Embargo till the 7th of August 2000

The planet shower still goes on!

6 new planetary ELODIE and CORALIE candidates

- ⋆ A new planetary system with two very low mass planets
- ⋆ The lightest planet (half the mass of Saturn)
- ⋆ Five planets from the CORALIE Southern survey (ESO La Silla) (1)
- ⋆ One planet from the ELODIE Northern planet-search programme (Haute-Provence Observatory) (2)

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HD 83443: a system with two Saturns

During the last 5 years, more than 40 exoplanets have been detected around stars of the solar vicinity, but only one system with multiple planets has been unambiguously identified around the star υ And. We report here the discovery of a second extra-solar planetary system with two Saturnian planets around the star HD 83443.

The new system was detected by means of high-precision radial-velocity measurements with the CORALIE high-resolution spectrograph at the 1.2-m Leonhard Euler Swiss telescope (ESO-La Silla) as part of the Geneva planet-search project conducted by the CORALIE team (1).

HD 83443 is a fairly bright star of 8.2 visual magnitude, slightly less massive than the Sun ($M = 0.8\,\mathrm{M}_\odot$), in the Vela constellation, 141 light years away from the solar system.

The new planetary system around HD 83443 is unusual by more than one aspect, with two very low mass gaseous giant planets, both on very tight orbits. Here are summarized their main characteristics:

	P [days]	$m_2 \sin i$ [$\mathrm{M_{Jup}}$]	e	a [AU]	K [$\mathrm{ms^{-1}}$]
HD 83443 b	2.9853	0.35	0.08	0.038	56
HD 83443 c	29.83	0.15	0.42	0.17	14

The short-period planet was already announced the 4th of May 2000 (ESO Press release, http://www.eso.org/outreach/press-rel/pr-2000/pr-13-00.html). This inner planet is the planet with the shortest period and with the smallest separation with the parent star among the known candidates. Its period $P = 2.9853$ days is very close to an integer expressed in sideral time: 2.9935 sideral days. As a consequence every 3 days almost the same radial velocity is observed and several months are needed to fill the different phases of the orbit. After a whole season of measurements we can still note a clumpiness of the observations at three phases (Fig. 1, Top left).

Early, an abnormal behaviour was detected in the residuals of the short-period Keplerian solution showing an apparent periodicity of about one month (Fig. 1, Top right). New measurements added after the announcement of HD 83443 b have fully confirmed the presence of the second planet. Interestingly enough, HD 83443 c is the planet with the smallest projected mass discovered to date. The system HD 83443 is thus composed of 2 planets with very low masses, respectively close to and smaller than the mass of Saturn

$$m_2 \sin i(\mathrm{HD\,83443\,b}) = 1.17\,\mathrm{M_{Sat}}$$
$$m_2 \sin i(\mathrm{HD\,83443\,c}) = 0.50\,\mathrm{M_{Sat}}$$

Looking at such a system with 2 planets on so close orbits immediately rises concerns about the system dynamical stability. A preliminary analysis of its dynamical behaviour clearly confirms the system stability. Nevertheless dynamical perturbations between the planets are far from being negligible and in particular may explain the non-circularity of the inner orbit despite of its very short period.

This system once more emphasizes the impressive diversity of extra-solar planets compared to our own solar system.

New planets from both celestial hemispheres

In addition to the new planet HD 83443 c described above, we can also announce new planetary candidates discovered in our planet-search programmes in both hemispheres.

From the North: One additionnal planet has been detected from the Haute-Provence Observatory around the star HD 190228. The stellar and derived planetary characteristics are given in the table below. The new candidate has been discovered by using the ELODIE spectrometer on the 1.93-m telescope. In addition to HD 190228 b, the ELODIE programme (2) has already revealed 4 planetary companions among which 51 Peg, the first detected extra-solar planet, and 1 very low mass brown dwarf ($m_2 \sin i = 19\,\mathrm{M_{Jup}}$).

From the South: Four additionnal new planetary candidates have been detected orbiting the stars HD 6434, HD 19994, HD 92788 and HD 121504. Similarly to the HD 83443 system, these new planets have been discovered by the CORALIE team (1) in the frame of the fruitful systematic radial-velocity survey carried out at La Silla Observatory (ESO, Chile). In about two years already 19 planets and very low mass brown dwarfs ($m_2 \sin i \leq 15\,\mathrm{M_{Jup}}$) have been detected with the CORALIE spectrometer fed by the small 1.2-m Euler Swiss telescope.

The main stellar characteristics as well as some orbital parameters and inferred planetary properties for the 4 systems are summarized in the table below. They show the similarities of the new candidates with the previously detected planets. The radial-velocity measurements with the best Keplerian solutions are presented in Fig. 2.

	Sp	d [pc]	P [days]	e	$m_2 \sin i\,[\mathrm{M_{Jup}}]$	a [AU]	Site
6434	G3IV	40.3	22.09	0.3	0.48	0.15	ESO
19994	F8V	22.2	452.8	0.15	1.8	1.3	ESO
92788	G5	32.3	340.8	0.36	3.8	0.94	ESO
121504	G2V	44.4	64.62	0.13	0.89	0.32	ESO
190228	G5IV	62.1	1127.	0.43	5.0	2.3	OHP

Today the ELODIE and CORALIE exoplanet searches have already revealed 25 companions to solar-type stars with masses smaller than $20\,\mathrm{M_{Jup}}$. Not only the quest for exoplanets reveals more and more candidates but also allows for the discoveries of planets with smaller and smaller masses as illustrated in Fig. 3.

More information about these discoveries

Further detailed information about these new planet candidates, are available on the dedicated web page at the Geneva Observatory web site: http://obswww.unige.ch/~udry/planet/planet.html