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MEETING REPORTS:

COLLOQUIUM: HIPPARCOS - SCIENTIFIC ASPECTS OF INPUT CATALOGUE PREPARATION II and SYMPOSIUM: A DECADE OF UV ASTRONOMY WITH THE IUE SATELLITE

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Abstract

The colloquium HIPPARCOS Scientific Aspects of Input Catalogue Preparation, held in Sitges, Spain, January 25 - 29, 1988, is described. Also described is a celebratory symposium on a Decade of UV Astronomy with the IUE Satellite, held April 12 - 15, 1988, in Greenbelt, MD. Brief descriptions of the European astrometric satellite HIPPARCOS and the ultraviolet satellite International Ultraviolet Explorer (IUE) are given. AAVSO participation in the scheduling of observations of large-amplitude variable stars (Mira and semiregular) with HIPPARCOS is discussed.

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HIPPARCOS - SCIENTIFIC ASPECTS OF INPUT CATALOGUE PREPARATION II

The Satellite

The High Precision Parallax Collecting Satellite (HIPPARCOS), scheduled to be launched by the European Space Agency in mid-1989, will be devoted to the precise measurement of positions, proper motions, and parallaxes of about 100,000 stars to a limiting magnitude of about 12. Through systematic scanning of the sky, 24,000 bits of data per second will be sent to Earth over the satellite's two-and-a-half year lifetime, filling about 1000 high-density magnetic tapes.

The precise collection of astrometric data planned will create an enormously valuable data base which can be utilized by astronomers working in all wavelengths of the electromagnetic spectrum on studies of stellar structure and evolution, galactic motion, celestial mechanics, reference frames, and a wide variety of other astronomical applications. Mean accuracy will be better than 0.002 arc second on each component of the position and parallax, and 0.002 arc second per year on each component of the proper motion - accuracies not achievable from ground-based observations. High precision data on position and parallaxes will allow astronomers to determine stellar luminosities, masses, and radii, and to study many aspects of stellar evolution. Proper motion observations will provide essential data for the study of the dynamics and evolution of our galaxy. For the first time direct luminosity calibrations, for which various indirect methods have so far had to be used, will be possible for regions of the Hertzsprung-Russell Diagram. These measurements will help to refine the Hertzsprung-Russell Diagram.

The idea for a space astrometry mission started in 1966 and evolved until 1980, when the European Space Agency adopted the Mission. One hundred mostly European astronomers from 50 institutions in 12 countries are involved, forming four consortia: the Input Catalogue (INCA), two independent data analyses in France (FAST) and the

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Netherlands (NDAC), and Photometric Data Analysis from Star mapper, TYCO.

The HIPPARCOS observing program will be guided by an Input Catalogue containing accurate photometric and astrometric information on standard stars and on objects that will be observed with the satellite. Since 1982 the INCA consortium has been measuring and compiling astrometric and photometric data on these stars and minor planets.

AAVSO Participation

Why is the AAVSO involved in an astrometric space mission? In the HIPPARCOS Observing Program 1% of the stars are variable stars, and of these about 300 of them are large-amplitude (Mira and semiregular type) variable stars of great interest for the investigation of stellar pulsation, stellar evolution, circumstellar molecular maser emission, mass loss, and chemical and dynamical evolution of the galaxy. Presently, only a limited number of long period variables have parallaxes and proper motion observations, and, unfortunately, the accuracy of these values is poor.

In order to obtain precise positions of stars with the HIPPARCOS satellite, it is necessary to predict the observability windows for these stars, i.e., the times and magnitudes when these stars are brighter than the detection threshold of the satellite. To make these predictions for long period variable stars (which in general do not have strictly periodic amplitudes and phases), long-term data are needed for predicting their brightnesses and phases, and up-to-date observations are necessary for confirming and refining these predictions. The AAVSO's long and successful experience in providing important services to astronomers during satellite missions and its extensive computerized data base on large-amplitude stars led the HIPPARCOS INCA and Science Team to ask the vital support of the AAVSO for the observation of these stars with HIPPARCOS.

AAVSO's 20-year computerized data on about 300 variables are being analyzed and predictions are made by the INCA team of their behavior during the mission. Throughout the mission the AAVSO will be providing monthly data to the INCA team to refine these predictions and adjust the time allocation for the satellite for these stars. Particular attention will be given to those stars that are quasi-periodic or multi-periodic.

HIPPARCOS - Scientific Aspects of Input Catalogue Preparation II

This colloquium was held in Sitges, Spain, January 25 - 29, 1988. The meeeting was devoted to papers on the work done by each team in providing data for INCA and their scientific significance. Presentations included results on the simulation of the mission, compilation of ground-based astrometric and photometric observations, methods of predicting the behavior of variable stars, AAVSO's role in programming the observing schedule of these stars, determination of fundamental astrophysical properties and double and multiple star elements, the extragalactic link with the satellite through observations of radio sources, procedures on the handling of data flow from the satellite, and the preparation and publication of the INCA catalogue itself.

In his concluding remarks about the meeting, Dr. A. Blaauw pointed out that although in the beginning "it took strong fighting" to convince astronomers of the importance and usefulness of an astrometric satellite, there is no question now that HIPPARCOS will be one of the most useful satellites serving astronomers working in all wavelengths of light. I particularly appreciated his acknowledgement of AAVSO's

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collaboration and help in scheduling observations of variable stars.

The meeting was a testimony to the fact that given a common goal, good leadership, and dedicated participants, international collaboration and cooperation results in excellent science.

All papers presented during this colloquium will be published in Proceedings titled, "HIPPARCOS Scientific Aspect of the Input Catalogue Preparation II", and edited by J. Torra and C. Turon.

A DECADE OF UV ASTRONOMY WITH THE IUE

Between April 11 and 15, 1988, 300 astronomers mostly from the US and Europe met at NASA's Goddard Space Flight Center to celebrate the 10th Anniversary of IUE, the International Ultraviolet Explorer satellite. The IUE satellite is a joint endeavor between the USA's National Aeronautics and Space Administration (NASA), the European Space Agency (ESA), and the United Kingdom's Science and Engineering Research Council, (SERC). It has been providing ultraviolet observations of celestial objects ranging from the Sun to quasars since its launch in 1978.

Travelling in geosynchronous orbit, the IUE is equipped with a 45 cm (22.5) telescope. Although operating with just 2 of its 6 gyroscopes since 1985, it has been the most productive and successful astronomical satellite of all time. 1400 papers on IUE observational results have been published in the astronomical literature since 1978.

The scientific program of this symposium was extremely rich with invited talks and several hundred poster papers in all fields of astronomy ranging from planetary to stellar, extragalactic, and the interstellar medium. In addition, invited talks by NASA and ESA astronomers on future space missions gave a glimpse of what is to come.

Variable stars have been in the observing program of IUE since the start of the mission. I would like to share a few significant findings on variable stars made by the IUE:

Dwarf Novae

IUE observations were important in understanding the behavior of the hot (10,000 - 30,000°K), optically thick accretion disk around the white dwarf component of the system.

IUE observations revealed a lag of half a day between optical and UV outbursts, which may indicate that the cause of outbursts may be due to instability in the red secondary component of the system, causing increase of mass transfer onto the accretion disk. However, controversy still exists as to whether the cause of outbursts is the increase of the transfer rate from the secondary or instability occurring in the accretion disk.

Novae

The time-dependent lines of Carbon, Oxygen, and Nitrogen in UV wavelengths have been used successfully to deduce abundances in ejected material of novae outbursts.

UV emission lines during the late (nebular) stage of outburst have shown that there are two kinds of novae outbursts:

1. Explosion of white dwarf consisting of Carbon and Oxygen.

2. Explosion of white dwarf consisting of Oxygen, Neon, Magnesium.

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This finding gave rise to "neon" white dwarfs, as in the case of the system QU Vulpeculae.

IUE observations indicate that novae at minimum are still active; mass is transferred from the secondary to the white dwarf.

Symbiotic Stars

IUE observations indicated that these systems are interacting binaries with much larger orbital separations between the two components than those in dwarf nova systems.

P Cyg profiles (absorption troughs on the short-wavelength side) indicate the presence of high velocity-winds through high outflow of Carbon IV and Nitrogen V.

UV data suggest the presence of a dense, hot, expanding envelope of matter ejected from the hot component and/or cool giant.

During quiesence there is variability in the UV wavelengths, and the varaiblity in the UV and the optical regions are not always in phase.

Pulsating variables (Miras)

Magnesium II emission in the UV in Miras has been found to be a good observational tool for studying the propagation of shock waves, particularly through the region where grains are forming.

AAVSO observers have helped in many IUE observing runs, especially on cataclysmic variable stars, and AAVSO observations have been used extensively for data correlation. It was particularly rewarding for me to hear the appreciation of so many astronomers for the services AAVSO has provided to them, and to have so many authors acknowledge the AAVSO in their talks and papers. I extend their thanks to our observers worldwide.

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