THE INVESTIGATION OF THE CLASSICAL CEPHEID RT Aur PERIOD

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ABSTRACT. The outcomes of the research into RT Aur period for the last 93 years are given in the article. New elements of changes in RT Aur brightness have been determined by the authors: $J.D.max = 2447890,265 + 3.7283116 * E$

Key words: Star: classical Cepheid RT Aur.

The research results of changes in the period of RT Aur brightness fluctuations (1985–2005) according to visual observations and measurements in the Odessa Photocollection negatives and in the Minsk Photocollection negatives (MPPLF) are represented in the paper. A set of epochs of RT Aur maximums, obtained by many professional astronomers in the 20th century were used in the research with a kind permission of Vitaliy P. Goransky (GAISh, Rossiya, Moskow).

The following members of the amateur group of variable stars observers "Betelgeuse" took part in the research: Ivan M. Sergey, Vladimir V. Schukin, Attila Kosa-Kiss, Valeriy D. Grigorenko,

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Vyacheslav T. Mamedov, Igor V. Klochko, Ivan S. Bryukhanov, Jury B. Strigelsky, Ivan J. Kushmar, Alexey M. Gain, Roman A. Grabovsky, Andrey S. Semenyuta, Igor I. Balyuk.

The elements of changes in RT Aur brightness (General Catalogue of variable stars (37) have been used in the O-C research:

$$J.D.max = 2442361.155 + 3.728115 * E$$

Two selective (but not best) diagrams of changes in the star brightness obtained on the basis of visual observations and measurements in photonegatives are given below (fig. 1, 2).

Let us introduce the O-C diagram, the chart and the outcomes of the research, where the data of GAISh were used (fig. 3).

Ninety nine epochs of maximums, obtained from our own observations as well as observations of foreign astronomers were used during the research into RT Aur period (see References).

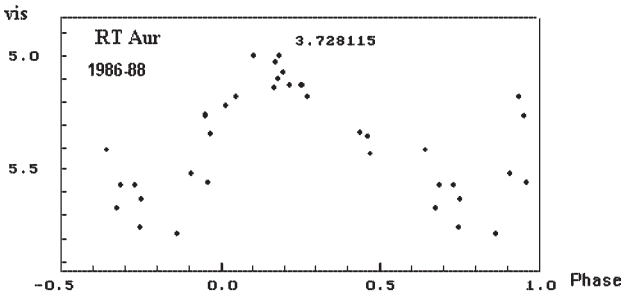

Figure 1:

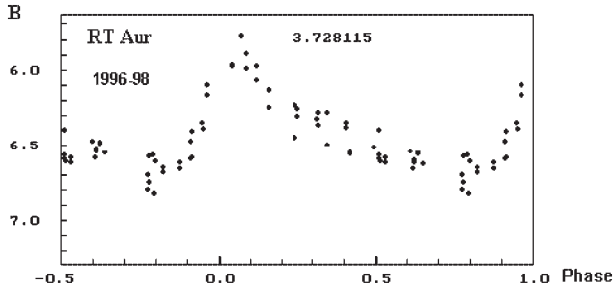

Figure 2:

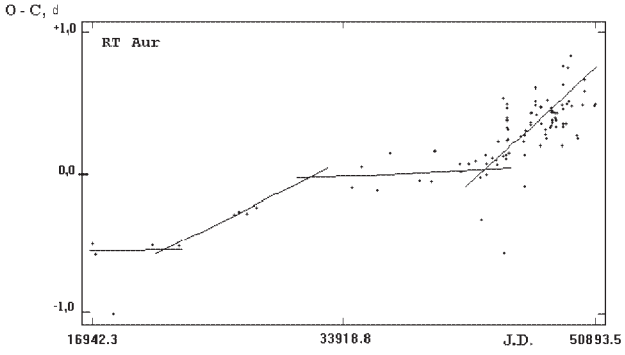

Figure 3:

The O-C diagram shows the spasmodic changes in the star period. Much earlier independent observations by German astronomers confirmed our assumptions that from the moment of RT Aur discovery three sharp spasmodic changes in the period have taken place. Sometimes considerable divergences of observed maximums from calculated O-C values are registered by our researches as well as German scientists. This fact can be presumably regarded as the evidence of some extraordinary chemical and physical changes, taking place inside the star, which is quite a rare occurrence for the stars of such variability type. On the basis of RT Aur observations, carried out by the group "Betelgeuse" in 1985–2005 and taking into account the RT Aur maximums from GAISh index the new elements of changes in RT Aur brightness have been established:

$$J.D.max = 2447890.265 + 3.7283116 * E,$$

where M - m = 0.3 p. Two diagrams of changes in star brightness, obtained from visual observations are given below (fig. 4 - all observations group "Betelgeuse" date back to 1985–2005; fig. 5 - observations, carried out by Andrey Semenyuta (Kazakhstan) and Igor Balyuk (Belarus) in 2005):

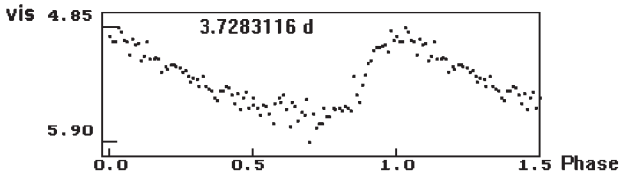

Figure 4: RT Aur 1985–2005, 14 observers

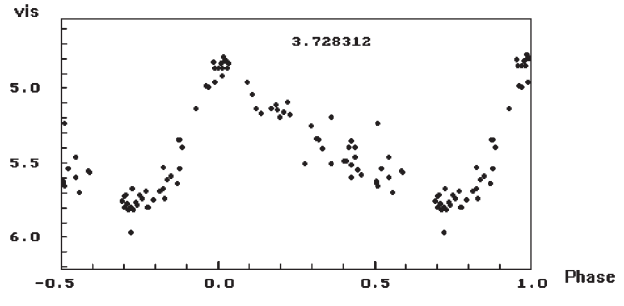

Figure 5: RT Aur 2005 (A. Semenyuta, I. Balyuk)

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References

Hoffmeister C., Richter G., Wenzel W. Veranderliche Sterne. Sternwarte Sonneberg. Leipzig, 1990.
Kippenhahn R. Hundert Milliarden Sonnen. Geburt, Leben und Tod der Sterne. Piper Munchen Zurich 6. Auftgabe 1987.
Soloviev A.: 1922, *Mirov. Isw.*, 99.
Kukarkin B.: 1935, *NNVS*, **4**, 383.
Krebs C.: 1987, *AN*, **263**, 159.
Nielsen A. V.: 1939, *Aarchus Medd.*, 14.
Mergentaler J.: 1941, *A.J.*, **18**, No 3, 209.
Dufay J.: 1947, *AAp*, **10**, 80.
Grouiller H.: 1947, *AAp*, **10**, 85.
Marks A.: DNU 1, 1956 - Urania Ann. Sci. Suppb. No 1, 1956.
Wisniewski W.Z., Johnson H.L.: 1968, *Arizona Comm.*, **No 112**, 57.
Takase B.: 1969, *Tokyo Bull.*, **ser II**, **No 191**.
Schaltenbrand R., Tammann G.A.: 1971, *AsAp Suppl* **4**, 265.
Winzer J.E.: 1973, *A.J.*, **78**, 618.
Feltz K.A., Mc Namara D.H.: 1980, *PASP*, **92**, 609.
Szabados L.: 1977, *Budapest Mitt.*, **No 70**.
MVS 8, H. 5, 78, 1978.
Harris H.C.: 1980, Thesis.
Huebscher J., Lichtenknecker D., Mundry E.: 1985, *BAV Mitt.*, **No 39**.
Huebscher J., Lichtenknecker D., Meyer J.: 1986, *BAV Mitt.*, **No 43**.
Schmidt J.: 1985, *BAV Rundbrief*, **No 2**, 75.
Kohler, Ratz: 1985, *MVS* **10, H. 7**, 163.
Mofett T.J., Barnes III T.G.: 1984, *ApJ Suppl*, **55**, 389.
Ratz K., Ratz M.: 1983, *MVS* **10, H. 2**, 42.
Bryukhanov I.S.: 1987, *Variable Stars* **22, No 4**, 617-622.
GEOS NC 322, 1982, p. 1/3.
Budquest J.: 1981, *GEOS NC* **270**, p. 3/4.
MVS 9, H. 5, 163, 1983.
MVS 9, H. 3, 80, 1981 (Arbeitskreise "Veranderliche Sterne" DDR).
Williams: *JBAA* 15, 245, u. 270.; AN No 4021.
Marknick, Williams: JBAA 15, 245, u. 270.; AN No 4021.
Goldman H., Ratz M., Ratz K.: 1990, *MVS* **12, H. 3**, 51.
Ratz M., Shille K.: 1988, *MVS* **11, H. 7**, 164.
Goldman H., Ratz M., Ratz K., Hinzpeter A.: 1988, *MVS* **11, H. 7**, 150.
MVS 11, H. 1, 19, 1986.
Lafler J., Kinman T. D.: 1965, *Ap. J. Suppl.*, **11**, 216.
Kholopov P.N., Samus N.N. et al.: 1985, *General Catalogue of variable stars*, **v. I–III**.