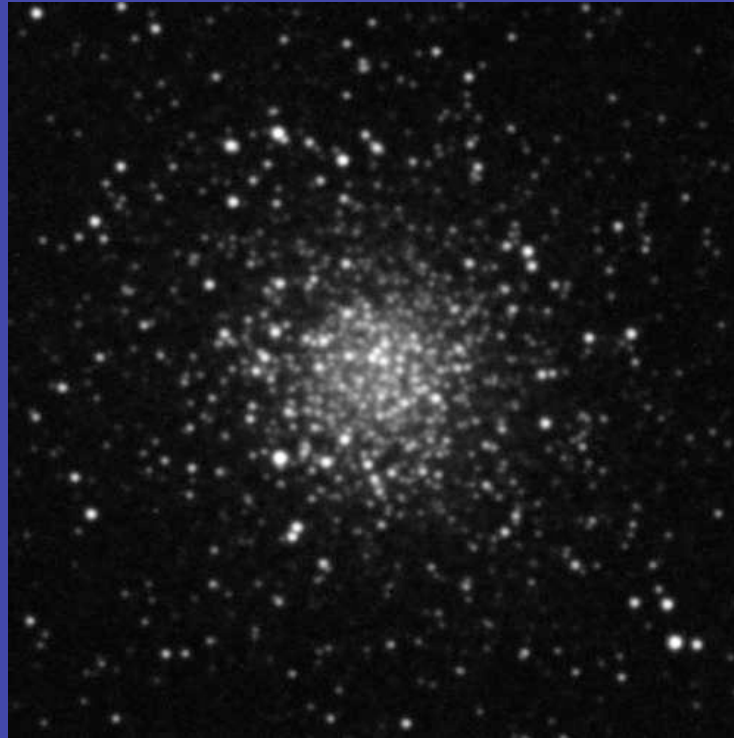


Cleaning Globular Cluster Color-Magnitude Diagrams with Proper Motions

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Presented at “Stars in Motion – A Symposium in Honor of Bill van Altena”, Yale University, September 20, 2008

Proper motions first applied to globular cluster membership by Barnard (1931), whose micrometer measures identified two field stars in the field of M92.

Plates taken by Ritchey and Barnard from 1900-1922 are foundation of modern Yerkes globular cluster program.

This was not the original purpose for which these plates were taken!

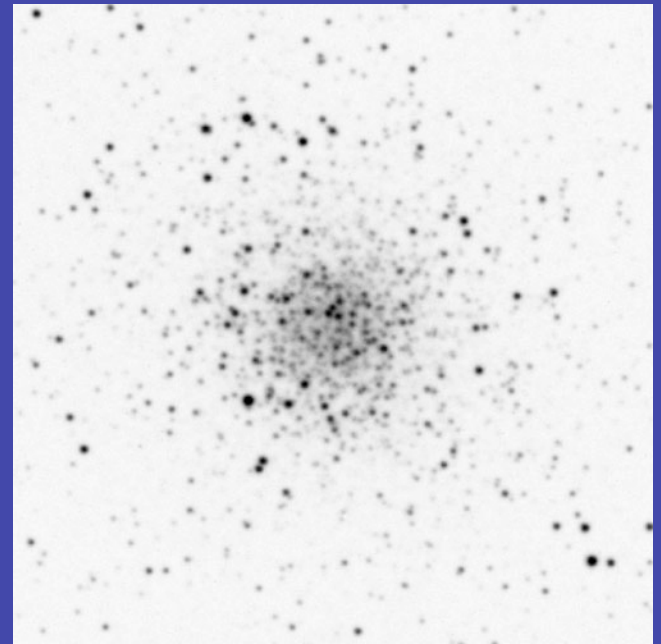
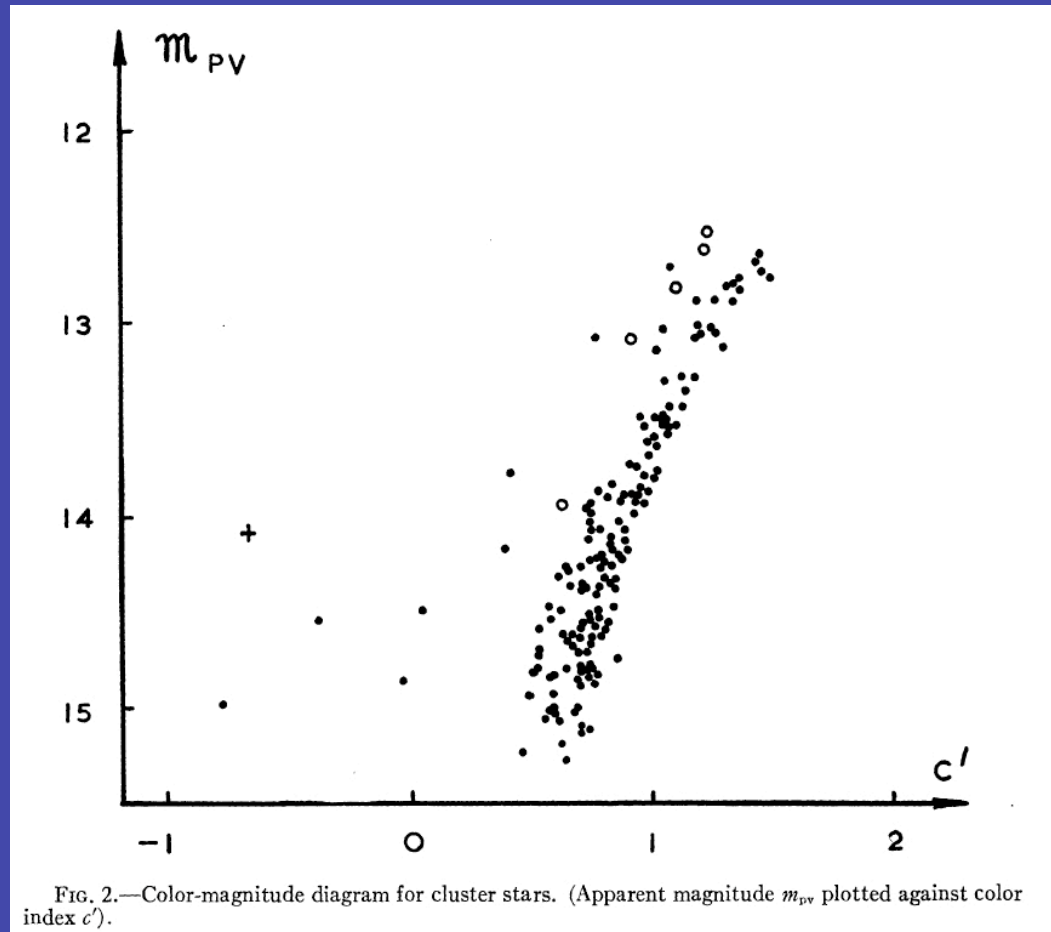


Image of M5 from FRy-1, taken May 1900 (first Yerkes refractor plate?).

The first globular cluster CMD with proper-motion selected members: M15 by Brown (1951; four pairs of Yerkes refractor plates with $\Delta t = 35$ -48 years).



M15 is also the first globular cluster CMD with modern Yerkes proper motions to identify members (Cudworth 1976; 10 Yerkes refractor plates used in common central overlap solution; $\Delta t = 74$ years).

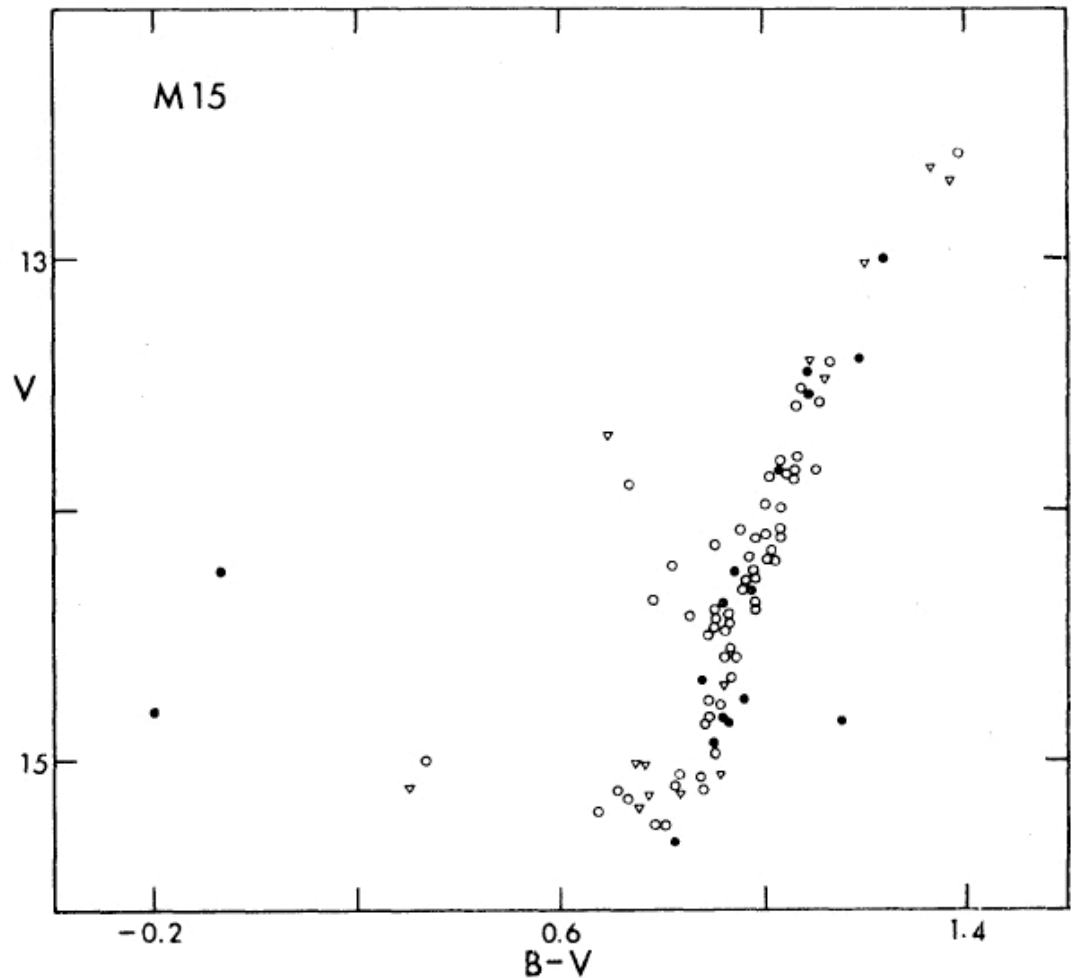
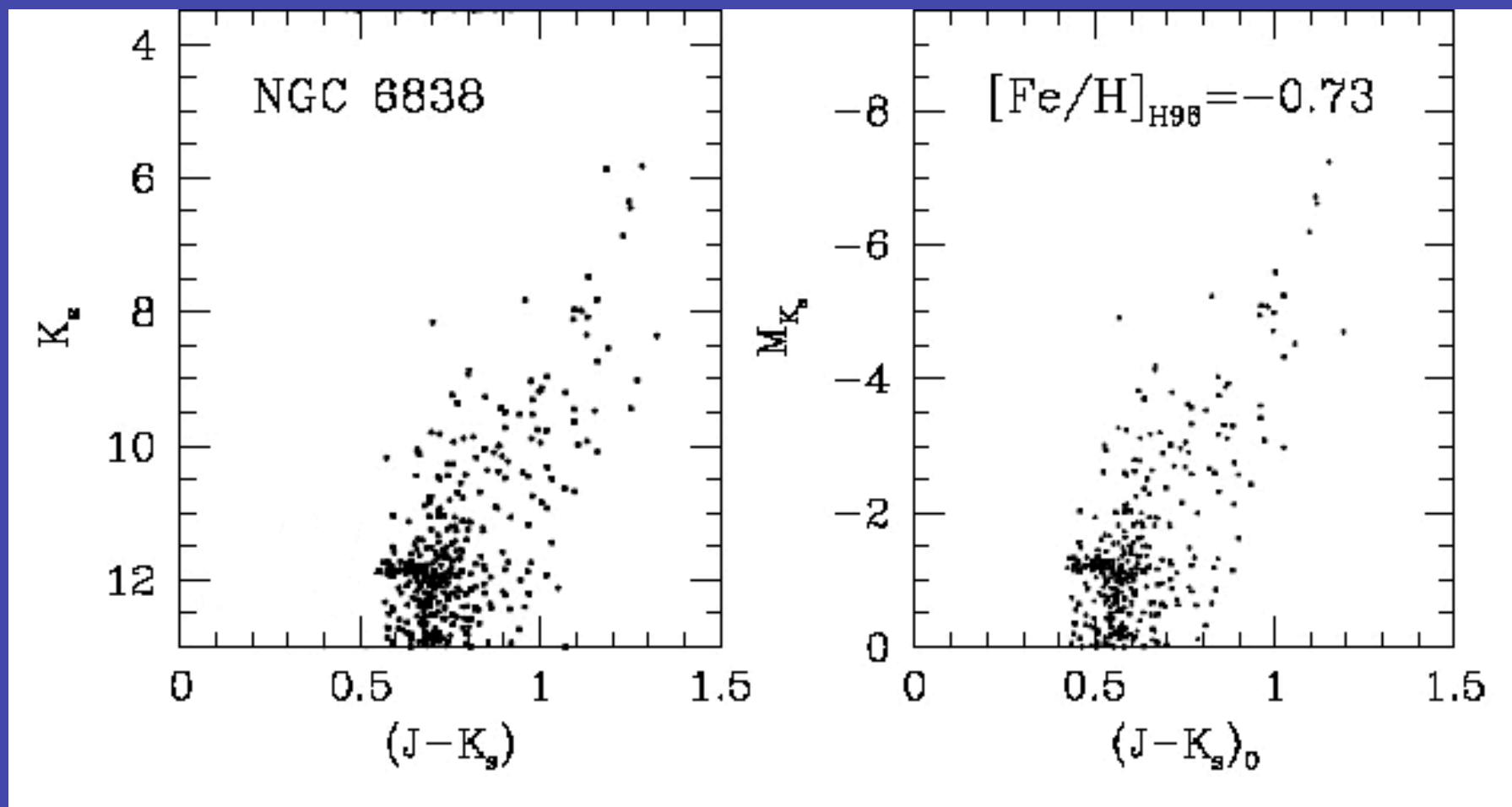


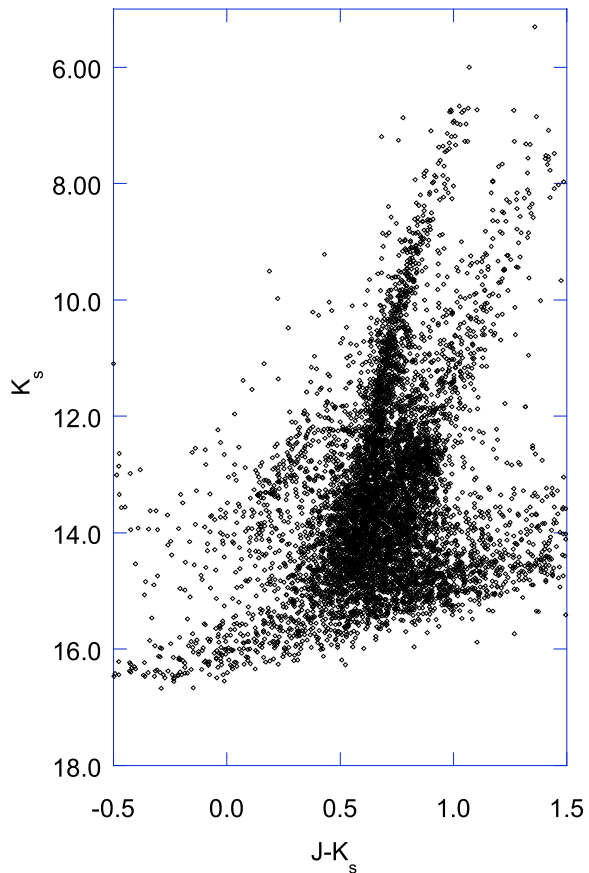
FIG. 4. Color-magnitude diagram of probable and possible cluster members. Triangles indicate stars with $10 \leq P_c < 90$; open circles represent stars with $P_c \geq 90$ and photometry transformed from (m_{pg}, m_{pV}) ; filled circles are stars with $P_c \geq 90$ and photometry from Sandage (1970).

Despite the availability of such membership data, some authors (e.g., Valenti et al. 2004; Ivanov & Borisova 2002, shown below with same color-cut applied to both CMDs) have corrected for field contamination by randomly removing the estimated number of field stars from the CMD.

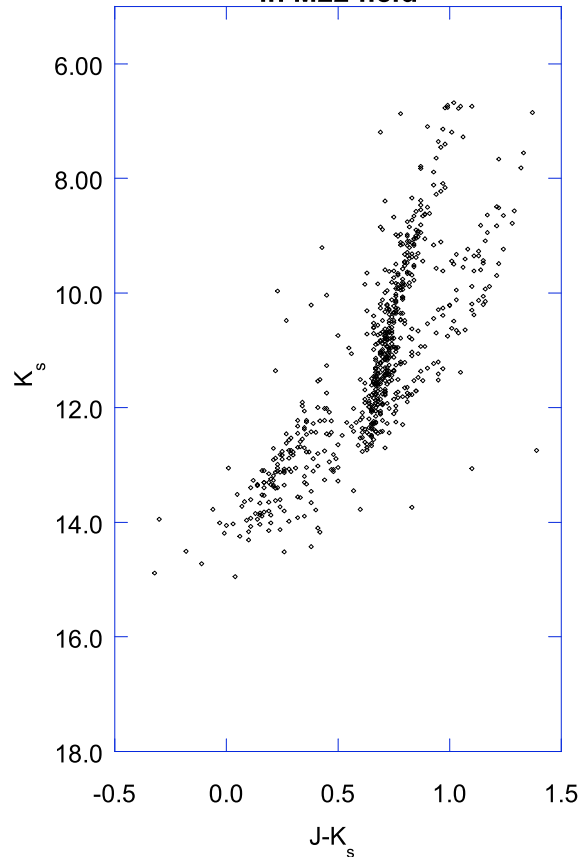


Cudworth (1986) members in M22 matched to 2MASS.

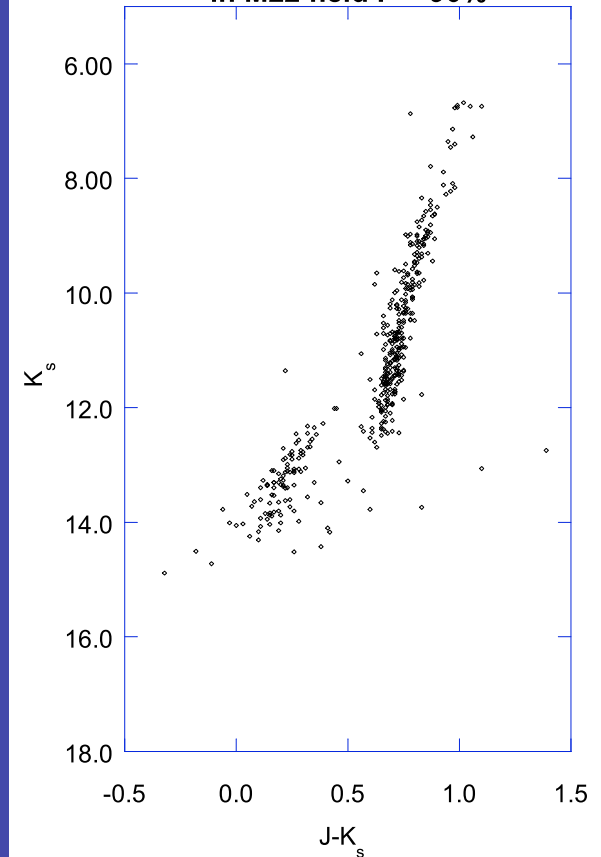
2MASS objects in M22 field



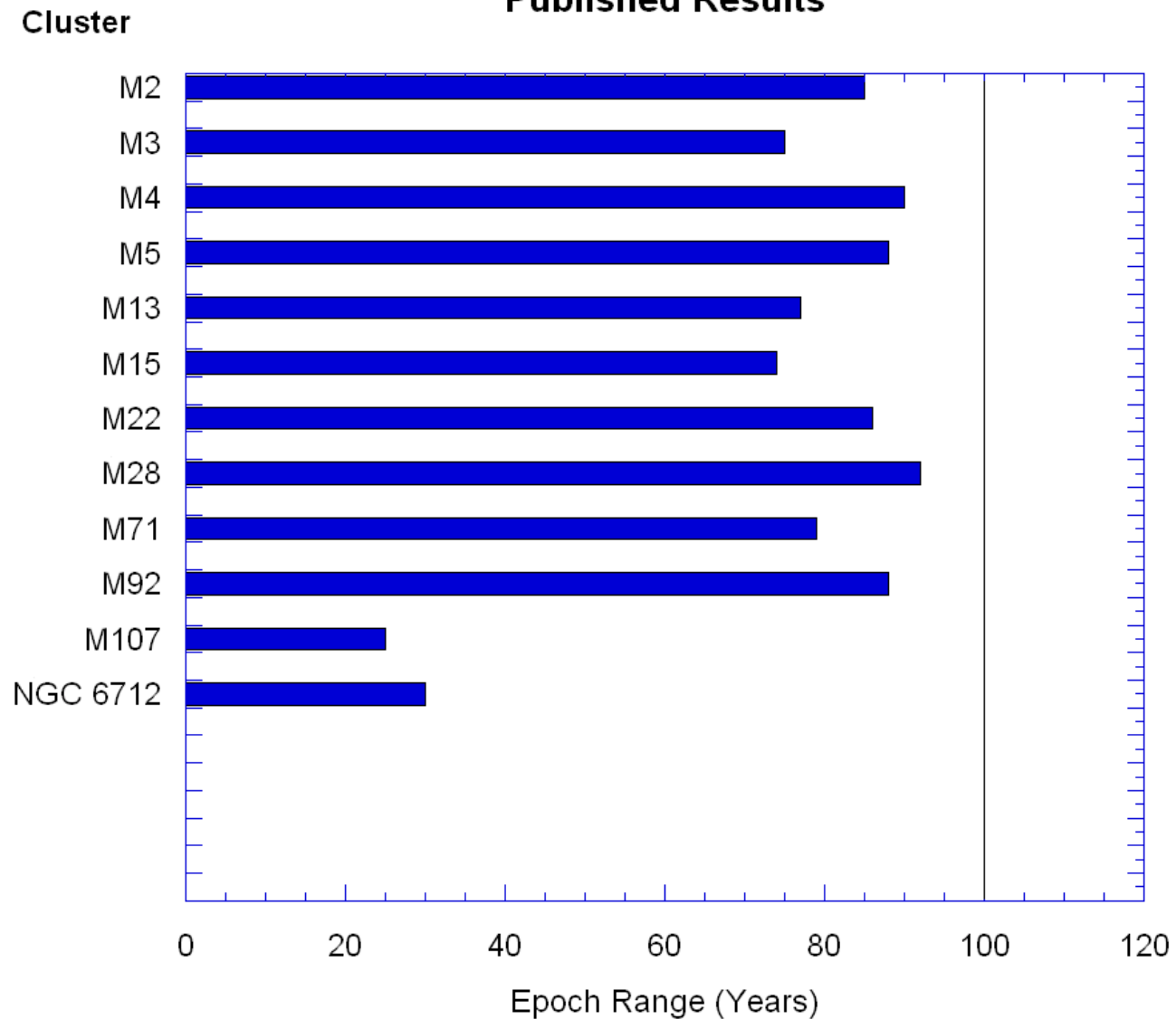
**2MASS-Cudworth (1986) matches
in M22 field**



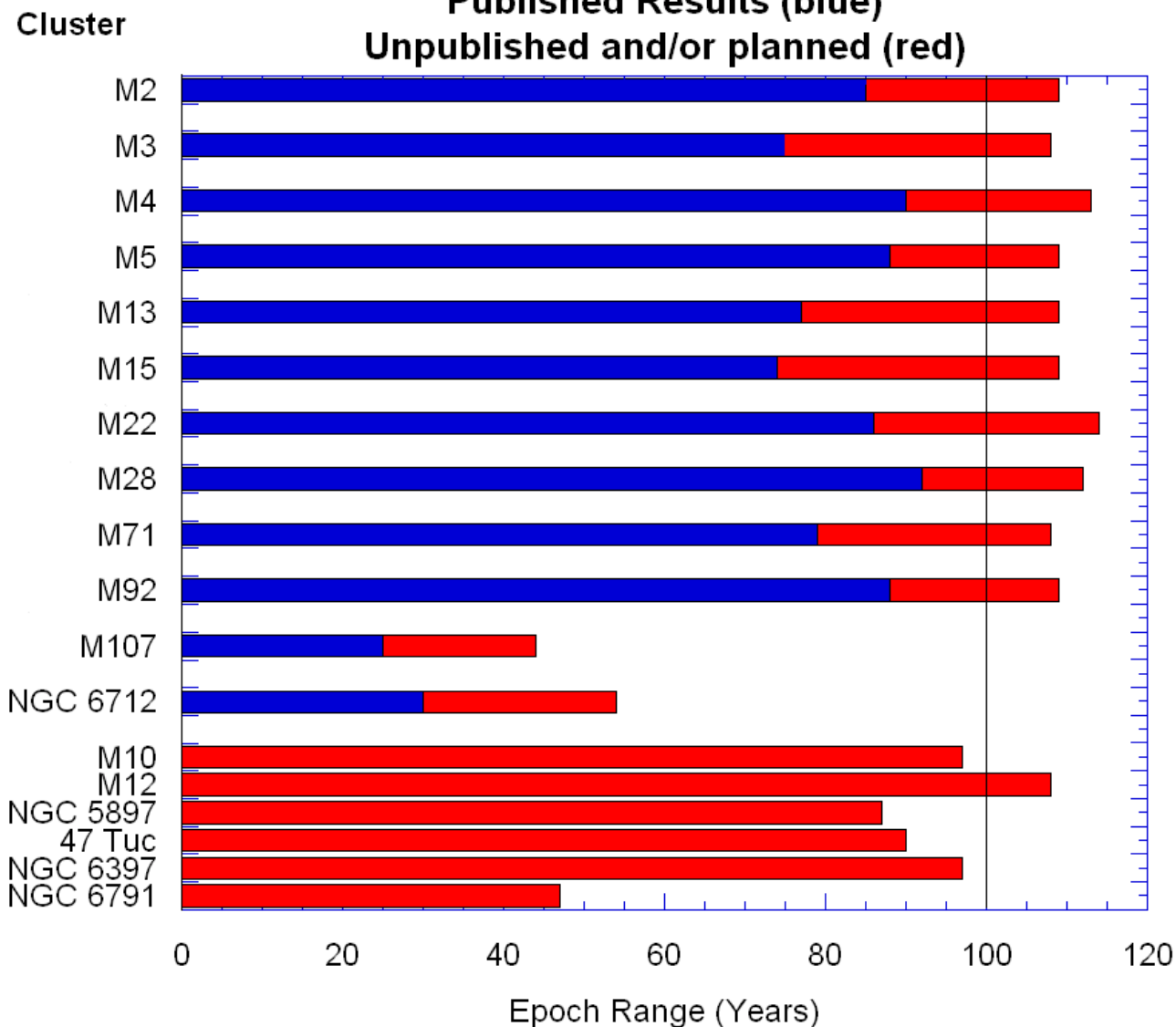
**2MASS-proper motion matches
in M22 field $P > 90\%$**



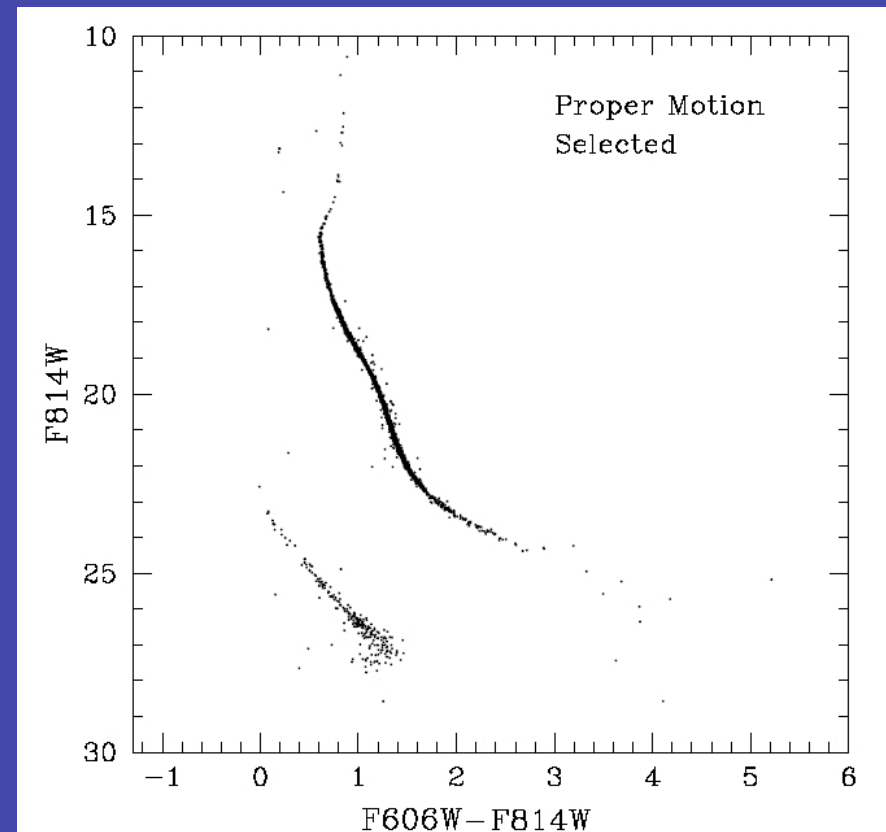
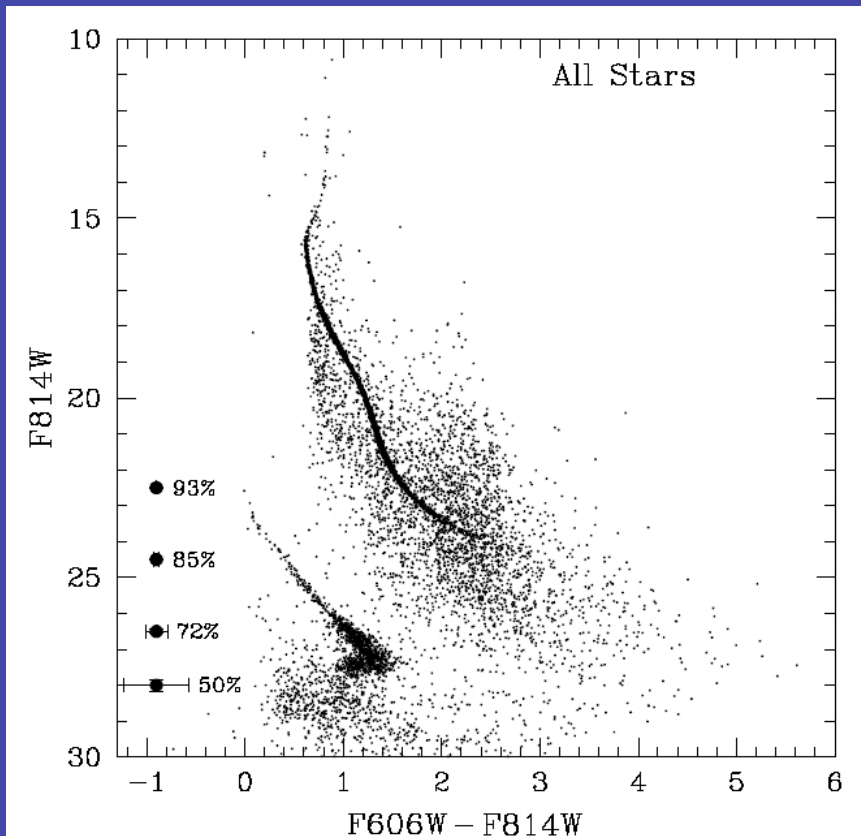
Yerkes Globular Cluster Proper Motion Studies Published Results



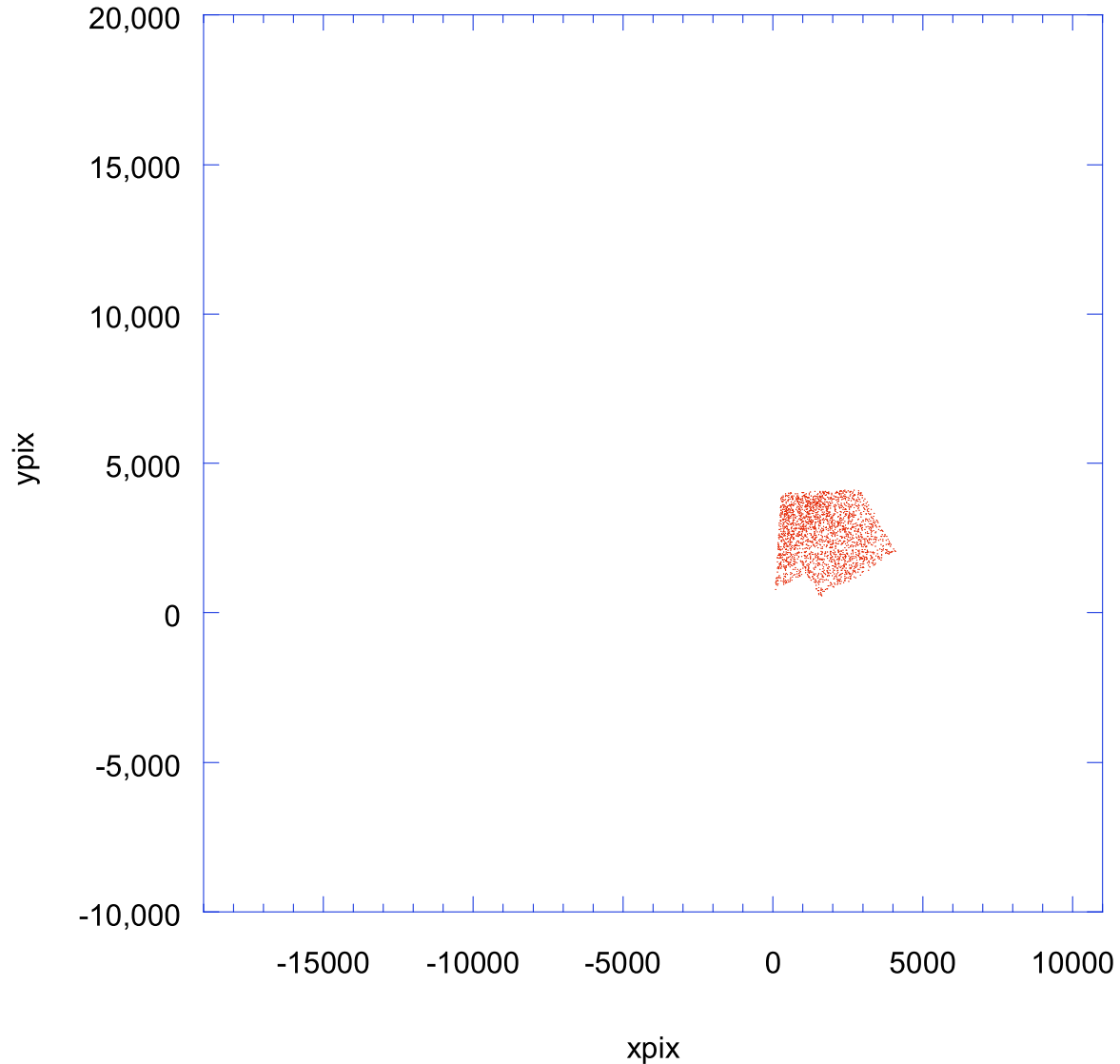
Yerkes Globular Cluster Proper Motion Studies

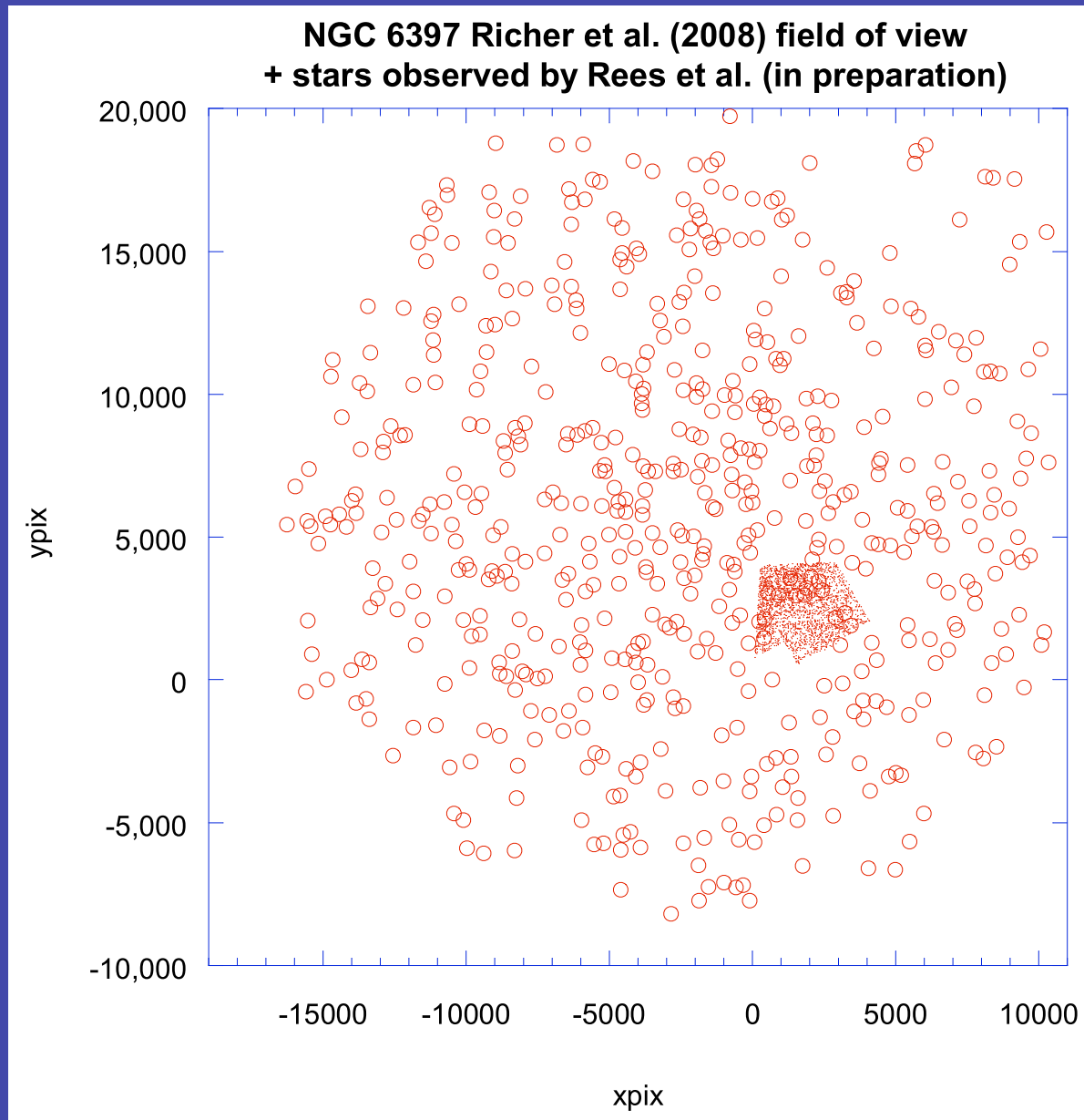


HST observations have extended proper motion-selected CMDs to the H-burning limit and the probable termination of the WD cooling track for NGC 6397 (Richer et al. 2008).



NGC 6397 Richer et al. (2008) field of view

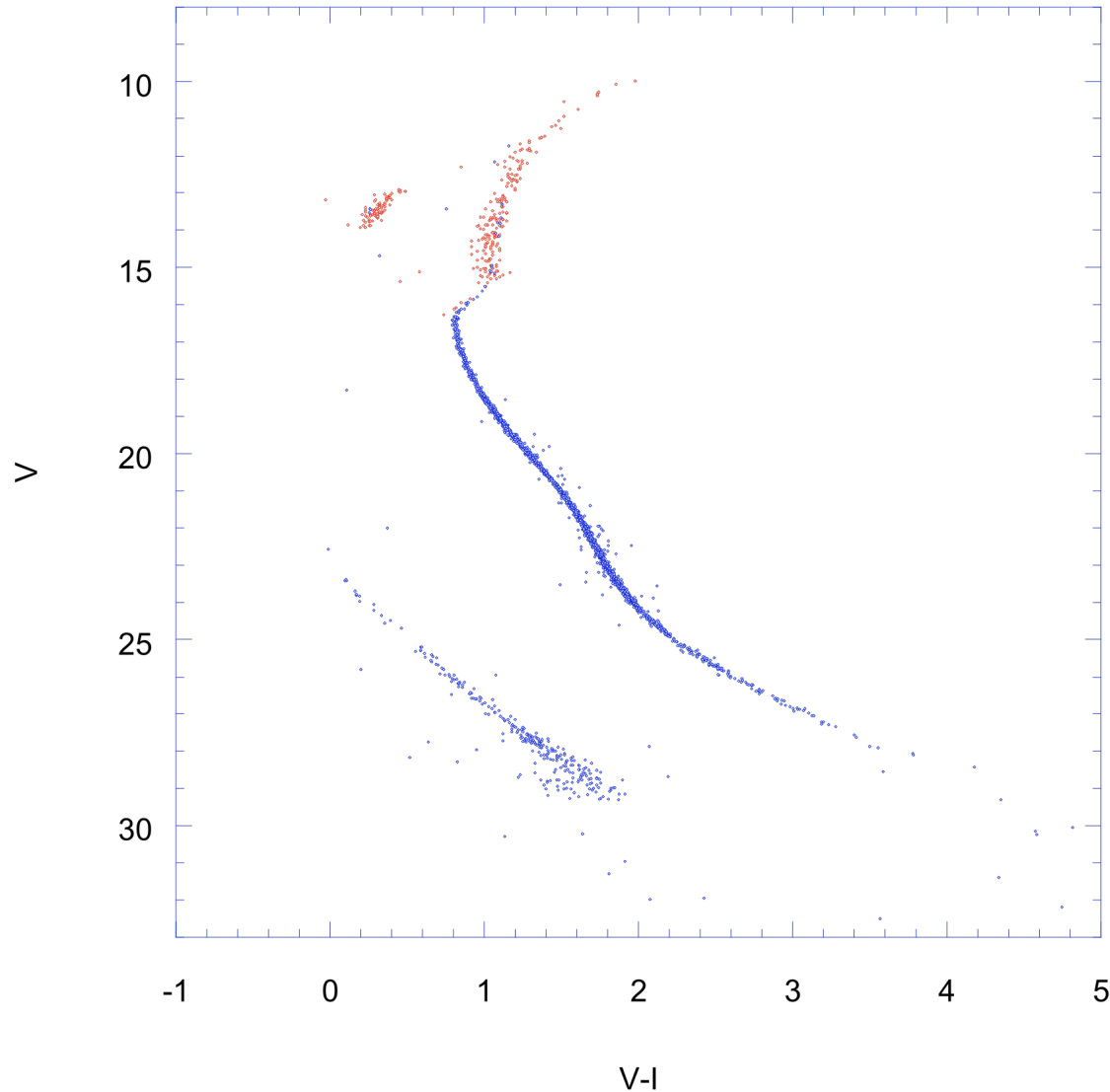




NGC 6397 Proper Motion Members

Red = photographic (V, B-V) transformed to (V, V-I)
from Rees et al. (in preparation); 290 stars

Blue = HST (F814W, F606W-F814W) transformed to (V, V-I)
from Richer et al. (2008); 2324 stars



Don't miss the special session on Archival
Data and Time-Domain Astronomy at the
Long Beach AAS Meeting!

Monday, January 5, 2009
10:00-11:30 AM

I have copies of the preliminary announcement.