

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS

Number 1082

Konkoly Observatory
Budapest
1976 January 15

INACTIVE STATE OF HZ Her

At Sonneberg Observatory there exist a number of 40 cm astrograph plates of the inactive state of Her X-1 = HZ Her in the time intervals 1934 April 15 to August 7 (J.D. 242 7543 ...7657) and 1937 April 5 to 1940 June 8 (J.D. 242 8630...9789). This communication includes the results of a more thorough investigation of that state, than has been given in Mitt. Veränd. Sterne Sonneberg 6, p. 61 ff, because it had turned out in the meanwhile that those plates are the only material which can lead to a rather precise light curve of the inactive state (this is the state in which HZ Her exhibits brightness variations of only small amplitude, unlike to the "normal" active state where a reflection effect of large amplitude is present). HZ Her has been in an active state for the past 17 years.

From our material we find that the light curve of the inactive state is a pure eclipsing one, reflection effect or ellipsoidal variations being completely absent. The amplitude of this eclipsing light curve is $m_{pg} = 14^m.60 - 15^m.15$; in the normally active state the range is roughly $12^m.90 - 14^m.80$ and depends on the 35 day cycle phase.

Primary and secondary minima of the inactive curve are of nearly equal depth, but the secondary minimum is very broad, $0^P.3$, as compared with the primary one ($0^P.1$). This is an evidence for the existence of absorbing matter - the accretion disk - around the X-ray star, the disk being not self-luminous, but absorbing.

Our inactive light curve shows an asymmetry:

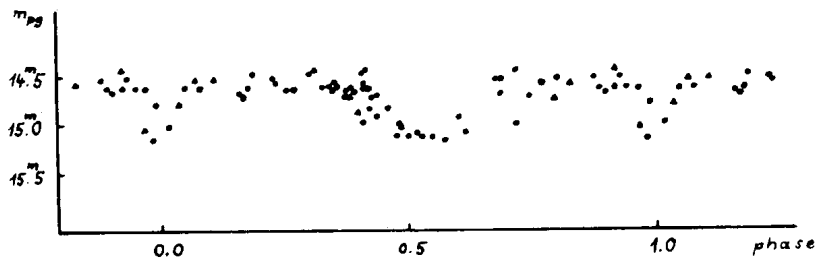
The center of the secondary minimum is situated approximately at phase 0.56 of the $1^d.7$ variation. This asymmetry can be explained by either an asymmetric shape of that absorbing accretion disk or by an excentric orbit of the system.

Processing of the series of observations on Sonneberg astrographic plates yields the following most probable elements:

$$\text{Primary min.} = 244\,1397.584 + 1.700175 \cdot E$$

The inactive light curve does not show any evidence for the 35^d X-ray cycle, shape and amplitude of the light curve being independent of the 35^d phase, unlike the variations in the normal active state.

The change from the inactive to the active curve and vice versa occurs in the course of a few days.



The inactive state light curve of HZ Her:

Δ - J.D. 242 7543 ... 7657

o - J.D. 242 8630 ... 9789

WOLFGANG WENZEL

Central Institute for Astrophysics
of the Academy of Sciences of GDR,
Sternwarte Sonneberg GDR

RENÉ HUDEC

Astronomical Institute of
the Czechoslovak Academy
of Sciences,
Observatory Ondřejov
Czechoslovakia