JD13

Hipparcos and the Luminosity Calibration of the Nearer Stars

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https://doi.org/10.1017/S1539299600014581 Published online by Cambridge University Press

Highlights of Astronomy, Vol. 12
International Astronomical Union, 2002
H. Rickman, ed.

Introduction to Joint Discussion 13, "HIPPARCOS and the Luminosity Calibration of the Nearer Stars"

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Joint Discussion 13 was supported by Division IV (Stars), with the participation of Division I (Fundamental Astronomy), Division V (Variable Stars) and Division VII (Galactic System). Participating Commissions were 8 (Positional Astronomy), 24 (Photographic Astrometry), 26 (Double & Multiple Stars), 27 (Variable Stars), 29 (Stellar Spectra), 35 (Stellar Constitution), 37 (Star Clusters & Associations) and 45 (Stellar Classification). Members of the Scientific Organising Committee were: B. Barbuy (Brazil), T. Bedding (Australia), C. Corbally (USA & Vatican), A. Gomez (France), J. Kovalevsky (France), J.-C. Mermilliod (Switzerland, *chair*), D. Soderblom (USA), D. VandenBerg (Canada) and F. van Leeuwen (UK). The Proceedings Editor was T. Lloyd Evans (South Africa). The President of Commission 45, M. Gerbaldi (France), and T. Lloyd Evans acted as Contact Persons.

The growing use being made of HIPPARCOS data in the field of stellar classification, and in particular work on the fine structure of the giant branch in relation to luminosity classification by C. Barnbaum and the late P. C. Keenan, suggested that it was time to review the use of these data. Two aspects were emphasized: the new results which are now being obtained for the common stars in the solar neighbourhood and the understanding of the data themselves, especially in relation to possible systematic errors which have been suggested as a cause of apparent anomalies in the distances of the open clusters. The new distance indicator, the red giant clump, and the application of Hipparcos data to asteroseismology also received attention in the invited papers, most of which are printed here.

Several of the review papers deal with the apparent discrepancies in the relative distances of open clusters and associations and with the statistical methods required to utilise the data. There is an optimistic view that there are no major, non-understood errors in the data, but there remain differences of opinion, in particular as to the degree to which theoretical results should be involved in using it – compare van Leeuwen with Lebreton on this point, and see also Brown. Two papers, by Grenon and by Jordi et al., concentrate on the luminosity calibrations of photometric systems, while those by Girardi and by Garnavich & Stanek (available only as an Abstract) deal specifically with the luminosity of the red giant clump and its use as a "standard candle". There are again differences of emphasis, and the complete set of papers contains a number of cross

links between the various topics. One may feel optimistic that the Hipparcos data are well understood by now, and that remaining differences of opinion are those which are typical of a difficult field in fundamental astronomy.

Thirty-one poster papers were presented. Brief accounts of a very few were given by their authors at appropriate points in the course of the meeting. Abstracts for all the posters appeared in the Abstract Booklet which was prepared for the 24th General Assembly of the IAU, but it is unfortunately not possible to reproduce these papers here. They covered much of the range of interest of the participating Divisions and Commissions. Three of these papers relate to matters of sufficient generality to require mention here, however. Two of these, "The Catalogue of the Nearest Stellar Systems – NESSY" by A. A. Andronov et al. (Pulkovo Observatory) and "The Influence of Unseen Companions on the Luminosity Function" by G. A. Gontcharov et al. (Pulkovo Observatory) emphasize the high proportion of stars which are in binary systems and the uncertainties resulting from the presence of undetected companions which are nevertheless bright enough to affect the colours and spectral types which are measured. These unrecognised companions still limit the precision of some of the results which we wish to derive. Richard O. Gray (Appalachian State University) reported that luminosity class on the MK system is, if anything, better correlated with microturbulent velocity than with surface gravity which has in the past been assumed to be the principal or only correlate. This has implications for our use of luminosity class as an indicator of luminosity.

The large number of published papers which use Hipparcos data testify to the importance of this dataset. Early papers concentrated on the most spectacular topics which could not be tackled at all by previous ground-based work. The majority of recent papers deal with the totality of the stars within reach of the parallax measurements and other data provided by Hipparcos, that is the area which was emphasized in this Joint Discussion. It may be said that the field is reaching maturity. One may expect the different methods in use to converge in their results as techniques are refined in the future. Space- based astrometry is certainly here to stay, and new satellite missions are expected to provide even larger datasets within the next two decades.