ESO in a nutshell

Planets from La Silla

Planets with the VLT

Planets with ALMA

Planets with the E-ELT
ESO in a nutshell
European Southern Observatory

- Inter-governmental organisation for ground-based astronomy in Europe
- Founded 1962 (hosted by CERN)
- Headquarters in Garching near Munich (since 1979)
- Annual Budget ~150 M€, ~650 staff members
- Operating in Chile the most advanced telescopes in the world
La Silla Observatory
operating since 1969,
reduced operations since 2000

Paranal Observatory
operating since 1998,
work horse of the European astronomical community
Planets from La Silla
HARPS and CORALIE are ultra-stable high-resolution spectrographs.

They search for planets using the radial velocity technique.

The two found over 80 exo-planets, i.e. 25% of all known exo-planets.

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2009 Highlights:

Gliese 581 e, the lightest planet discovered with only two Earth masses. The refined orbits put Gliese 581 d well inside the habitable zone! (Mayor et al. 2009)
2009 Highlights:

CoRoT-7b and -7c: radial velocity follow-up with HARPS and discovery of a second super-earth planet in the system. (Queloz et al. 2009)
Planets with the VLT
• UVES and FLAMES are used for radial velocity follow-up of transits
• CRIRES achieves 6m/s rms in the NIR on low-mass planets
• NACO and SINFONI are used for high-contrast imaging of planets. NACO imaged the first exo-planet (around a brown dwarf)
• PRIMA on the interferometer is aiming at 20-30 µas astrometry
• In 2010 the VLT will get a planet finder with SPHERE
• In 2014, a radial velocity machine with ESPRESSO
Atacama Large Millimetre Array

- Up-coming flagship facility for radio/sub-mm astronomy
- Global partnership Europe/North America/East Asia (co-ordinated by ESO for Europe)
- Starting full operations in 2012
- 66 sub-mm antennas (54x12m, 12x7m)
- 14 km maximum baseline (resolution < 10 mas)
- 30-1000 GHz (10-0.3mm wavelength) covered by 10 receiver bands
Star and Planet formation with ALMA

Extra-solar: chemistry of star forming regions, synthesis of pre-biotic molecules, physics and chemical composition of pro-planetary disks, tidal gaps in disks.

Solar system: planetary atmospheres, asteroids and comets
Planets with the E-ELT
European Extremely Large Telescope

- Most ambitious optical telescope ever built
- Primary mirror of 42m diameter
- Working at optical / infrared wavelength
- Adaptive optics / 6 lasers - diffraction limited
- Currently in detail design phase
- Start construction 2011, first light in 2018

Maintaining Europe’s leadership in ground-based astronomy
Radial velocity measurements of a few cm/s will be achievable: terrestrial planets in habitable zones around solar-type stars will be detectable.

Contrasts of $\sim 10^{-9}$ at 100 mas will be achievable: Direct imaging and characterisation of rocky planets in habitable zones will be possible.

High-resolution spectra of the atmospheres of earth-like planets around low-mass stars can be obtained during planet transits.
ESO’s perspective

ESO runs the strongest programme world wide in the search for exo-planets in habitable zones.

Exiting ESO facilities have a long term committed to this programme.

Seek ESO’s support for space missions!
My perspective after this week
(N.B. How I perceive things, not necessarily how here are)

Space- and ground-based exo-planet communities are not united yet.

Cultural differences still do exist (e.g. 300M$ is not cheap on the ground...).

A clear roadmap, combining ground- and space-based facilities, does not emerge.

Get inspired by this weeks results of Corot+HARPS