Exoplanet and brown dwarfs transiting A-F type stars
RV follow up of TESS early type dwarfs with CORALIE

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Planets around hot stars

The detection and characterisation of exoplanets around massive A-F type stars, is **essential to investigate and constrain the impact of stellar mass on planet properties**. These planets have a larger probability to be in a misaligned polar or retrograde orbit. The high obliquities of these planets may shed light on their formation since it can be linked to orbital migration processes around stars of high masses. Their atmospheric characterisation provides constraints on the composition of their atmospheres that may in turn reveal clues to their formation history. Also they receive large amounts of UV radiation that can drive unique chemical processes in their atmospheres.

TESS offers us the opportunity to explore the occurrence rate and the properties planets transiting early-type stars.

RV follow-up with CORALIE

RV follow-up surveys have veered away from hot, fast-rotating stars since they exhibit **fewer and broader spectral lines.** In this work we follow giant (>7 R⊙) exoplanet candidates transiting bright (V<12), hot (T_{eff}>6200 K), fast rotating TOIs using CORALIE spectrograph. With this sample (Fig.2, blue) we can significantly increase the number of well-characterised planets orbiting such hot stars (Fig.2, red).

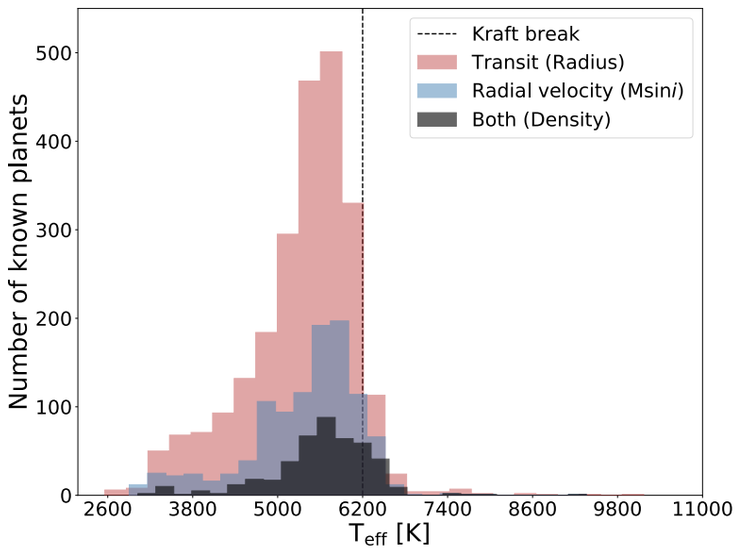


Fig.1: Number of known exoplanets as a function of stellar effective temperature. The blue histogram tracks all confirmed planets listed by the NASA Exoplanet Archive detected in RVs (precision >20%), and red have a detected transit (precision >20%). The black curve is for planets that are confirmed in both RVs and transit photometry. The black vertical line at 6200 K indicate the Kraft break.

First results

Our work led into the discovery of **TOI-1107**, a massive planet, and **TOI-629**,**TOI-1982** and **TOI-2336**, three BDs.

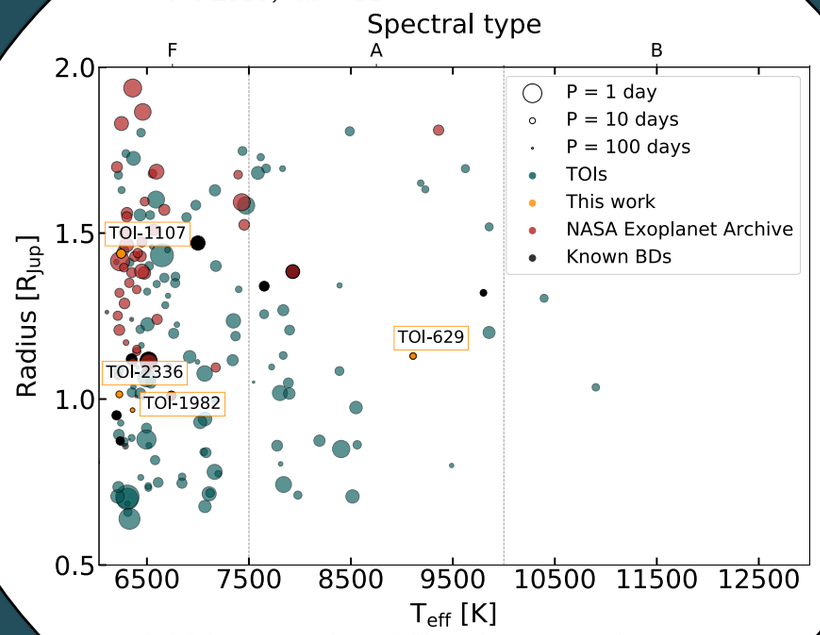
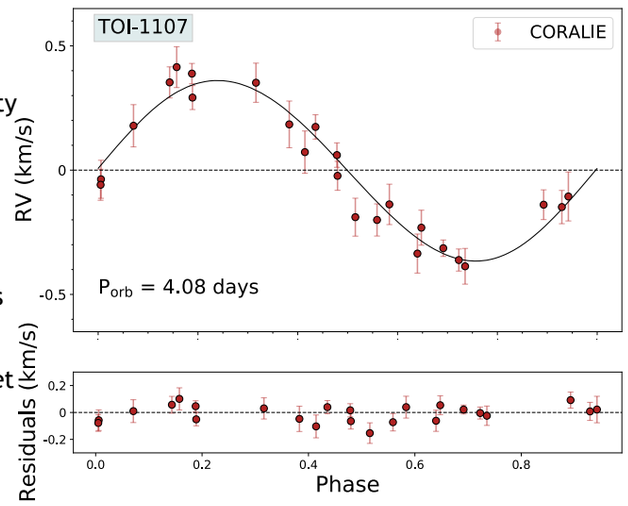


Fig.2: Radius-temperature diagram of all known planets transiting early-type stars (mass and radius precision better than 20%, red points). Our TOIs sample is plotted in blue and the four discoveries are plotted in orange. All known transiting BDs are plotted in black (check Nolan Grieves poster)

TOI-1107b: A massive planet around a F-type star

The planet was detected in the TESS light curves and confirmed with radial velocity measurements with the CORALIE spectrograph (right Figure).

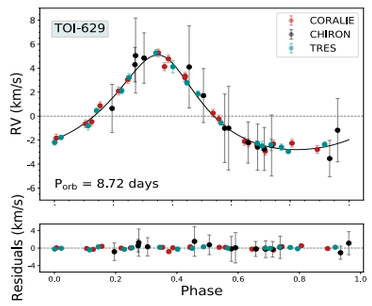
TOI-1107 (Psaridi et al., in prep) is a 4.08 day period planet with a planetary mass of 3.4 Jupiter masses and a low eccentricity of about 0.03. The radius of the planet is 1.43±0.04 R_{jup}.



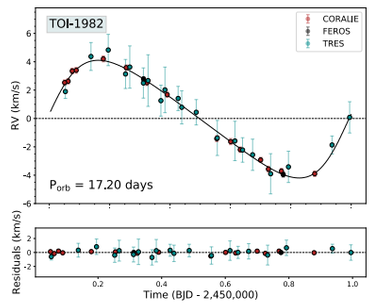
Three new brown dwarfs

The three BDs, **TOI-629** (Psaridi et al., in prep),**TOI-1982** (Psaridi et al., in prep) and **TOI-2336**, were confirmed with CORALIE and with CHIRON, TRES and FEROS spectrographs (Figures below).

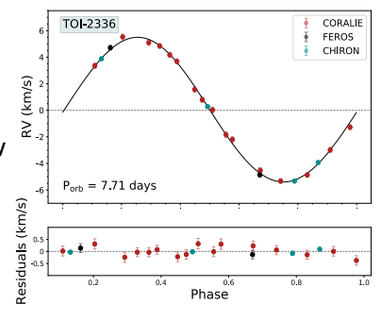
TOI-629 is a 8.72 day period, massive BD with a planetary mass of 69.7 Jupiter masses and a high eccentricity of about 0.29. The radius of the BD is 1.12±0.04 R_{jup}.



TOI-1982 is a 17.2 day period BD with a planetary mass of 63.3 Jupiter masses and a high eccentricity of about 0.26. The radius of the BD is 0.96±0.05 R_{jup}.



TOI-2336 is a 7.71 day period BD with a planetary mass of 64.1 Jupiter masses and a low eccentricity of about 0.01. The radius of the BD is 1.01±0.08 R_{jup}.



From CORALIE to HARPS

For the characterisation of **fast rotating stars (T_{eff} > 6500 K)** that require higher precision and efficiency we are planning to use **HARPS (accepted proposal) in period 108** for 10 nights. In this ambitious program we want to increase the number of well-characterised planets with masses **smaller than ~2M_{jup}** orbiting such hot stars, calculate the bulk density and assess their internal structure.

Research is founded by:
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