1 Abstract

The pulsating B star BW Vulpeculae is a $\beta$ Cephei star with a period of 4.8 hours and a very large amplitude in radial velocity and brightness. The origin of the pulsation is the $\kappa$ mechanism of ionized iron. With the 50cm telescope at APO we obtained time resolved spectroscopic and photometric observations covering the full cycle. The spectral range included the He I 5875 Å absorption line, which shows the pulsations prominently, as helium is abundant in $\beta$ Cephei stars and B stars in general. We measured the doppler velocity of this spectral line, which gives the velocity curve describing the inward and outward velocity of the outer layers of the star. We found a discontinuity at two moments in its cycle, on both sides of the standstill phase where the star has its minimum radius and maximum brightness. One of these discontinuities showed a line doubling, which is explained by a shock effect due to a $\kappa$ mechanism around the iron opacity bump in the inner region of the star. The iron-opacity driven expansion drives the outer layers outward to the point of maximal radius followed by a short phase of zero radial velocity, after which the outer layers fall back inwards onto the deeper layers where they will create an inward shock. The $\kappa$ mechanism will recreate an outward shock and the cycle repeats. The photometric observations where conducted simultaneously in order to obtain a light curve in the Johnson $B$ and $V$ band. The maximum in the $V$ light curve was confirmed to occur at the same phase as the still-stand phase in the radial velocity curve.