

KEPLER'S DETAILED VIEW ON THE PULSATIONS OF THE RR LYRAE PROTOTYPE AND BLAZHKO STAR RR LYR

Katrien Kolenberg
University of Vienna
GO20038

Though the RR Lyrae stars have been studied for over a century now, several aspects of their pulsations remain understood. An intriguing subclass consists of the stars showing the Blazhko effect, with light curves that are modulated on time scales of typically tens to hundreds of days. Despite numerous studies, the origin of these long-term cycles remains a mystery. Moreover, in several RR Lyrae stars glitches and short-term irregularities in the light curves have been observed. This phenomenon has never been studied in detail. RR Lyr, the eponym and prototype of the RR Lyrae stars, is one of the best studied stars of its class. It is also a well-known Blazhko star with a modulation period of about 39 days (Kolenberg et al. 2006). In photometry of the star spanning over a century, both the pulsation and the Blazhko cycle have shown variations that are too fast to be of an evolutionary nature. On top of this, short-term irregularities have also been reported in RR Lyr. The 33.5 days of photometry of RR Lyr gathered during Kepler's first roll showed the potential of the unprecedented accuracy of Kepler data. On the basis of these preliminary data we already detected previously unseen frequencies (Kolenberg et al. 2010). The nature of the newly detected frequencies and their connection to the Blazhko effect, as well as the small irregularities in the pulsation of RR Lyr, can only be investigated with short cadence data. This would be the first time such a study is undertaken, and no other instrument can explore these previously unseen aspects of the star's pulsation. We propose to observe RR Lyr with Kepler in short cadence during more than two complete modulation cycles (90 days). By observing RR Lyr itself, we will be able to study variations in the Blazhko cycle, and the nature of the additional observed frequencies and their stability. These observations will be a milestone in gaining a better understanding of the pulsations of RR Lyrae stars in general. A better understanding of the Blazhko effect and other deviations from strictly regular pulsation will improve RR Lyrae stars as distance scale calibrators and tracers of galactic history.