

J C Bhattacharyya: the Guide and the Supervisor

STUDIES OF ASTRONOMICAL SEEING

By
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A Thesis
Submitted for the Degree of
Doctor of Philosophy
in the Faculty of Science
BANGALORE UNIVERSITY

Indian Institute of Astrophysics
BANGALORE

DECLARATION

The work forming the subject matter of this thesis was entirely done by me under the guidance of Dr. J. C. Bhattacharyya and Dr. K. S. Balasubrahmaniam. This work has not been submitted earlier to any Institute or University for the award of any degree or diploma.

Venkatesh S.L.

CHAPTER II

OBSERVATIONS OF SEEING AND OPTIMIZATION

2.1. Observational methods of seeing

1. Image diameter: The only seeing feature observed through a large aperture is the profile of an image. It is observed that an image does not have sharp edges. It has been shown that the profile is usually nearly Gaussian. Perfect registration must be used so that the image look like close. The magnification has to be chosen according to the seeing conditions. Photoelectric measurements through diaphragms of different sizes show what fraction of the starlight is included in a visually estimated diameter.
2. Image motion: In the case of small apertures, it is sufficient to estimate the maximum excursion of the image from its average position. Such estimates again yield a radius within which the image will stay for 80 to 90 per cent of the time; this radius nearly has the same value as obtained in the previous section.
3. Photographic trails: Image motion can be studied readily by trailing the image of bright stars across a photographic plate. This procedure also allows for the detection of the entire image profile expected for large apertures. This method works quite satisfactorily if the seeing effects are manifest as image motion.

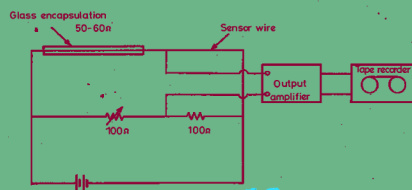


Fig. 3.19. Nihrome wire bridge network shown with amplifier and tape recorder.

PHYSICAL STUDIES OF SOLAR SYSTEM OBJECTS

Table 4.1 Eclipse events during 1985 from VBO. Fitted parameters using Lommel-Seeliger's law

| Date | Event | $\delta \alpha_m$ | Impact Parameters | Fitted Parameters | χ^2 |
|----------|-------|-------------------|-------------------|-------------------|----------|
| (1) | (2) | (3) | (4) | (5) | (6) |
| 85/09/24 | 1E2 | -78 | 328 | 448 | 1.067 |
| 85/10/24 | 3E1 | -86 | 1683 | 1738 | 0.505 |
| 85/10/12 | 1E2 | -105 | 691 | 603 | 7.055 |
| 85/11/15 | 3E1 | -118 | 336 | 369 | 8.688 |

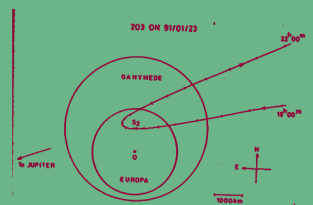


Fig. 2.1. Geometry during a mutual event. The Sun, the earth, Jupiter, and the Galileo satellite lie very nearly in one plane, leading to the possibility of mutual occultations (e.g. here J03) and eclipses (e.g. 2E1).

Fig. 4.1(a). Geometry during the occultation of Ganymede as seen by Europa centered at O at the instant of close approach on 01/01/82. The path of Ganymede between $15^{\circ}00'$ UTC and $22^{\circ}00'$ UTC is along the curved track. The 100 km radius latitude position of Ganymede at intervals of 10° .

4 Results of Observations of Mutual Events from VBO

4.1 Extraction of Astrometric Parameters

A STUDY OF THE STELLAR POPULATIONS IN GALAXIES FROM INTEGRATED SPECTRA

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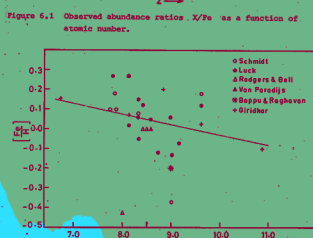
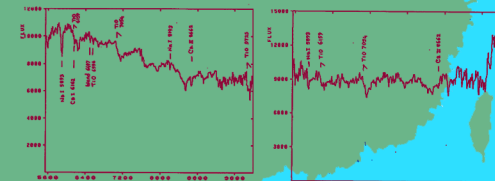


Figure 6.2. The radial abundance gradient in the Sun's galactic-centric position is shown by an arrow.

EMISSION LINE STUDIES OF WOLF-RAYET BINARIES

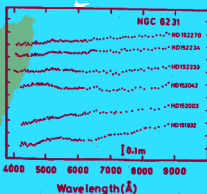


Figure 3.3. Energy distribution of some stellar members observed for continuum. The difference of HD 152270 and HD 151923 is apparent.

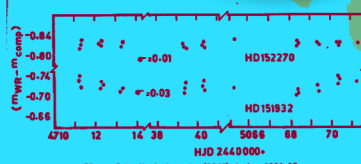


Figure 3.4. Variation of $m(5600)$ during 1981-83.

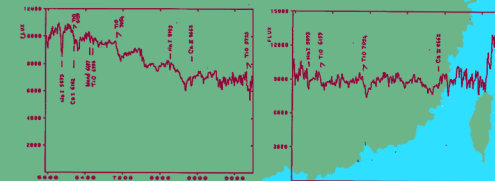


Figure 6.3. The observed spectrum of NGC 5128 in the H-alpha region. The observed spectrum is shown in solid line and the model fit is shown in dashed line.

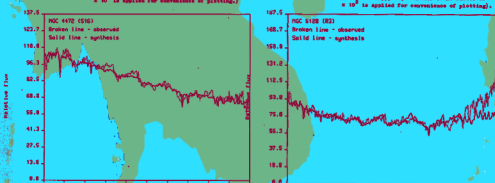


Figure 6.4. The observed spectrum of NGC 5128 in the H-beta region. The observed spectrum is shown in solid line and the model fit is shown in dashed line.

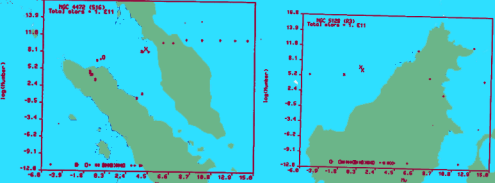


Figure 6.5. The observed spectrum of NGC 5128 in the H-gamma region. The observed spectrum is shown in solid line and the model fit is shown in dashed line.

the latest H-giant group available in the library (NGC 113). NGC 5128 shows an enhanced metal rich giant sequence which contributes about 19% of the light at 1 micron. The spectrum of NGC 5128 turns up towards bluer wavelengths and also towards the infrared. This seems to suggest massive young stars being formed and evolving to provide late H giants or even supergiants. The existing stellar library components are not, in our finding, adequate to match the increasing flux towards the infrared.

It would be very useful to obtain observations at several positions on the patchy surface of the galaxy and obtain the distribution of the stellar populations spatially, over both the old ellipsoidal component and the young star forming disk.

One of the main conclusions from the analysis of line indices is that they can be exploited in choosing between solutions. During the analysis of line indices in both the stellar library and the galaxies we find several useful indicators of metallicity and luminosity, which, though used for stars have not been used commonly for galaxies e.g. CaII at 8500, CaI 8162.

Our immediate aim in the continuance of this study is to use the recently acquired CCD (charge coupled device) detector system at the Vainu Bappu Observatory

SPECTRAL ANALYSIS OF SELECTED CEPHEIDS AND THE GALACTIC DISTRIBUTION OF METALLICITY

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<http://hdl.handle.net/2248/132>

SUNETRA GIRIDHAR

This thesis is dedicated
to the memory of

M.K. Vainu Bappu

who inspired me throughout this work,
but did not live to see its completion

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I wish to express my deep sense of gratitude to late Professor M.K. Vainu Bappu for suggesting the topic of this thesis and for constant encouragement and guidance throughout the project. The work would not have materialized if not for his generous allotment of observing time on 102-cm reflector at Vainu Bappu and computing time in TWC 316 at the Indian Institute of Astrophysics. Various facilities at the Institute, in the aspects of observation, data reduction and the final presentation, which have all gone into this thesis, were all created by Professor Vainu Bappu.

I am thankful to Professor J.C. Bhattacharyya for becoming my Supervisor after the sudden demise of Professor Bappu on August 19, 1982. Professor Bhattacharyya has critically read all the Chapters of the thesis and made valuable suggestions that helped in the completion of the project.

THE STUDY OF FAINT GALACTIC OPEN CLUSTERS

A Thesis
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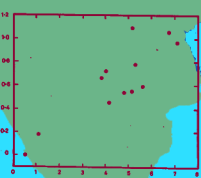


Fig. 6.4. The average height of the interstellar reddening curve as a function of distance.

to be the junction for the merging of the local arm with the outer Perseus arm.

The location of OC 1762 at $l=270^{\circ}$ and $D=7$ kpc appears to be of particular importance, especially due to the presence of two already known clusters - one at $l=265^{\circ}$, $D=6$ kpc and the other at $l=260^{\circ}$, $D=8$ kpc. These positions along with those of OC 692 and OC 715 at $l=250^{\circ}$ and $D=6$ kpc give an indication of a feature which is originating from the local arm at $D=4.5$ kpc and extending towards $l=260^{\circ}$ and $D=8$ kpc. This branching off feature is clearly seen in the radio map of the Galaxy by Kerr (1970) and the same is marked by a dotted line in Fig. 5.4. Thus, for the first time there seems to be an indication of this branching off feature from optical observations. However, it is essential to note the strong interstellar extinction found in this general direction, which indicates the presence of large quantities of interstellar matter (Garrison, 1965). Thus any further attempts to improve the evidence for this branching off feature must be made with extra care, especially while accounting for the interstellar reddening in the direction of $l=260^{\circ}$ to 280° .

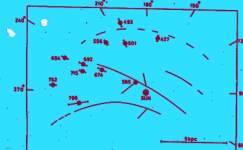


Fig. 5.5. The location of the clusters studied in the present work are marked on the map of the Galaxy. The Galactic structure shown here for the direction of $l=260^{\circ}$ to 280° is similar to that shown in the radio map of the Galaxy by Kerr (1970). The dotted line shows the interstellar reddening curve as shown in Fig. 5.4.

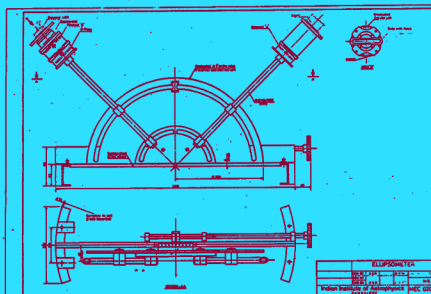


Fig. A.1. Sectional view of the ellipsometer.

STOKES POLARIMETER AND THE MEASUREMENT OF VECTOR MAGNETIC FIELDS IN SOLAR ACTIVE REGIONS

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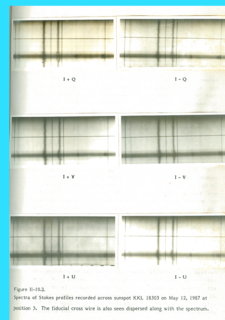


Figure 5.1. Images of three profiles recorded across magnetogram 565, 567 and 569 on May 15, 1987 at 09:00 UT. The shaded areas are also seen in the diagram along with the profiles.



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