RevMexAA (Serie de Conferencias), **40**, 290–290 (2011)

SPM4: THE YALE/SAN-JUAN SOUTHERN PROPER MOTION SURVEY: 100 MILLION ABSOLUTE PROPER MOTIONS

W. F. van Altena[1]

The Yale/San Juan Southern Proper Motion SPM4 Catalog is the culmination of a highly successful 47-year collaboration between the National University of San Juan (UNSJ) and the Yale Southern Observatory (YSO). The SPM4 Catalog contains absolute proper motions, celestial coordinates, blue and visual passband photometry for 103 million stars and galaxies between the south celestial pole and $\delta = -20°$. The Catalog is roughly complete to $V = 17.5$ and the precision of its positions and absolute proper motions is approximately 30 to 150 mas and 2 to 10 mas yr^{-1}, respectively.

The SPM4 is based on photographic and CCD observations taken with the Yale Southern Observatory's double-astrograph at the Cesco Observatory in El Leoncito, Argentina. The first-epoch survey, taken from 1965 to 1979, was entirely photographic. The second-epoch survey is approximately 1/3 photographic (taken from 1988 to 1998) and 2/3 CCD-based (taken from 2004 through 2008). Each photographic plate covers a 6.3×6.3 degree area of sky and there is significant overlap between them. Also, each field has a pair of blue and yellow passband plates taken simultaneously. Each photographic observation consisted of two offset exposures, one 2 hours in duration, the other 2 minutes. Also, an objective wire grating was always used in order to produce measurable grating images for the brighter stars. In this manner, the effective dynamic range of the plates was greatly increased, allowing bright Hipparcos-magnitude stars to be linked to external galaxies on the same plate.

Beginning in 2001, CCD cameras were installed on the double astrograph in order to complete the SPM second-epoch survey. Two cameras were installed, a 4K × 4K PixelVision (PV) camera ($0.93° \times 0.93°$) in the focal plane of the yellow lens, and an Apogee 1K × 1K ($0.38° \times 0.38°$) camera behind the blue lens. The latter was later replaced by an Apogee Alta 2K × 2K ($0.42° \times 0.42°$) CCD camera. Exposure times were 120-s, reaching the same depth as the first-epoch plates. As with the plates, the objective grating was in place for the CCD observations.

The SPM photographic plates were digitized using the PMM plate scanner of the US Naval Observatory-Flagstaff Station. Image detection and centering of images above a given threshold was made using software of the USNO. SPM ccd frames were processed using SExtractor to detect images, while final centers and photometry were provided by Yale's 2-d Gaussian-fitting image analysis code. All images were then cross-identified with an input list constructed from the following source catalogs: Hipparcos, Tycho 2, UCAC3, 2MASS psc, 2MASS xsc, LEDA galaxy catalog, Veron-Cetty & Veron quasar catalog.

Multiply-measured stars (from the long and short exposures on the plates and the diffraction grating images of both plates and ccd frames) are used to calibrate and correct for systematics, particularly in the photographic material. The SPM is unique in this capability. After correction, multiple measures of the same object are combined to form a single "best" position at each of the two epochs. The positional differences between the two epochs yield relative proper motions that are finally transformed to absolute proper motions, using Hipparcos stars at the bright end and external galaxies at the faint end.

The B,V photometry in the SPM4 is extremely heterogeneous. In some cases, it is derived from our blue and visual filtered CCD cameras. In some cases, it is derived from the PMM measures of our first-epoch plates. And in the cases where neither of these are available or reliable, it is propagated from the input master catalog.

Some scientific results obtained from the SPM program are: Platais et al. (1998); Dinescu et al. (2003, 2005); Girard et al. (2004, 2006) and Vieira et al. (2007, 2010).

[1]Yale University Astronomy Dept. P.O. Box 208101, New Haven, CT 06520-8101, USA (william.vanaltena@yale.edu).

REFERENCES

Dinescu, D. I., et al. 2003, AJ 125, 1373
_________. 2005, ApJ 618, L25
Girard, T. M., et al. 2004, AJ, 127, 3060
_________. 2006, AJ, 132, 1768
Platais et al. 1998, A&A 331, 1119
Vieira, K., et al. 2007, AJ, 134, 1432
_________. 2010, AJ, 140, 1934