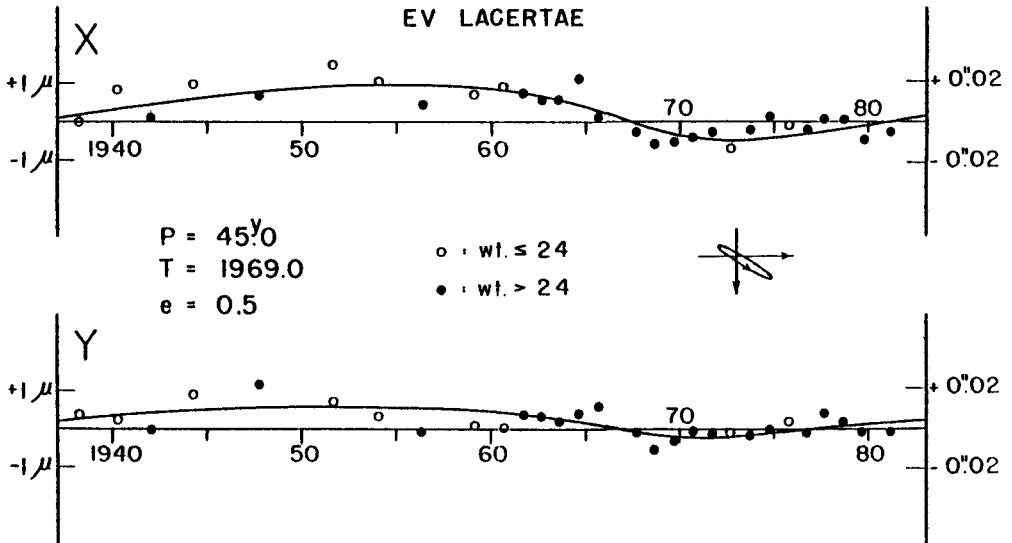


EV LACERTAE: IS FLARE ACTIVITY RELATED TO AN UNSEEN PLANET-LIKE COMPANION?

Sarah Lee Lippincott
 Sproul Observatory, Swarthmore College

ABSTRACT: The presence of an unseen companion to EV Lac with 2 to 4 Jupiter masses is likely. A period of ~ 45 years indicates the separation at the time of periastron is ~ 2 a.u.

EV Lacertae, BD+43°4305, has been on the astrometric program of the Sproul Observatory since 1938. Yearly coverage during the observing season has yielded 343 nights of observation on plates taken with the 61-cm refractor.



The orbital motion of EV Lac

The normal point positional residuals in X (RA) and Y (decl.) are given with parallax and proper motion removed. The computed displacement curves representing Kepler motion are plotted together in the inset to give the photocentric orbit, in this case the orbit of the primary about the center of mass.

With the elimination of parallactic and proper motion, the yearly mean residuals show trends which can best be explained by Keplerian motion indicating the presence of an unseen companion with a period of ~ 45 years and an orbital eccentricity of ~ 0.5 . Assuming a mass of $0.25 M_{\odot}$ for the visible component, we find the mass of the companion has a likely range of 2 to 4 times Jupiter's mass, giving the ratio of their masses M_A/M_B , ~ 100 to 1. The range in separation of the two components would be from ~ 2 to ~ 6 a.u. to be consistent with the values given above. The closest approach, 2 a.u., was ~ 1969 , and by 1982 the separation is estimated as ~ 4 a.u. The interpretation of any long-term changes in the flare activity of EV Lacertae should give some consideration to the likely presence of an unseen planet-like object.

Considering the wide-range magnetic field effects of Jupiter, one might consider comparable effects taking place around the EV Lacertae companion. Also the differential acceleration or tidal effects on EV Lacertae are likely to be 100 times that caused by Jupiter on the Sun. Unfortunately, any change in flare frequency around the time of periastron in ~ 1969 from the current frequency is hard to evaluate from inspection of the literature, although some statistical inferences could be made.

There are ~ 4000 exposures taken between 1938 and 1981 on the Sproul astrometric program; the current exposure time is 0.5 minutes. From visual inspection there were no flares observed over 0.2 magnitude.

This research is aided by NSF grant AST 81-16514 and past grants.