MICROLENSING IN THE LENSED QUASAR UM 425 ?

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Abstract. During the ESO key-program on gravitational lenses, the light curves of two images (A and B) of the lensed quasar UM 425 were obtained (from 1987 to 1995). This poster presents a possible interpretation of the light curves in terms of a micro-lensing event in the faint B component of the system, without ruling out a possible intrinsic variation of the source.

1. Long term photometry and interpretation

The photometry of UM 425 was obtained by fitting simultaneously the components A and B with 2-D Moffat profiles (Courbin et al. 1995). In addition to a smooth increase of intensity in both A and B, B shows a peak of intensity suggesting a micro-lensing event, although A seems also to be affected by micro-lensing (Michalitsianos & Oiversen 1995)

Fig. 1 shows the result of the fit of micro-lensing curve on the light curve of UM 425B after subtraction of the smooth variation. Two parameters are free: the impact parameter at maximum amplification U_{min}, and the crossing time τ of the source (time needed for the source to cross the Einstein ring).

Several combinations of U_{min} and of the crossing time τ give a good fit. However, the fitted peak is never higher than 0.3 magnitude, the best fit giving 0.25. The magnification is then 1.26, which indicates that the source does not cross the Einstein ring (where the magnification would be 1.34).

Are these parameters compatible with both the physical properties of micro-deflectors in the lensing galaxy and with its estimated redshift of 0.6 (Meylan & Djorgovski 1995)? Two schemes seem reasonable:

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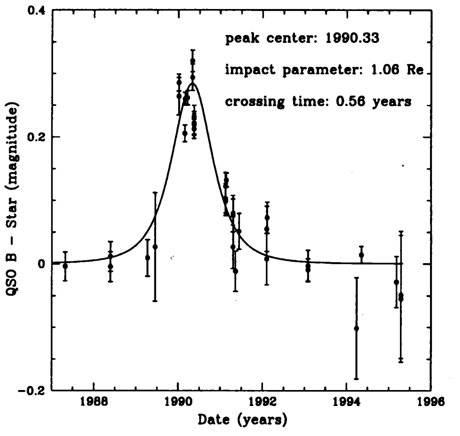

Figure 1. Light curve of UM 425B, "background" subtracted. The results of the fit are indicated as well as the 1σ error bars (photon noise only).

(i) A micro-lensing event by a very low mass object (about 0.01 $M_\odot$) at a redshift close to 0.6 with a transverse velocity of the order of 400-600 $\mathrm{km\,s^{-1}}$. Constraining the velocity to be smaller than 300 $\mathrm{km\,s^{-1}}$ gives lens masses smaller than 0.005 $M_\odot$, corresponding to the masses of big planets, if a redshift of 0.6 is kept for the deflector.

(ii) A micro-lensing event by an object with a mass between 0.01 $M_\odot$ and 0.1 $M_\odot$ at higher redshift, e.g., 1.3-1.4, implying a very high mass for the macro-deflector. If we assume such redshifts, the mass of the lensing galaxy should be as high as 10^{14} $M_\odot$ in order to produce the separation of 6.5" observed between UM 425 A and B. This is still possible, when considering a cluster of galaxies at high redshift.

Finally, if the peak of intensity observed in UM 425B is due to a micro-lensing event, the size of the magnified source has to be smaller than 10^{-4} pc (diameter of the Einstein ring) in order to reproduce the observed amplification. This small size is compatible with the size of the regions responsible for the continuum emission in quasar spectra. A spectrophotometric monitoring would then allow to decide if the variations observed are due to an intrinsic variation of the quasar or to micro-lensing.

References

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