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Title:	A Gaia-PS1-SDSS (GPS1) Proper Motion Catalog Covering 3/4 of the Sky
Authors:	Gupta, Prashansa (/jspui/browse?type=author&value=Gupta%2C+Prashansa)
Keywords:	Gaia DR1, PS1 Sloan Digital Sky Survey (SDSS) 2MASS
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Citation:	Astrophysical Journal, Supplement Series, 232 (1)
Abstract:	We combine Gaia DR1, PS1, Sloan Digital Sky Survey (SDSS), and 2MASS astrometry to measure proper motions for 350 million sources across three-fourths of the sky down to a magnitude of ${m}_{r}\sim 20$. Using positions of galaxies from PS1, we build a common reference frame for the multi-epoch PS1, single-epoch SDSS and 2MASS data, and calibrate the data in small angular patches to this frame. As the Gaia DR1 excludes resolved galaxy images, we choose a different approach to calibrate its positions to this reference frame: we exploit the fact that the proper motions of stars in these patches are linear. By simultaneously fitting the positions of stars at different epochs of—Gaia DR1, PS1, SDSS, and 2MASS—we construct an extensive catalog of proper motions dubbed GPS1. GPS1 has a characteristic systematic error of less than 0.3 $\mathrm{mas}\,{\mathrm{yr}}^{-1}$ and a typical precision of 1.5–2.0 $\mathrm{mas}\,{\mathrm{yr}}^{-1}$. The proper motions have been validated using galaxies, open clusters, distant giant stars, and QSOs. In comparison with other published faint proper motion catalogs, GPS1's systematic error ($\lt 0.3\,\mathrm{mas}\,{\mathrm{yr}}^{-1}$) should be nearly an order of magnitude better than that of PPMXL and UCAC4 ($\gt 2.0\,\mathrm{mas}\,{\mathrm{yr}}^{-1}$). Similarly, its precision (~1.5 $\mathrm{mas}\,{\mathrm{yr}}^{-1}$) is a four-fold improvement relative to PPMXL and UCAC4 (~6.0 $\mathrm{mas}\,{\mathrm{yr}}^{-1}$). For QSOs, the precision of GPS1 is found to be worse (~2.0–3.0 $\mathrm{mas}\,{\mathrm{yr}}^{-1}$), possibly due to their particular differential chromatic refraction. The GPS1 catalog will be released online and be available via the VizieR Service and VO Service.
Description:	Only IISERM authors are available in the record.
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