32 New Exoplanets Found (w/ Video)

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On 19 October 2009, the team who built the High Accuracy Radial Velocity Planet Searcher, better known as HARPS, the spectrograph for ESO’s 3.6-metre telescope, reported on the incredible discovery of some 32 new exoplanets, cementing HARPS’s position as the world’s foremost exoplanet hunter. One of these is surrounding the star Gliese 667 C, which belongs to a triple system. The 6 Earth-mass exoplanet circulates around its low-mass host star at a distance equal to only 1/20th of the Earth-Sun distance. The host star is a companion to two other low-mass stars, which are seen here in the distance.

(PhysOrg.com) -- Today, at an international ESO/CAUP exoplanet conference in Porto, the team who built the High Accuracy Radial Velocity Planet Searcher, better known as HARPS, the spectrograph for ESO's 3.6-metre telescope, reports on the incredible discovery of some 32 new exoplanets, cementing HARPS's position as the world’s foremost exoplanet hunter. This result also increases the number of known low-mass planets by an impressive 30%. Over the past five years HARPS has spotted more than 75 of the roughly 400 or so exoplanets now known.

"HARPS is a unique, extremely high precision instrument that is ideal for discovering alien worlds," says Stéphane Udry, who made the announcement. “We have now completed our initial five-year programme, which has succeeded well beyond our expectations.”

The latest batch of exoplanets announced today comprises no less than 32 new discoveries. Including these new results, data from HARPS have led to the discovery of more than 75 exoplanets in 30 different planetary systems. In particular, thanks to its amazing precision, the search for small planets, those with a mass of a few times that of the Earth — known as super-Earths and Neptune-like planets — has been given a dramatic boost. HARPS has facilitated the discovery of 24 of the 28 planets known with masses below 20 Earth masses. As with the previously detected super-Earths, most of the new low-mass candidates reside in multi-planet systems, with up to five planets per system.

In 1999, ESO launched a call for opportunities to build a high resolution, extremely precise spectrograph for the ESO 3.6-metre telescope at La Silla, Chile. Michel Mayor, from the Geneva Observatory, led a consortium to build HARPS, which was installed in 2003 and was soon able to measure the back-and-forward motions of stars by detecting small changes in a star’s radial velocity — as small as 3.5 km/hour, a steady walking pace. Such a precision is crucial for the discovery of exoplanets and the radial velocity method, which detects small changes in the radial velocity of a star as it wobbles slightly under the gentle gravitational pull from an (unseen) exoplanet, has been most prolific method in the search for exoplanets.
In return for building the instrument, the HARPS consortium was granted 100 observing nights per year during a five-year period to carry out one of the most ambitious systematic searches for exoplanets so far implemented worldwide by repeatedly measuring the radial velocities of hundreds of stars that may harbour planetary systems.

The programme soon proved very successful. Using HARPS, Mayor's team discovered — among others — in 2004, the first super-Earth (around μ Ara); in 2006, the trio of Neptunes around HD 69830; in 2007, Gliese 581d, the first super Earth in the habitable zone of a small star; and in 2009, the lightest exoplanet so far detected around a normal star, Gliese 581e. More recently, they found a potentially lava-covered world, with density similar to that of the Earth's.

"These observations have given astronomers a great insight into the diversity of planetary systems and help us understand how they can form," says team member Nuno Santos.

The HARPS consortium was very careful in their selection of targets, with several sub-programmes aimed at looking for planets around solar-like stars, low-mass dwarf stars, or stars with a lower metal content than the Sun. The number of exoplanets known around low-mass stars — so-called M dwarfs — has also dramatically increased, including a handful of super Earths and a few giant planets challenging planetary formation theory.

"By targeting M dwarfs and harnessing the precision of HARPS we have been able to search for exoplanets in the mass and temperature regime of super-Earths, some even close to or inside the habitable zone around the star," says co-author Xavier Bonfils.

The team found three candidate exoplanets around stars that are metal-deficient. Such stars are thought to be less favourable for the formation of planets, which form in the metal-rich disc around the young star. However, planets up to several Jupiter masses have been found orbiting metal-deficient stars, setting an important constraint for planet formation models.

Although the first phase of the observing programme is now officially concluded, the team will pursue their effort with two ESO Large Programmes looking for super-Earths around solar-type stars and M dwarfs and some new announcements are already foreseen in the coming months, based on the last five years of measurements.

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