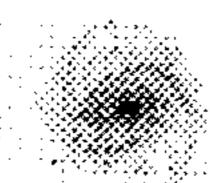
АСТРОНОМИЧЕСКОЕ ОБЩЕСТВО



EURO-ASIAN ASTRONOMICAL SOCIETY

Round

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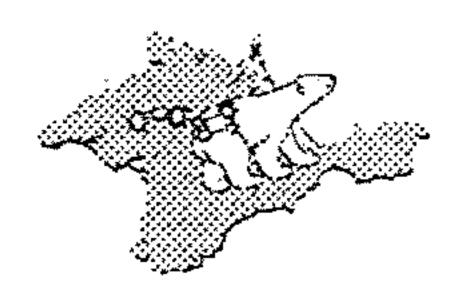
Group

ЯЗЫК

language



English



XII Международная астрономическая олимпиада XII International Astronomy Olympiad

Крым, Сименз

29. IX. - 07. X. 2007

Simeiz, Crimea

Practical round. Problems to solve

6. The O-C diagram. Variable stars of the Mira Cetus type show significant variations in their pulsational period from cycle to cycle. Sometimes their periods increases or decreases during a long time period, sometimes it suddenly changes from one value to another, or show irregular variation. In addition to this, the shape of the light curve can change, and this leads to irregular errors in the determination of the moments of maximum of the light. To find a possible period variation, so called «O-C» diagrams are used. They give the dependence of the difference between observed (O) and calculated (C) moments of maximum light upon JD or cycle number. The moment of maximum is calculated using the linear formula T=T₀+PE, where T₀ is some initial moment of maximum, P is the supposed period, E is the number of cycles that passed after the moment T₀. The two columns of the table list the observational data, the number of current of observation, and corresponding moment of maximum O for a certain star of the considered type.

For this star the value of the calculated period determined before the listed observations was 302.0 days.

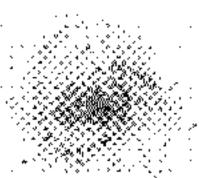
- 6.1. Fill in the empty spaces of the table (at the separate sheet).
- 6.2. Make a plot "O-C" versus E.
- 6.3. Using the "O-C" diagram find the regions where the period is relatively stable (i.e. it changes not very significantly from cycle to cycle), and find the mean value <P> for each of these time intervals. In your copybook make a new table (see an example at right side) in which ______

each line should contain the corresponding intervals of the and its approximate value.

Region, NN	Interval JD 244 JD 244	< P>

N of	JD		
observation	244		
OUSCI VALION	(O)		
1	42551.0		
2	42852.1		
3	43155.8		
4	44063.3		
5	44365.5		
6	44969.9		
7	45273.9		
8	45878.2		
9	46181.8		
10	46486.4		
11	46791.2		
12	47401.9		
13	47706.2		
14	48007.4		
15	48308.1		
16	48609.5		
17	48909.4		
18	49210.8		
19	49811.8		
20	50114.6		
21	50414.5		
<u> </u>	JUTIT.J		

relatively stable periods



EURO-ASIAN ASTRONOMICAL SOCIETY

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XII Международная астрономическая олимпиада XII International Astronomy Olympiad

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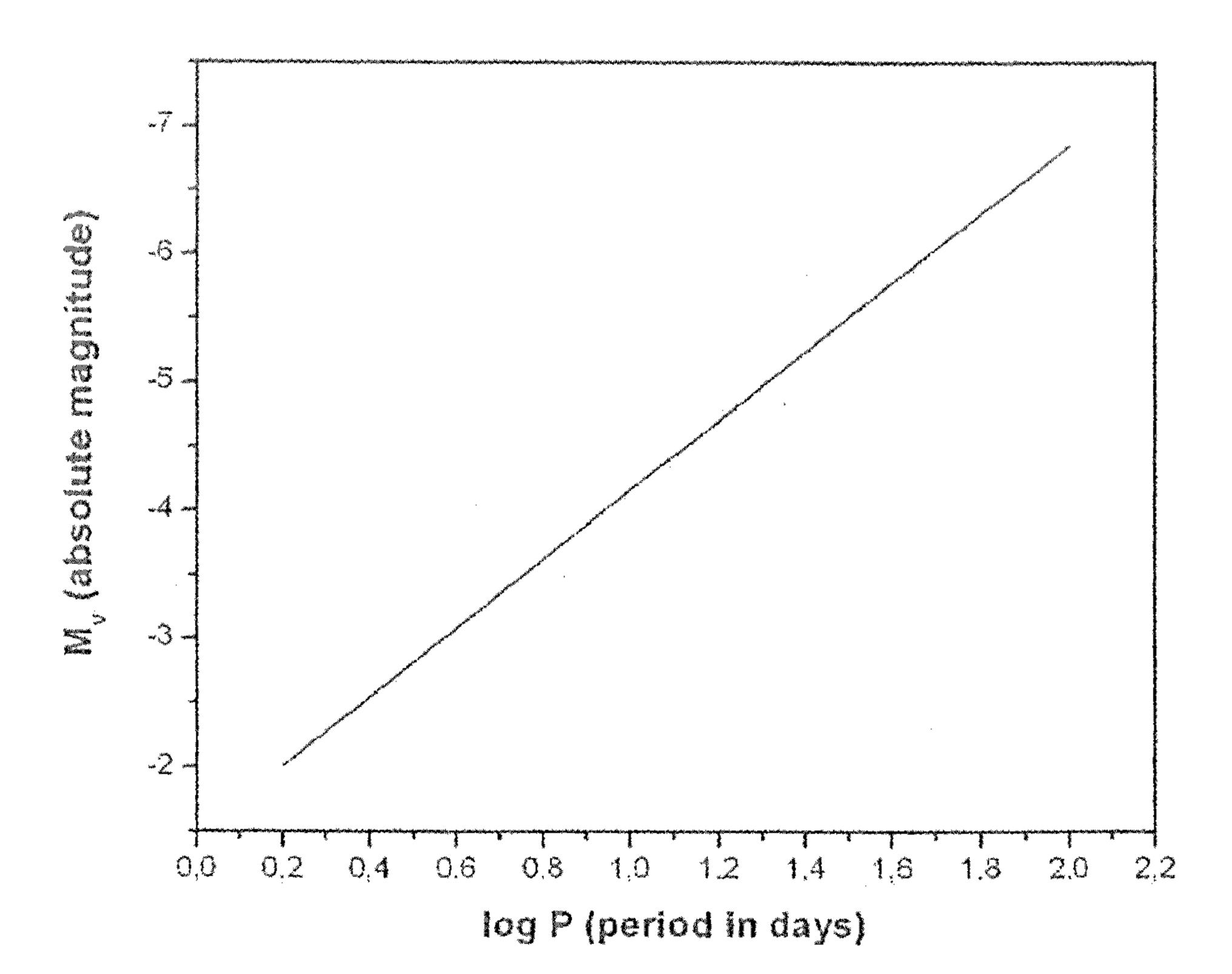
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Practical round. Problems to solve

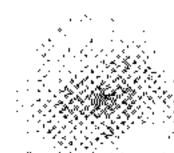
Radial velocity. A cepheid has its mean apparent magnitude of 6^m.2. Spectroscopic observations for this cepheid were carried out during 16 successive nights. The list of observations is given in the table, where the radial velocity is given in heliocentric system. Make such a plot based on the data listed in this table which enables you to derive several important characteristics of this cepheid and to answer the question: Could this cepheid be seen by the first people on the Earth (about 2 million years ago)? (The answer should be written in English: Yes or No.) What was the apparent magnitude of this star at that time?

Supplementary information: Use the relation showed in the plot below (this relation is valid for cepheids – pulsating stars).

Recommendations: Interstellar absorption and possible changes of the cepheid mean luminosity during the last 2 million years can be ignored.



Observed		
radial		
velocity,		
km/s		
75		
T.L.		
3 I		
45		
67		
75		
63		
46		
S., 7		
50		
70		
70		
53		
42		
42		
58		



EURO-ASIAN ASTRONOMICAL SOCIETY

Round Group



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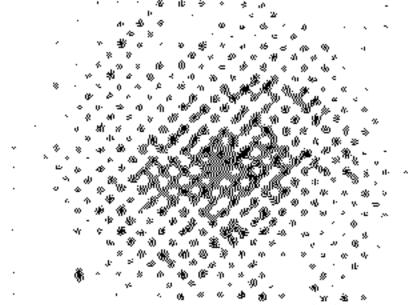
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Komm. Cumens 29. IX. - 07. X. 2007 Simeiz, Crimea

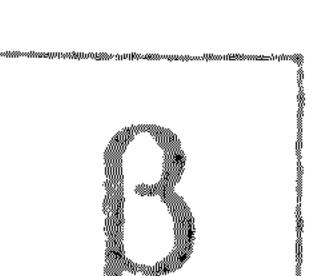
Cole of participant

Practical round. Table to fill for problem 6

	JD 244 (O)	JD 244 (C)		Omercial Control of the control of t
	42551.0	**************************************	0	0
	42852.1			
	43155.8			
	44063.3	**************************************		
	44365.5		**************************************	
	44969.9	(Σ. 1660) aruda —	general personal personal de la companya de la comp	
**************************************	45273.9	tender menner open provinsi dengen en gegrependen en som en green en green en de de temperature en de de tempe		
8	45878.2	**************************************		
	46181.8			
10	46486.4			
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12	47401.9			
13	47706.2			a para da da anta anta anta anta anta anta an
14	48007.4			
15	48308.1		***************************************	
16	48609.5			
17	48909.4		<u></u>	
18	49210.8			- 10 - 10 - 10 - 10 - 10 - 10 - 10 - 10
19	49811.8			
20	50114.6			
21	50414.5			



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XII Международная астрономическая олимпиада XII International Astronomy Olympiad

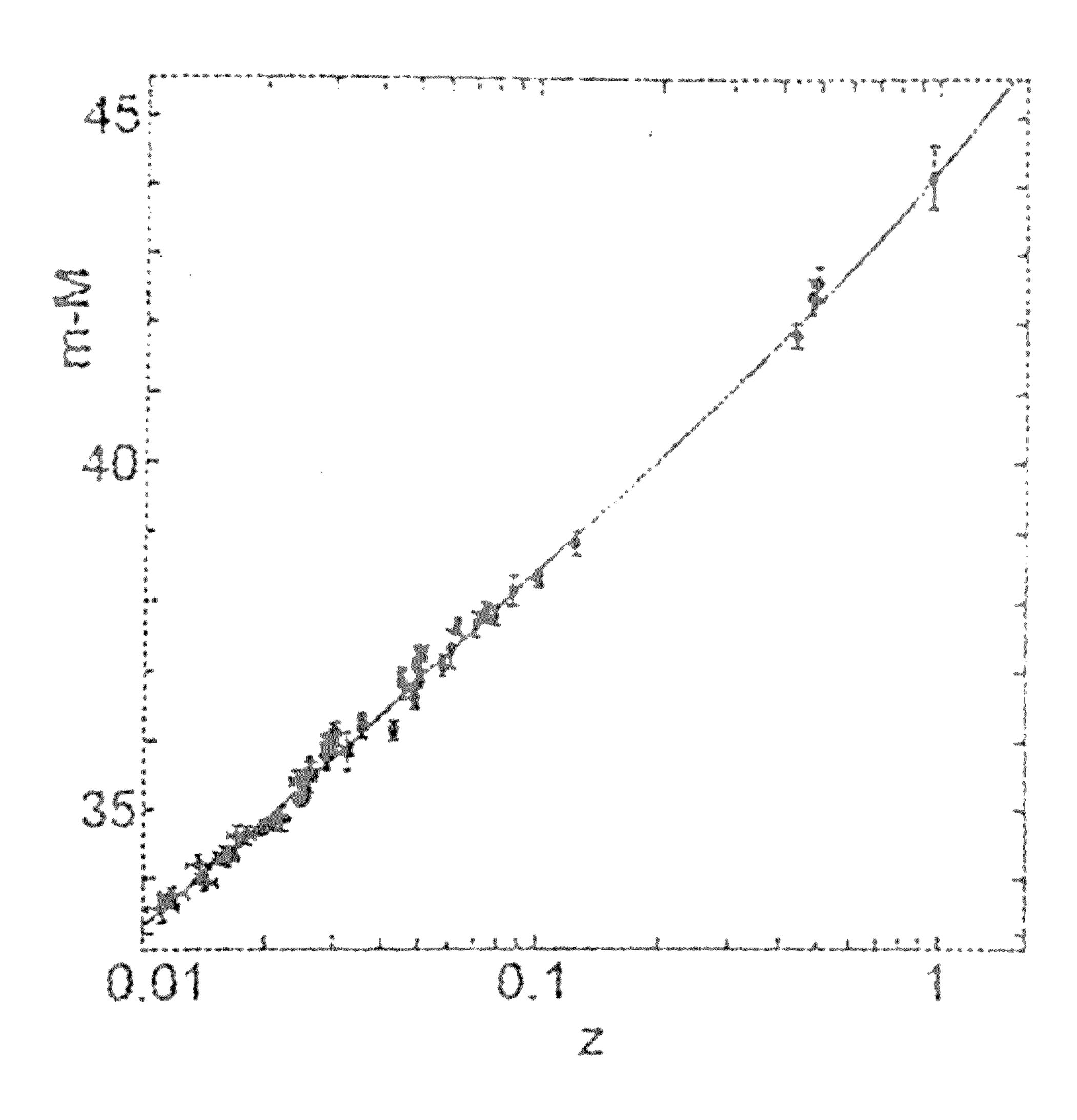
Kobin, Cuneus

29. IX. - 07. X. 2007

Simeiz, Crimea

Practical round. Problems to solve

- Supernova. A Hubble diagram is shown in the right plot. Find the apparent magnitude of a hypothetic Supernova of type Ia, if it exploded at a distance $2.5 \cdot 10^3$ Mpc, and it is known that all of the SN Ia have similar absolute magnitudes (M = $-19^m.5$).
- 7. Radial velocity. Imagine a cepheid whose position is on the border between the constellations of Sgr and Sct. This cepheid has a mean apparent magnitude of $6^{m}.2$. Spectroscopic observations of the H α line (laboratory wavelength is $\lambda = 6562.8 \text{ Å}$) for this cepheid were carried out during 16 successive nights in the second part of September. The list of observations is given in the table. Make such a plot based on the data listed in this table which enables you to derive several important characteristics of this cepheid and to answer the

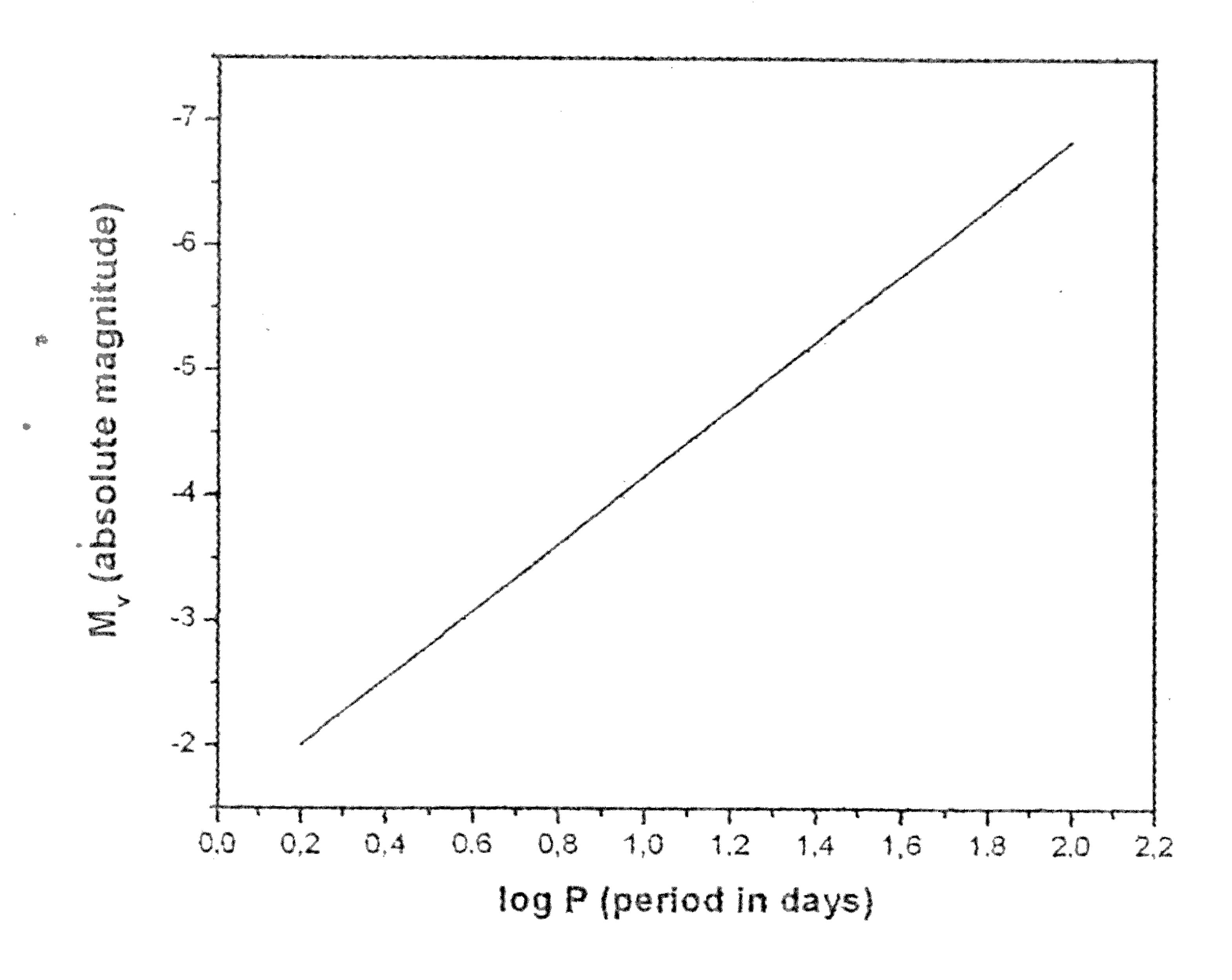


question: Could this cepheid be seen by the first people on the Earth (about 2 million years ago)? (the answer should be written in English: Yes or No.) What was the apparent magnitude of this star at that time?

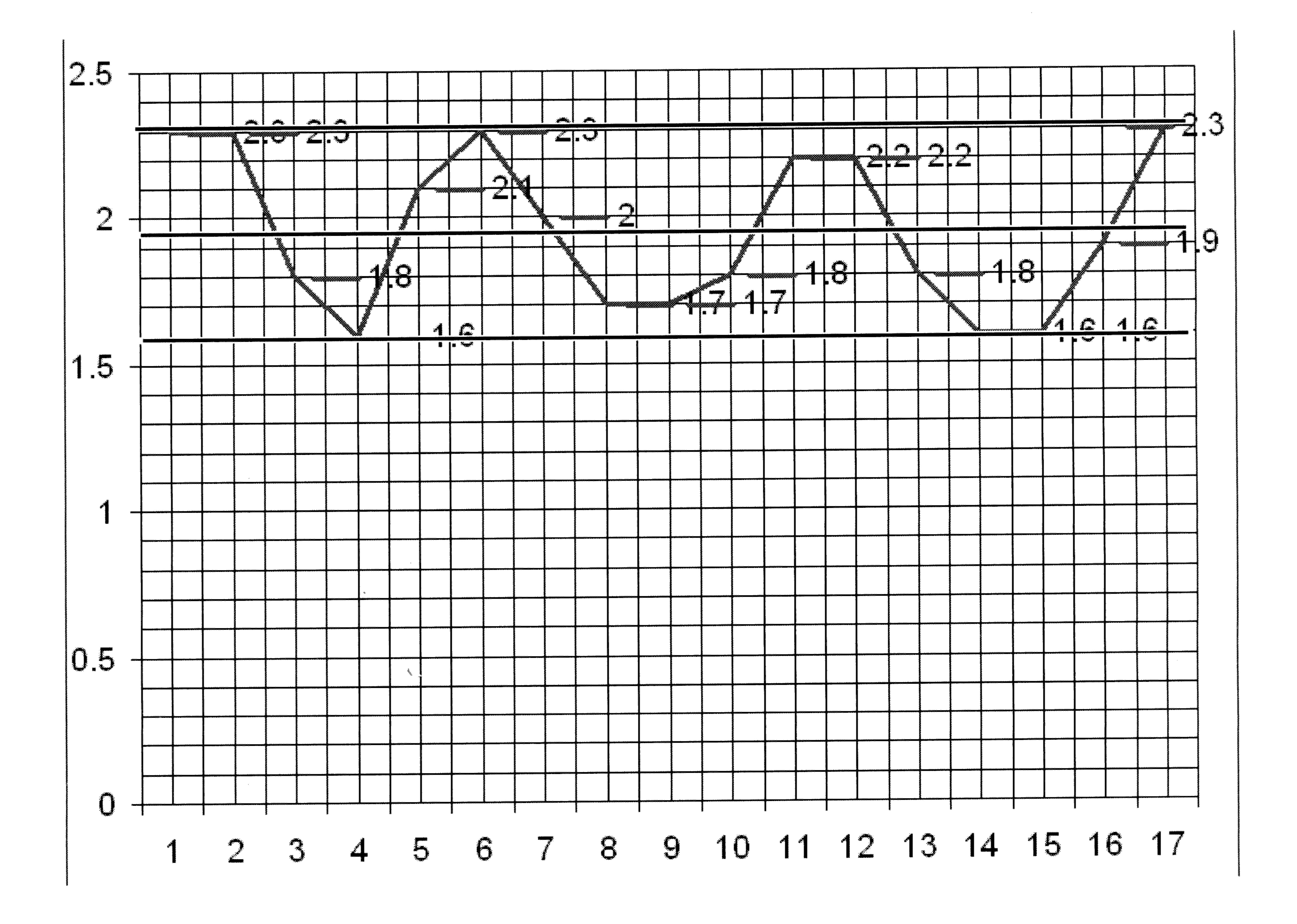
Supplementary information: Use the relation showed in the plot below (this relation is valid for cepheids – pulsating stars).

Recommendations: interstellar absorption, rotation of the Earth around its axis and possible changes of

the cepheid mean luminosity during the last 2 million years can be ignored.



observations (in part of days)	Observed Wavelength,		
	6565,1		
1.8	65651		
2,9	6564,6		
3.9	6564,4		
4.9	6564,9		
5.8	6565,1		
6.8	6564,8		
7.8	6564,5		
	6564,5		
8.9	6564,6		
9.8	6565,0		
10.8	6565,0		
11.9	6564,6		
12.8	6564,4		
13.8	6564,4		
14.8	65647		
	6565,1		



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