მზის რადიაცია და ატმოსფეროს გამჭვირვალობა აბასთუმანში

შ. ჩხაიძე

ჩვენი ბიულეტენის პირველ ნომერში გამოქვეყნებული იყო 1934 წლის აქტინომეტრულ დ კვირვებათა საფუძველზე გამოყვანილი ატმოსფეროს სიმღვრივის ფაქტორი აბასთუმნისათვის[1]. აქტინომეტრული დაკვირვება გრძელდებოდა აგრეთვე 1935 წლის განმავლობაშიაც ობსერვატორიის იმავე დროებით მოედანზე კურორტ აბასთუმანში.

ცხრილი I TABLE

$h_{\odot}$	mass	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	წლიური year
							Ante Meridiem							
19.3	2.56	1.30	1.26	1.17	—	1.03	1.08	1.07	1.08	—	1.20	1.24	1.29	1.17
23.5	2.13	1.36	1.31	1.22	1.20	1.12	1.18	1.12	1.13	1.17	1.27	1.31	1.36	1.23
30.0	1.71	—	1.39	1.34	1.30	1.22	1.24	1.21	1.22	1.27	1.37	1.37	—	1.29
41.8	1.28	—	—	1.44	1.37	1.31	1.33	1.31	1.32	1.37	1.47	—	—	1.37
							Post Meridiem							
19.3	2.56	1.31	1.28	1.19	1.12	1.04	1.11	1.12	1.08	1.15	1.20	1.27	1.30	1.18
23.5	2.13	1.39	1.34	1.24	1.22	1.13	1.16	1.17	1.13	1.19	1.29	1.33	1.36	1.25
30.0	1.71	—	1.41	1.35	1.30	1.24	1.26	1.21	1.25	1.29	1.37	1.38	—	1.31
41.8	1.28	—	—	1.46	1.37	1.33	1.32	1.32	1.35	1.38	1.47	—	—	1.38
							Average							
19.3	2.56	1.30	1.27	[illegible]	1.12	1.03	1.08	1.08	1.08	1.13	1.20	1.25	1.29	1.17
23.5	2.13	1.37	1.33	1.27	1.21	1.12	1.15	1.13	1.13	1.18	1.28	1.32	1.36	1.24
30.0	1.71	—	1.40	1.35	1.30	1.22	1.24	1.21	1.23	1.27	1.37	1.38	—	1.30
41.8	1.28	—	—	1.45	1.37	1.32	1.32	1.31	1.33	1.37	1.47	—	—	1.37

1934, 1935 წ. წ. განმავლობაში მიღებულ დაკვირვებათა მთლიანი შედეგები თვიურ საშუალოთა სახით წარმოდგენილია ცხრ. I-ში, სადაც მზის განსაზღვრულ სიმაღლეთათვის ანუ გარკვეული მასებისათვის მოცემულია მზის პირდაპირი რადიაციის ინტენსივობა სხივებისადმი მართობულ ზედაპირზე $gr cal cm^{-2} min^{-1}$-ებში.

ამ მასალის საფუძველზე, იმავე მეთოდით, რომელიც პირველ წერილში იყო აღწერილი[2], გამოყვანილ იქნა სიმღვრივის ფაქტორი, რომლის თვიური მნიშვნელობანი მოცემულია ცხრ. II-ში.

ცხრილი II TABLE

$h_{\odot}$	mass	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	წლიური year
19°.3	2.56	1.84	1.91	2.18	2.34	2.68	2.42	2.38	2.38	2.30	2.10	1.99	1.88	2.20
23.5	2.13	1.85	1.97	2.14	2.31	2.68	2.45	2.54	2.58	2.45	2.10	2.02	1.89	2.25
30.0	1.71	—	2.03	2.18	2.32	2.62	2.47	2.62	2.57	2.47	2.08	2.13	—	2.35
41.8	1.28	—	—	2.25	2.54	2.72	2.66	2.72	2.66	2.54	2.14	—	—	2.53

როგორც ამ ცხრილიდან ჩანს ატმოსფეროს სიმღვრივის მინიმუმს ადგილი აქვს ზამთრის პერიოდში, რაც სავსებით ბუნებრივია; მართლაც ამ დროს ატმოსფეროში ძლიერ მცირეა წყლის ორთქლისა და მტვერის რაოდენობა. რაც შეეხება მაქსიმუმს, თუმცა ის უფრო მოსალოდნელი იყო ზაფხულის თვეებში, მას ადგილი ჰქონია მაისში, რის ნამდვილი მიზეზი ჯერ-ჯერობით აუხსნელია. ძნელია იმის თქმა, არის ეს განხილული წლების ანომალია, თუ ადგილობრივი პირობების თავისებური გავლენის შედეგი.

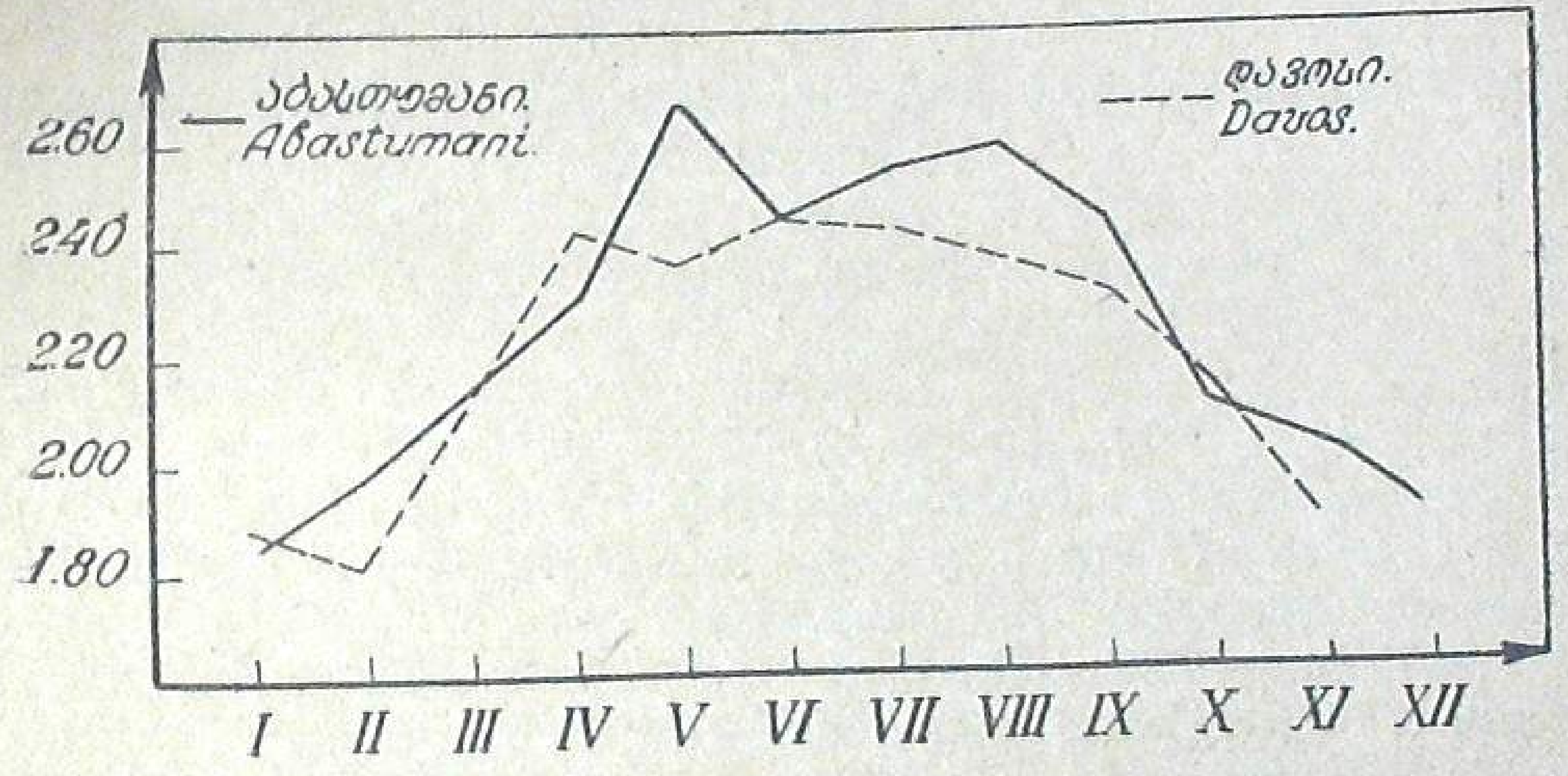
დღიური მსვლელობა შეიძლება შევამჩნიოთ ცხრ. I-ის პირველსა და მეორე ნაწილში მოცემულ მასალაზე, საიდანაც ჩანს, რომ რადიაციის ინტენსივობა ნაშუადღევს უფრო მაღალია ვიდრე შუადღემდე მზის შესაბამ სიმაღლეთათვის, რაიც იმას მოწმობს, რომ ატმოსფეროს სიმღვრივე შუადღემდე მეტია ვიდრე ნაშუადღევს. ამგვარად, ორი წლის მასალის განხილვამ კვლავ დაადასტურა ის ფაქტი, რომელიც ჩვენ აღნიშნული გვქონდა იმავე წერილში[3].

აბასთუმნისათვის ეს თავისებურება ადგილობრივი ხასიათისა უნდა იქნეს. მართლაც, ჩვენი დაკვირვების დროებით ადგილს აღმოსავლეთით და სამხრეთ-აღმოსავლეთით ცენტრალური კურორტი აკრავს, სამხრეთ-დასავლეთით და დასავლეთით კი — წიწვიანი ტყეებით შემოსილი გორაკები.

შედარების მიზნით ჩვენ დავამუშავეთ იმავე პერიოდისათვის (1934, 1935 წ. წ.) ევროპის ცნობილი კურორტის დ ა ვ ო ს ი ს აქტინომეტრული დაკვირვებანი[4] და გამოვიყვანეთ სათანადო სიმღვრივის ფაქტორი. სიმღვრივის ფაქტორის მიღებული მნიშვნელობანი დავოსისათვის თვიურ საშუალოთა სახით მოგვყავს ცხრ. III-ში.

ცხრილი III TABLE

m	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	წლიური year
2.30—2.80	1.87	1.89	1.90	2.35	—	2.38	2.42	2.38	2.23	1.99	1.82	1.83	2.10
2.00—2.25	1.88	1.81	2.13	2.44	2.37	2.45	2.44	2.38	2.32	2.13	1.89	—	2.20
1.50—1.90	—	1.94	2.10	2.29	2.60	2.54	2.38	2.50	2.31	2.02	1.97	—	2.26
1.10—1.45	—	—	—	2.44	2.69	2.62	2.59	2.62	2.31	—	—	—	2.55



ნახ. 1 Fig.

როგორც ცხრ. II და III გვიჩვენებს, აბასთუმნის და დავოსის ატმოსფეროს სიმღვრივის ფაქტორის მნიშვნელობანი საკმაოდ ახლოა ერთმანეთთან. საშუალო წლიურ მნიშვნელობებისათვის სიმღვრივის ფაქტორის სხვაობანი შესაბამ მასებისათვის არ აღემატება 0.09-ს დავოსის სასარგებლოდ, რაც სავსებით ბუნებრივია ადგილთა სიმაღლეების განსხვავების გამო. (დავოსის სიმაღლე ზღვის დონიდან 1600 *m*, ხოლო აბასთუმნის ობსერვატორიის დროებითი მოედნის — 1350 *m*).

ცალკე თვეებისათვის აბასთუმნის და დავოსის ატმოსფეროს სიმღვრივის მსვლელობის სურათს ნახ. 1 იძლევა.

1936 წლის იანვრიდან აქტინომეტრული დაკვირვება გადატანილ იქნა მთა ყ ა ნ ო ბ ი ლ ზ ე, აბასთუმნის სამთო ასტროფიზიკური ობსერვატორიის მოედანზე, რომლის სიმაღლე ზღვის დონიდან 1700 *m* აღწევს.

იქვე დადგმული იქნა აგრეთვე II რიგის მეტეოროლოგიური სადგური. ამჟამად ვამუშავებთ 1936, 1937 წ. წ. მასალას და ჩვენი ბიულეტენის შემდეგ ნომერში განზრახული გვაქვს მთა ყანობილისა და კურორტ აბასთუმნის მონაცემების შედარებითი გამოკვლევის გამოქვეყნება.

ივნისი, 1937.

ლიტერატურა: Literature:

1. Bull. Abast. Obs. 1, p. 105, 1937.
2. Ibid.
3. Ibid.
4. Tab. d. Intensität d. Sonnenstr. in Nord- und Mittel-Europa; Met.-Magn. Obs. Potsd.

SOLAR RADIATION AND THE TRANSPARENCY OF THE ATMOSPHERE AT ABASTUMANI

SH. M. CHKHAIDSE

(Summary)

In the precedent number of the Bulletin[1] the author published the results of investigation of the turbidity factor of Abastumani on the basis of actinometric observations made during 1934.

In the present note the results of a similar investigation made on the ground of observational material of 1934 and 1935 are stated.

Table I contains for each month the mean values of radiation on the perpendicular surface in $\frac{gr\ cal}{cm^2\ min}$ for different solar altitudes.

Table II lists the values of the turbidity factor.

Table III gives the values of the turbidity factor for Davos, calculated on the basis of actinometric observations made in the same years[4] (1934—1935).

On Fig. 1 the comparison of the course of the turbidity factor for Abastumani with that for Davos is shown.

The data given in this note as well as those of the previous investigation refer to the temporary platform of the Observatory at Abastumani. Since 1936 the observations are carried out on Mount Kanobili at an altitude exceeding by 300 *m* that of the temporary platforf.

June, 1936.

აბასთუმნის ასტროფიზიკური ობსერვატორიის ბიულეტენი № 2. 1938
БЮЛЛЕТЕНЬ АБАСТУМАНСКОЙ АСТРОФИЗИЧЕСКОЙ ОБСЕРВАТОРИИ № 2. 1938
BULLETIN OF THE ABASTUMANI ASTROPHYSICAL OBSERVATORY No. 2. 1938

A BRIEF REPORT ON THE ACTIVITY OF THE ABASTUMANI ASTROPHYSICAL OBSERVATORY ON MOUNT KANOBILI IN THE YEARS 1932—1937

THE ORGANIZATION OF THE OBSERVATORY

Special expeditions to the southern regions of the USSR, the object of which was the selection of the site most suitable for astronomical observations, resulted in the foundation of the Abastumani Observatory in 1932[1].

The 13-inch reflector constructed by the Leningrad State Astronomical Institute served for observations till to 1937, when several new instruments were mounted.

At first the Abastumani Observatory existed as an experimental station. The results obtained showed that astronomical observations could be carried on successfully at Abastumani. Basing on the opinion of the special commission of experts, who recognized plateau Kanobili to be the best place for a Mountain Astronomical Observatory, the Government decided to start in 1934 the erection of the Observatory on Mount Kanobili (1700 *m* above the sea level).

THE BUILDING-CONSTRUCTION FOR THE OBSERVATORY

By the 20th anniversary of the October Revolution the construction of special buildings was completed and all the instruments present installed. Thus the preparation of the technical basis for scientific work of the Observatory was concluded.

At present there are several buildings for scientific purposes (towers and pavilions) as well as subsidiary constructions (electric power station) with a total capacity of 5000 m^3, in which the following instruments are installed: 16-inch refractor, 13-inch reflector, spectrohelioscope and auxiliary mechanisms.

SCIENTIFIC RESEARCH WORK

Notwithstanding the organization activity, several scientific research works were carried on.

Until the principal instrument of the Observatory—the 16-inch refractor—could be put in action, the works were carried out with 13-inch reflector.

The 13-inch reflector. The works with 13-inch reflector in 1933 concerned chiefly the testing of the instrument, the investigation of the faults of the mechanism and the constructive improvements. The inspection of the reflector mirror was made which showed that the greatest deviation of the mirror from the nearest paraboloid is equal to 0.37 of the wave length.

The errors of the photometric field of the reflector were studied.

Some problems concerning the methods of focal photometry of stars were developed[2].

The absorption coefficient for Abastumani in photographic and visual rays was determined[3].

Since 1934 the observations with the reflector were made alternatively in two focus systems: in the Newtonian focus and in the Nasmith one. The eclipsing variable stars of the W Ursae Majoris type are being observed photographically in the Newtonian focus.

The investigation of the stars: BB Pegasi[4], AP Aurigae[5], OO Aquilae[6], AG Virginis[7], ZZ Persei[8], UX Eridani[9], RZ Comae Berenices[10], AH Aurigae[11], SS Comae Berenices[12] is fully completed by now, the mean curves for the variation of their brightness drawn and the corrections of elements computed.

For several stars of the same class of variables the photographic material was accumulated. Besides that, the photographic observations of the short-period Cepheid star CY Aquarii were made on the basis of which the mean light-curve was drawn and the new elements derived[13]. The observations of UW Aquarii showed that this star was only erroneously recorded as a variable[14]. The observations of the W Ursae Majoris type stars were carried out in most cases by V. M. Bodokia.

The Newtonian focus was used also for other episodic works.

Thus, for example, in 1933 the direct-vision prism was tested in the beam of rays converging at the focus according to the idea of the Academician D. S. Rojdestvensky.

In the Nasmith focus of the 13-inch reflector the electrophotometric observations were made only episodically.

In October 1934 the Guthnick stellar electrophotometer was tried for the first time. To inspect the instrument and to determine the accuracy obtained testings of the stars were carried out. At that time the computations showed a satisfying accuracy of the order of $\pm 0^{m}.015$.

Further observations proved that with this electrophotometer one can penetrate with sufficient certainty to the 5th or 6th star magnitudes. Electrophotometric observations during the summers 1935, 1936 and 1937 confirmed the character of color-index variations of the star β Lyrae found by Elvey; they made it also possible to detect the variation of the brightness of P Cygni[15] and to draw the light-curve for λ Tauri[16].

In collaboration with the Leningrad Astronomical Institute the scheme for a new stellar electrophotometer was developed. In summer of 1937 the instrument was put to the test at the Abastumani Observatory.

In the new electrophotometer the photoelectric current is measured with a mirror galvanometer after being amplified in an amplifier assembled according to the DuBridge-Brown scheme. The housing of the photoelement is evacuated.

The investigations showed that with this electrophotometer stars down to 8.5 or 9.0 magnitudes can be observed with a normal accuracy.

In 1937 the observations of P Cygni and λ Tauri were made with the new electrophotometer. The same instrument served for various auxiliary works and those made for reduction purposes. Thus, for example, the transparency coefficient, necessary for reduction of the atmospheric absorption, was determined. The obtained value of the transparency coefficient is equal to 0.776.

The electrophotometric works are being conducted by V. B. Nikonov.

The spectrohelioscope constructed by Howell and Sherburne was mounted early in 1937. Systematic observations were begun on September 1st. Observations are being conducted by K. G. Zakharin and Sh. M. Chkhaidse.

The 16-inch refractor with 8-inch parallel cameras was completely mounted in 1936. However, owing to the absence of electro-energy, it was set in action only in 1937. At the end of 1937 the object glasses of the 8-inch cameras were examined according to Hartmann's method[17]. Several other investigations have been also carried out.

The works with 16-inch refractor are conducted by E. K. Kharadse and M. A. Vashakidse.

Experimental works. In 1934 and 1935 E. K. Kharadse examined solar spectrogramms with the purpose to study the contours of hydrogen lines in connection with the changes in the intensity of the solar ultra-violet radiation[18].

During the total solar eclipse of June 19, 1936 K. G. Zakharin investigated the degree and the direction of polarization in the outer part of the solar corona.

For this purpose the mechanician V. V. Vikhrov constructed in the workshops of the Observatory a camera with a reflecting analyser. The observations were made in two regions of the spectrum using normal—Ilford Special Rapid (backed)—plates without filter and Ilford Hypersensitive Panchromatic (backed) plates with a filter transparent for $\lambda > 5700$ Å. The results showed that the degree of polarization is greatly different for different regions of the spectrum as well as for different points of the corona.

The distribution of polarization in the outer zone is especially complicated.

The direction of polarization in most cases differs considerably from the radial one; however, it changes regularly for each position angle.

A certain connection was detected between the polarization direction, coronal forms and the position of the rotation axis.

In coronal streamers the direction of polarization deviates towards the middle part of the streamer, approaching in it the tangential direction.

The paper discussing the results obtained is to be published by the Academy of Sciences of the USSR in a special symposium which will contain all the works concerning the eclipse of 1936.

The same publication will contain also the article by V. B. Nikonov about the radiometric determination of the total coronal radiation made during the eclipse of June 19, 1936.

The observations of the corona were realized by means of a special radiometer enabling the comparison of the coronal and lunar radiation.

For the ratio of the total coronal radiation to the total solar radiation the following value was derived:

$$\frac{E_c}{E_\odot} = 4.1 \times 10^{-6}.$$

The results obtained indicate clearly enough a relative excess of the total radiation as compared with the radiation of the region of the spectrum of a more or less short wave length, i. e. the excess of infra-red in the outer parts of the corona.

Theoretical investigations. During 1936 and 1937 some problems of theoretical astrophysics were worked up by Sh. G. Gordeladse. The applicability of Zanstra's method to temperature determination of the stars surrounded by a gaseous envelope of a moderate radius was considered [19]. It was shown that in this case Zanstra's method gives exaggerated values of temperature.

Several other works concerning Novae were also published [20], viz., the estimation of the mass ejected during the outburst of Nova; the estimation of the energy of outburst etc.

V. A. Ambarzumian in collaboration with Sh. G. Gordeladse completed a work on diffuse nebulae and cosmic absorption [21]; it was shown that there is no genetic relation between diffuse nebulae and illuminating stars and the conclusion was suggested that a multitude of unilluminated nebulae is irregularly distributed in the space. As the amount of radiation from distant stars absorbed by these nebulae proved to be of the same order of magnitude as the observed general absorption, the latter may be explained by the existence of these unilluminated nebulae.

M. A. Vashakidse investigated the distribution of A, F and G type stars in the direction perpendicular to the galactic plane and in the plane of symmetry [22].

V. A. Ambarzumian and M. A. Vashakidse finished a collective work on the interpretation of the anomalous Balmer decrement in the spectra of late type stars with emission lines. The anomalous decrement is theoretically explained by the presence of absorption by titanium [23].

Geophysical works and the study of atmospheric conditions. Actinometric and meteorologic observations serving for reduction purposes as well as the study of atmospheric conditions at Abastumani are conducted by Sh. M. Chkhaidse. The results of actinometric observations [24] as well as those of special investigations of atmospheric conditions [25] have been partially published.

Sh. M. Chkhaidse determined the turbidity factor for Abastumani [26] and he was busy with a comparative study of meteorologic characteristics for Mount Kanobili and the health—resort Abastumani on the basis of the material accumulated during 1936 and 1937.

THE STAFF

By the end of 1937 the following are on the staff of the Observatory: E. K. Kharadse, Sh. G. Gordeladse, V. B. Nikonov, M. A. Vashakidse, Sh. M. Chkhaidse, K. G. Zakharin (scientific workers), Eveline E. Dolidse (laboratorian), Nino R. Eristavi (librarian), V. V. Vikhrov (mechanician) and three post graduate students.

The scientific worker V. M. Bodokia passed away in early autumn of the year 1937.

During 1936 and 1937 three of the collaborators defended their theses for the scientific degree. Four of the collaborators were sent on scientific missions.

LIBRARY

The library contains about 3.000 books. Over 80 periodicals are taken in regularly.

By June, 1936 a book on solar eclipses compiled by V. M. Bodokia came out in a popular edition. By the end of 1937 the first number of the Bulletin of Abastumani Observatory was issued.

The following works are prepared for print: a monograph by Sh. G. Gordeladse—«Novae» and popular books: «Stars» by M. A. Vashakidse and «Planets» by V. M. Bodokia.

EDUCATIONAL WORK AMONG MASSES

During the years 1932—1937 the Observatory has taken part actively in the educational work among masses, making astronomical sciences intelligible through popular lectures on various problems organized in collective farms, villages and establishments of the Abastumani district.

In all about 100 lectures were delivered.

COLLABORATION WITH OTHER SCIENTIFIC INSTITUTIONS

From the beginning the Observatory worked in a close collaboration with several scientific institutions of the USSR, viz.: Leningrad Astronomical Institute (photoelectric investigations); Moscow Astronomical Institute (the study of variable stars); State Optical Institute (the examination of the direct-vision prism); Astronomical Observatory of the Leningrad State University and others.

The Observatory participated also in the following conferences: Astrophysical Conference at Poulkovo (1932); the Conference on the problems of astronomical instruments engineering in Leningrad (1933); the first All-Union Astronomo-geodesic Congress in Moscow (1934); the Conference on the study of variable stars and so on. It took part also in the works of the All-Union Committee for the preparation of observations of the total solar eclipse of 1936.

The Abastumani Observatory as well as all other scientific institutions of the Soviet Union is greatly supported and taken care of by the Government. This support and attention ensured the successful organization of the Abastumani Observatory which is the first Mountain Astrophysical Observatory in the USSR and at the same time the first astronomical institution in Soviet Georgia.

This support and attention give us confidence in the further growth and successful work of the Abastumani Astrophysical Observatory on Mount Kanobili.

January, 1938.

E. K. Kharadse
Director of the Abastumani Astrophysical
Observatory on Mount Kanobili.

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