The Full-sky Astrometric Mapping Explorer[1] - Distances and photometry of 40 million stars

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The Full-sky Astrometric Mapping Explorer (FAME) is designed to perform an all–sky, astrometric survey with unprecedented accuracy. It will create a rigid astrometric catalog of 4 $\times 10^7$ stars with $5 < m_V < 15$. For bright stars, $5 < m_V < 9$, FAME will determine positions and parallaxes accurate to < 50 μas, with proper motion errors < 50 $\mu as/year$. For fainter stars, $9 < m_V < 15$, FAME will determine positions and parallaxes accurate to < 500 μas, with proper motion errors < 500 $\mu as/year$. It will also collect photometric data on these 4 $\times 10^7$ stars in four Sloan DSS colors. NASA selected FAME to be one of five MIDEX missions funded for a concept study. In September 1999, NASA will select two of these five missions for flight as MIDEX-3 (CY2003 launch) and MIDEX-4 (CY2004 launch) in its Explorer program.

The greatest strength of FAME will be the large number of stars observed, enabling diverse studies of stellar and galactic evolution. FAME will provide a meaningful statistical sample of stars for studies of the frequency of stellar companions with $m > M_{jupiter}$. This will provide accurate statistics on the frequency of occurrence of multiple star systems as a function of spectral type, as well as the frequency of occurrence of giant planets. It will explore the possible transition region between giant planets and brown dwarfs, improving our understanding of star system formation. By determining accurate parallaxes for 4 $\times 10^7$ stars, FAME will calibrate the absolute luminosities of solar neighborhood stars. This will determine the distances and ages of open and globular clusters, refine stellar structure models, and calibrate the distances to Cepheid and RR Lyrae stars. FAME will also monitor ∼40,000 solar–like stars for photometric variations at the 0.1% level to search for evidence of magnetic activity cycles analogous to the 11-year solar activity cycle.

FAME will revolutionize variable star research by determining accurate distances to a large number of Cepheid and RR Lyrae stars, identifying a large number of variable stars, and improving our understanding of stellar structure and evolution.

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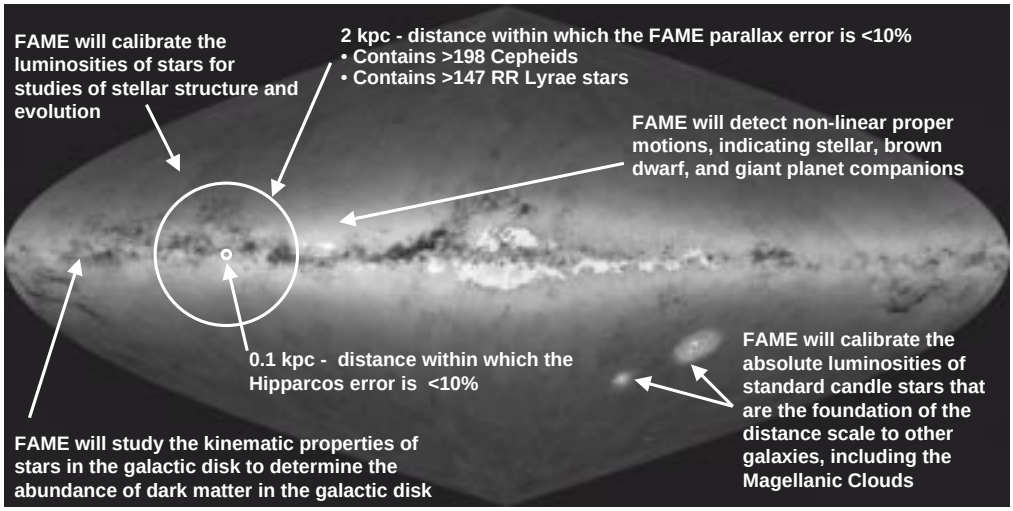

Figure 1. FAME will map our quadrant of the galaxy out to 2kpc from the Sun providing the information needed to calibrate the standard candles that define the extragalactic distance scale, calibrate the absolute luminosities of stars of all spectral types for studies of stellar structure and evolution, and detect orbital motions caused by brown dwarfs and giant planets.

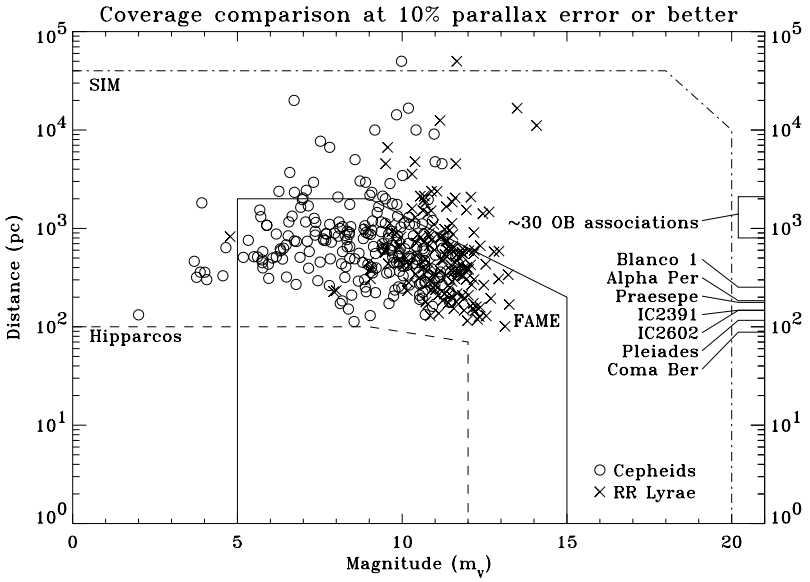

Figure 2. Comparison of the astrometric capabilities of FAME to SIM and Hipparcos. The lines indicate where achieved parallax accuracy will be 10% error or better. Known Cepheids are indicated by circles and RR Lyraes with '×'s. Distances to clusters and OB associations are indicated at the right of the figure.