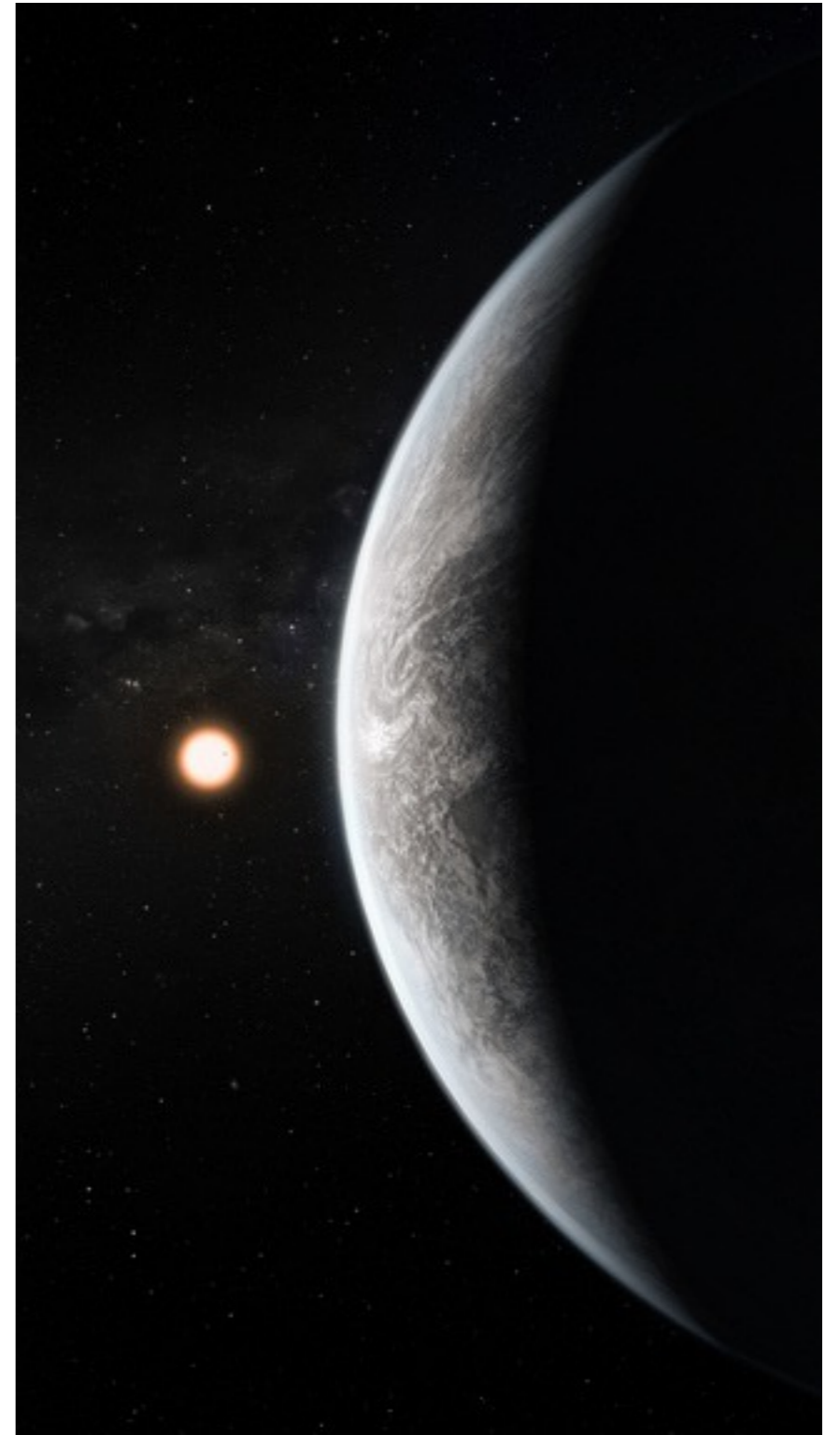
- **1995: discovery of first planet orbiting another star**
 - Giant planet like Jupiter (300x more massive than Earth)
- **Present status:**
 - 750+ extra-solar planets discovered
 - Most are like Jupiter (massive, easier to detect)
- **Models and observations suggest that rocky (small) planets like our Earth should be the most common**
- **Extra-solar planet science became one of the hottest domains of present day astrophysics**

Some BIG questions in exoplanet science

How many Earths are there in the Universe?

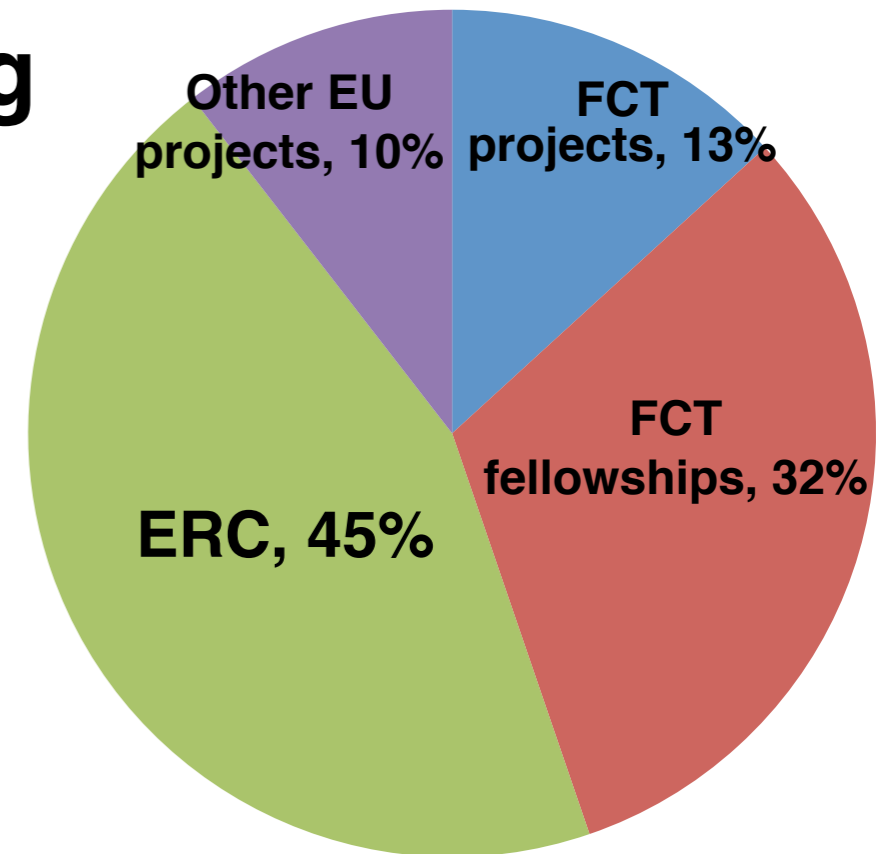
How many planets out there have the conditions for life?

How can we find and characterize them?



The EXOEarths project

- **Funded by ERC starting grant (Oct. 2009-Sept-2014)**
- **Complementary FCT and EU funding**
- **The team:**
 - 8 Researchers
 - 9 PhD students
 - 8 different nationalities!



- **Goals: train and develop a team of researchers to do state-of-the-art research in exoplanet science in Portugal**

Scientific goals of the EXOEarths project

- **Create the conditions for the detection and characterization of Earth like planets in the habitable zones of other “suns”**
- **Understand and overcome the astrophysical limitations for the detection of other Earths using future instruments (ESO/ESA)**
- **Understand the star-planet relation as a way to characterize the planets and determine their frequency in the Galaxy**

EXOEarths in numbers

- 63+ papers published in high impact journals
- 42 oral presentation in international conferences
- Discovery of more than 50 new extra-solar planets
- 5 European Southern Observatory (ESO) Press releases
- 100+ articles in national and international media with results from the research



An example research result

- **Detection of a planet with 3.6 times the mass of the Earth**
- **Distance from the star imply “warm” temperature**
- **Can this planet harbor life?**
- **Is it too big? Does it have a suitable atmosphere?**





ESPRESSO@VLT

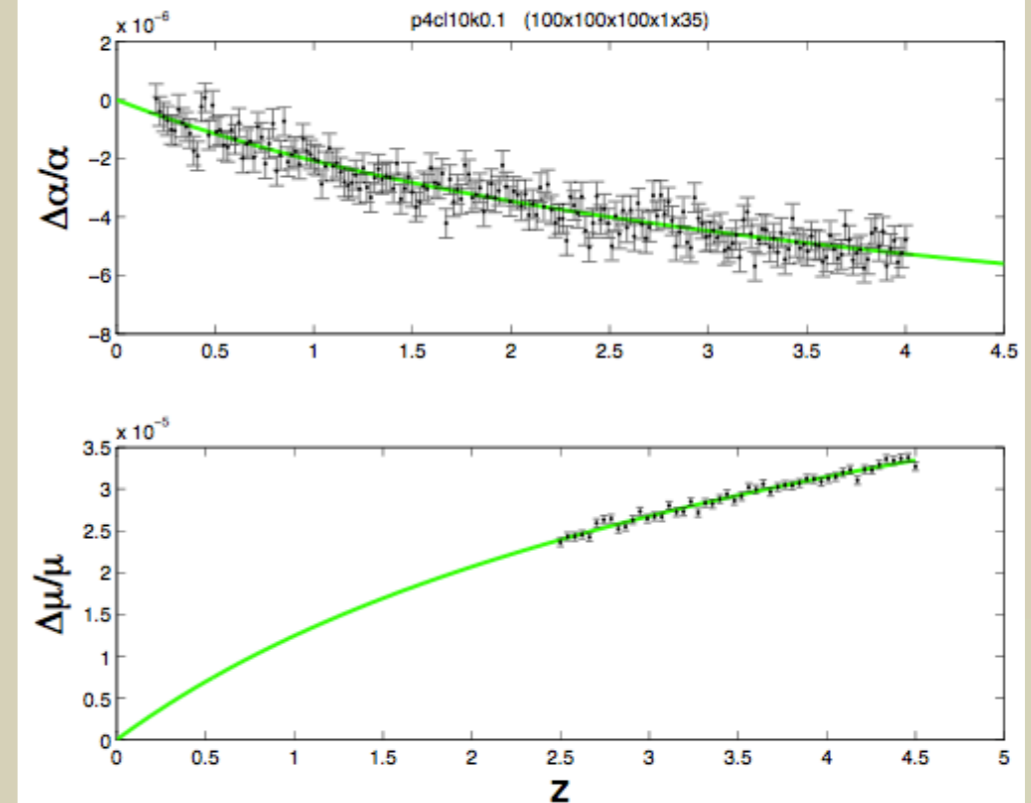
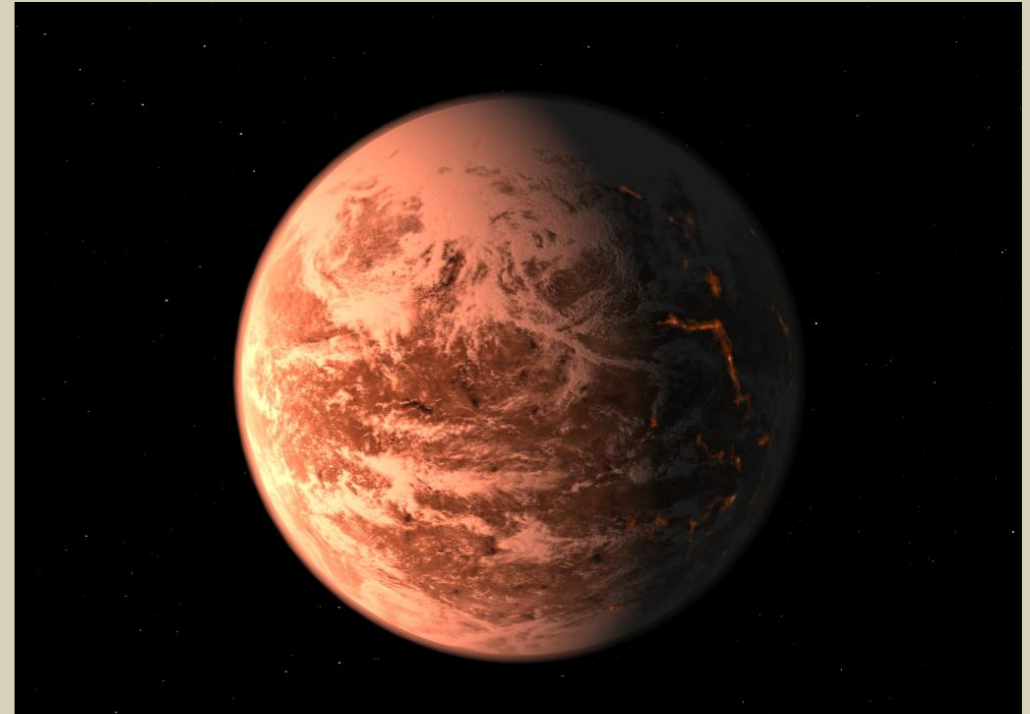


- * **ESPRESSO: a new instrument for the ESO/VLT telescopes**
- * **International consortium including (in Portugal) researchers from CAUP and FCUL**
- * **Precision 10 times better than presently possible!**
- * **Currently in detailed design phase**
- * **Observations start in 2016**



Main Science Cases

- * Search for Earth-like planets orbiting other “suns”
- * Variability of physical constants (alpha and mu)



ESPRESSO and beyond

- **ESPRESSO will allow us for the first time to find “new worlds in the cosmos”**
- **Build a catalog of possible habitable planets orbiting other suns**
- **And then we need to:**
 - Characterize the planets: temperature, composition
 - Characterize their atmospheres: traces of life?
 - New instrumentation is needed (ESO and ESA)

Out strategic plan for the future

- **Stability of the team in the long term**
 - Ensure that key team members have a long term career perspective
 - Capacity of attract highly skilled young researchers
- **Long term stable funding**
 - Pursue national and european funding opportunities
- **Guarantee participation in key international projects/ consortia**
 - ESO and ESA: ESPRESSO (ESO-VLT), CODEX (E-ELT), PlanetVision
- **Contribute for a stimulating scientific environment**
 - Excellence of host institution and its focus is essential

For more information:

www.astro.up.pt/exoearth

