With FEROS on the trail of planets of intermediate-mass stars

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In contrast to planets of solar-like stars, almost nothing is known about close-in planets of intermediate-mass stars (1.3-2.1 Msun). The detection of such planets would thus be very interesting. Since the life-time of the proto-planetary disks of intermediate-mass stars is short, the detection of close-in planets of intermediate-mass stars would demonstrate that planets form and migrate within a relatively short time. It would also be interesting to find out, whether the properties (e.g. higher mass, higher density) of these planets differ from those of solar-like stars, as theory predicts.

Because intermediate-mass stars rotate fast as long as they are on the main sequence, radial-velocity (RV) surveys are limited to massive planets of short orbital periods. Since transit surveys preferentially detect planets with short orbital periods, and since 20% of the CoRoT targets are A and B-type stars, we use the CoRoT-database as input catalogue, and focus on candidates with the size of Jupiter and orbital periods of 4 days, or less.

Step one: Identifying the targets

Using the multi-object spectrograph AAOmega @AAT, we obtained spectra of more than 10000 stars from which we used to identify A- and B-stars (Sebastian et al. 2012; Guenther et al. 2012). Using the AAOmega-data, we also demonstrated that by combining broad band photometry and low-resolution spectroscopy, we can extend the survey to all 24 fields observed by CoRoT.

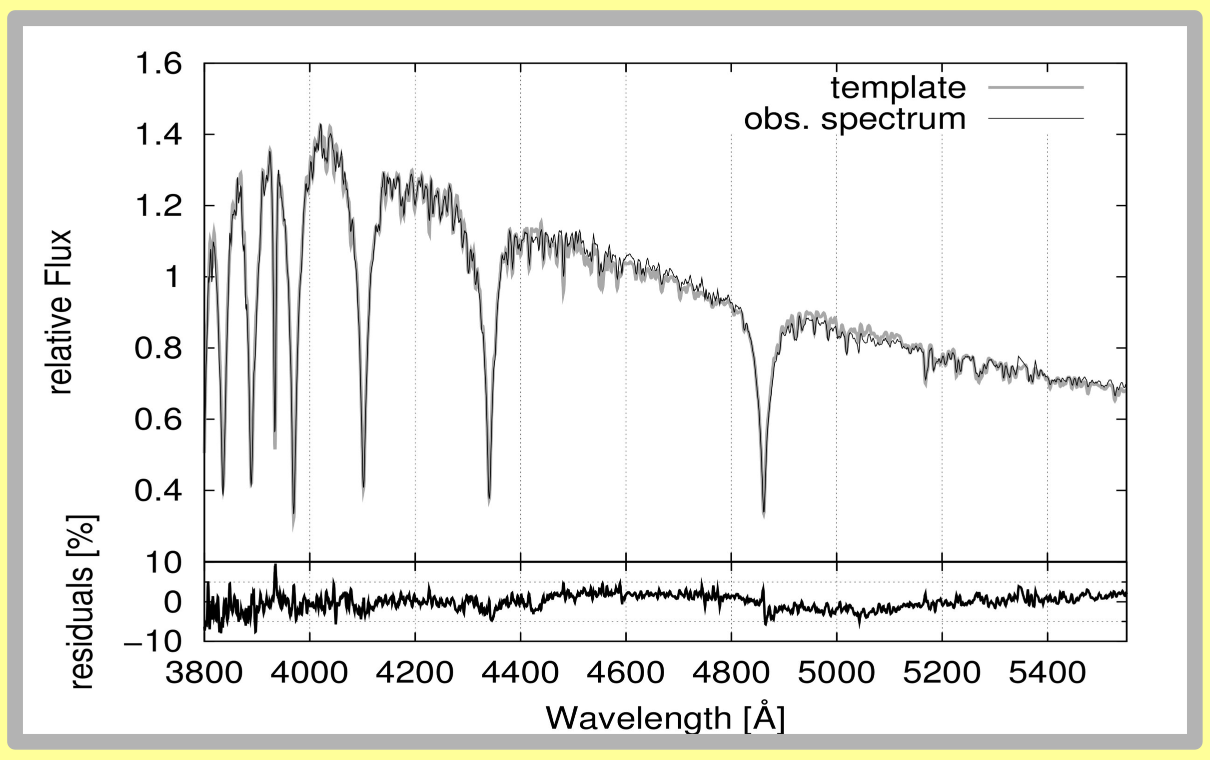

Fig. 1: Spectrum of an A-star discovered by us together with an A-star taken from a library of spectra (Valdes et al. 2004) for comparison.

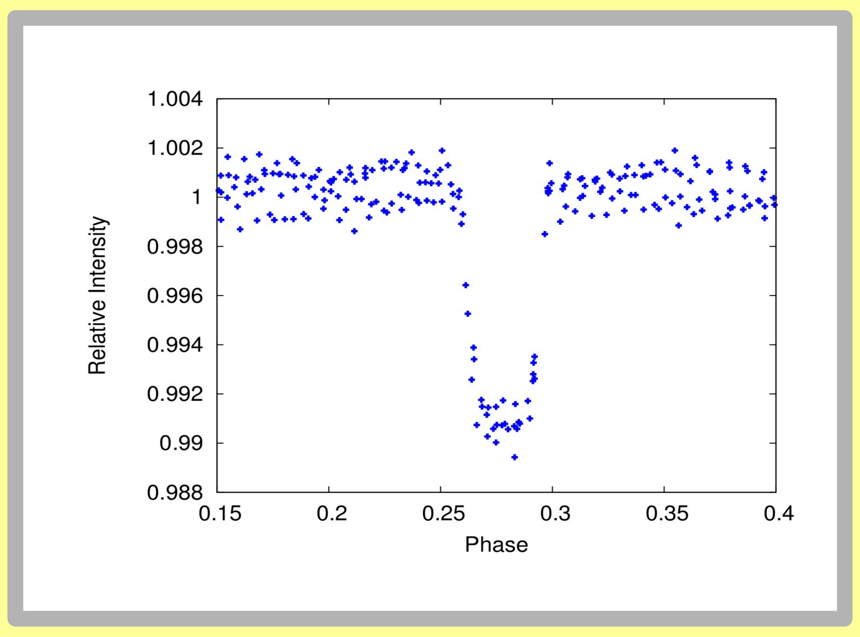

Fig2: The CoRoT-light curve of a transit - candidate. The determination of its mass by precise radial-velocity-measurements is currently ongoing.

Step two: Identifying objects that transit

In the next step, we searched for transits of our targets using the newly developed algorithms in Exotrans (Grziwa et al. 2012). So far, we have identified a hand full of promising candidates in each of the CoRoT-fields.

Step three: Measuring the mass of the transiting objects

Using the Sandiford- Echelle@2.1m-Telescope (McDonald Observatory) we obtained RV measurements of the first set of targets. Two candidates turned to be binaries, for all others we obtained upper limits of a few Jupiter-masses.

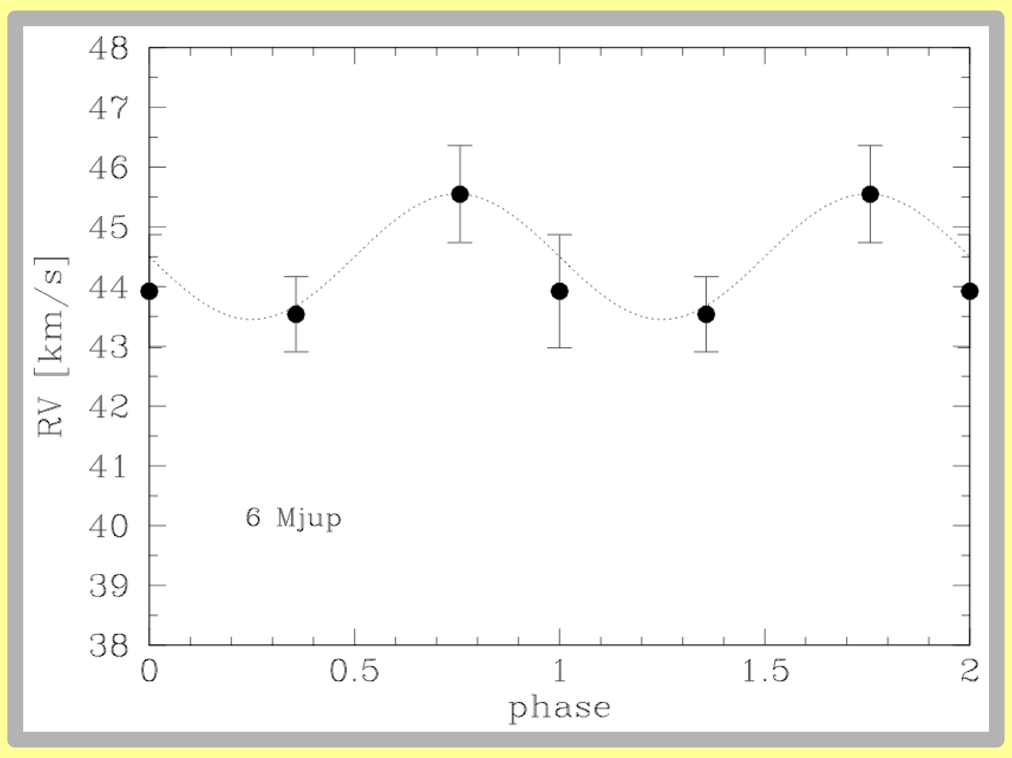

Fig. 3: The RV-signal of a target-star for which we already obtained upper limits. Since FEROS offers a broader wavelength coverage and higher sensitivity than the Sandiford- Echelle, we would be able to measure the mass of the companion.

Ongoing Project:

In the future we plan to use the **FEROS-spectrograph@2.2m- ESO Telescope on La Silla**. The instrument has an eight times broader wavelength-coverage than the Sandiford- Echelle and is three times more sensitive. We thus expect that FEROS will push the limit down to one Jupiter-mass, or even less. This will allow us to detect the RV-signal of the planets.

References:

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