The discovery of the new stream in the VST ATLAS data

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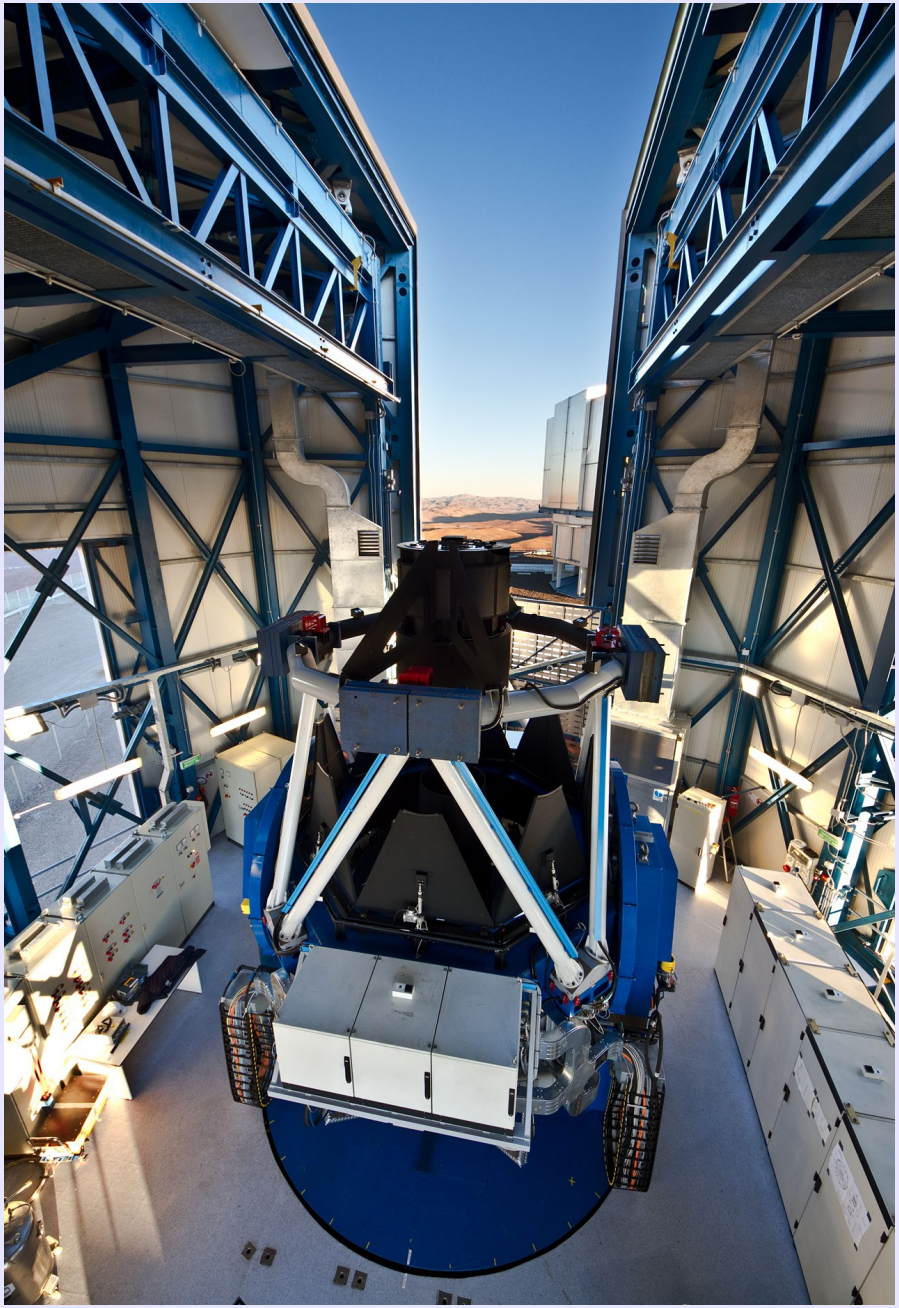
et al

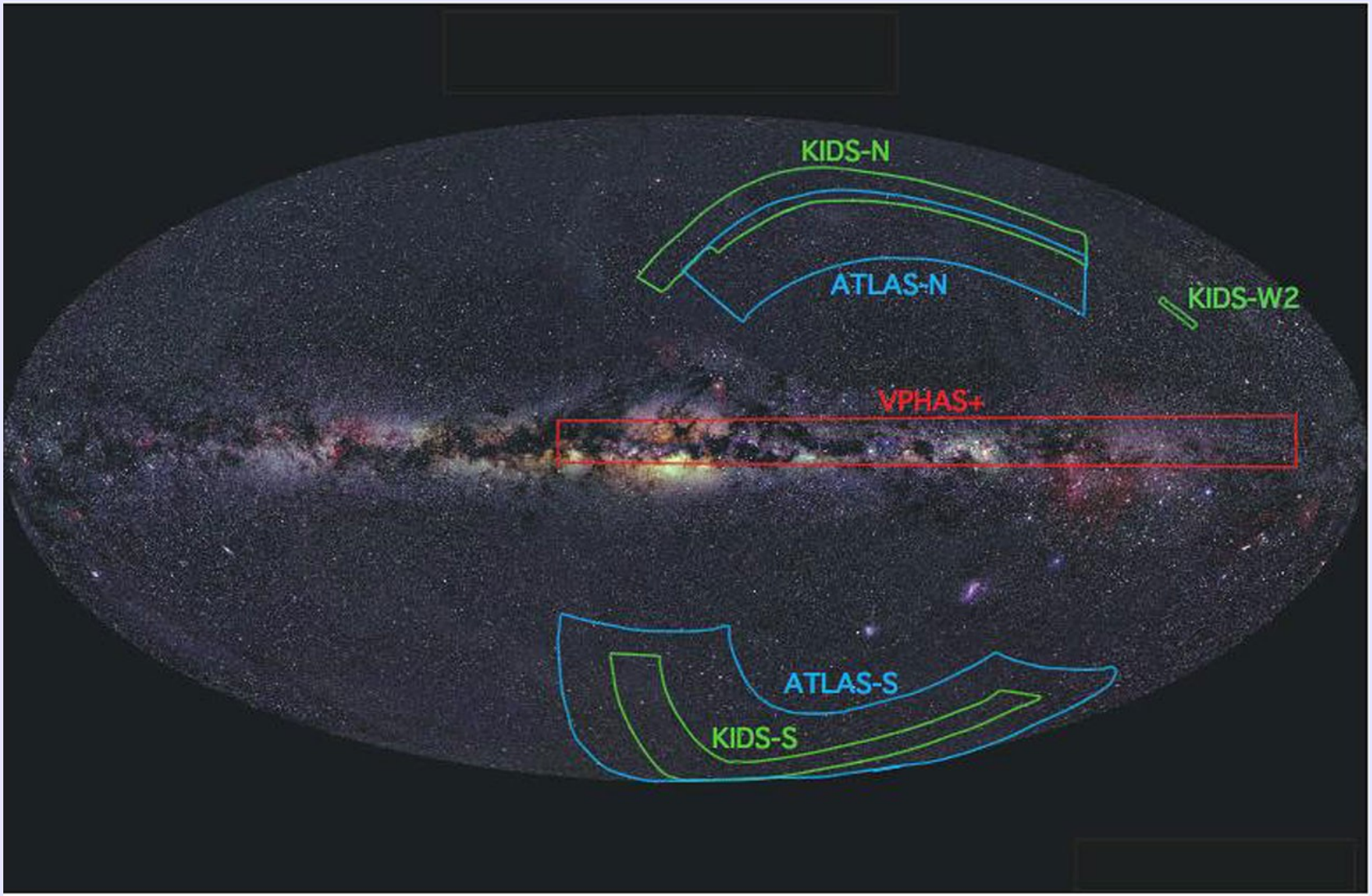
astro-ph:1403.3409
MNRAS submitted

VST – VLT Survey Telescope

- ESO: 2 survey telescopes, VISTA (4m), VST
- 2.6 m diameter mirror
- Cerro Paranal
- OmegaCAM 1x1 deg
- CCD mosaic 32 2k$_x$4k
- Scale 0.21”/pix
- Filters: Sloan ugriz, Johnson BV, Halpha

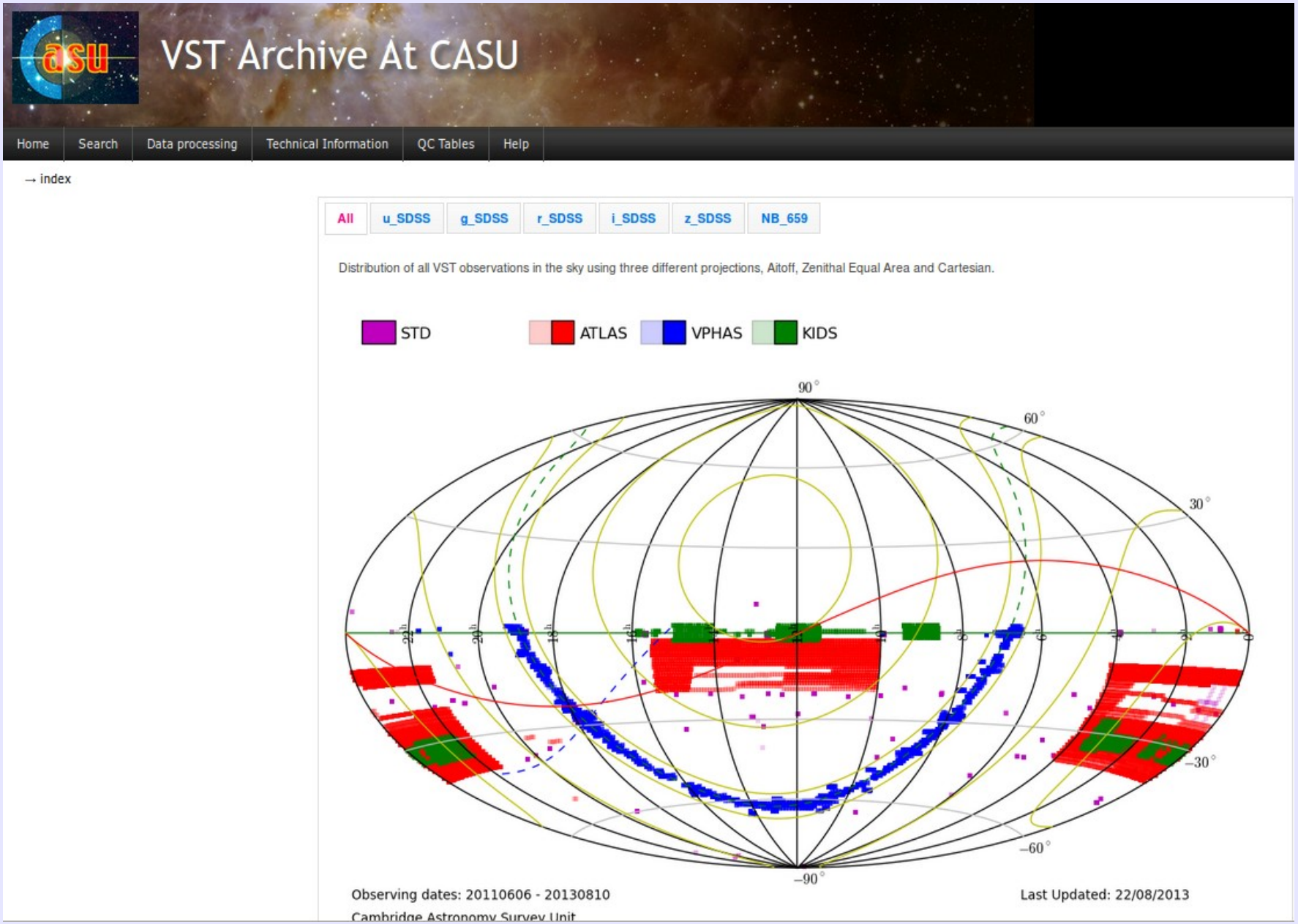


VST surveys

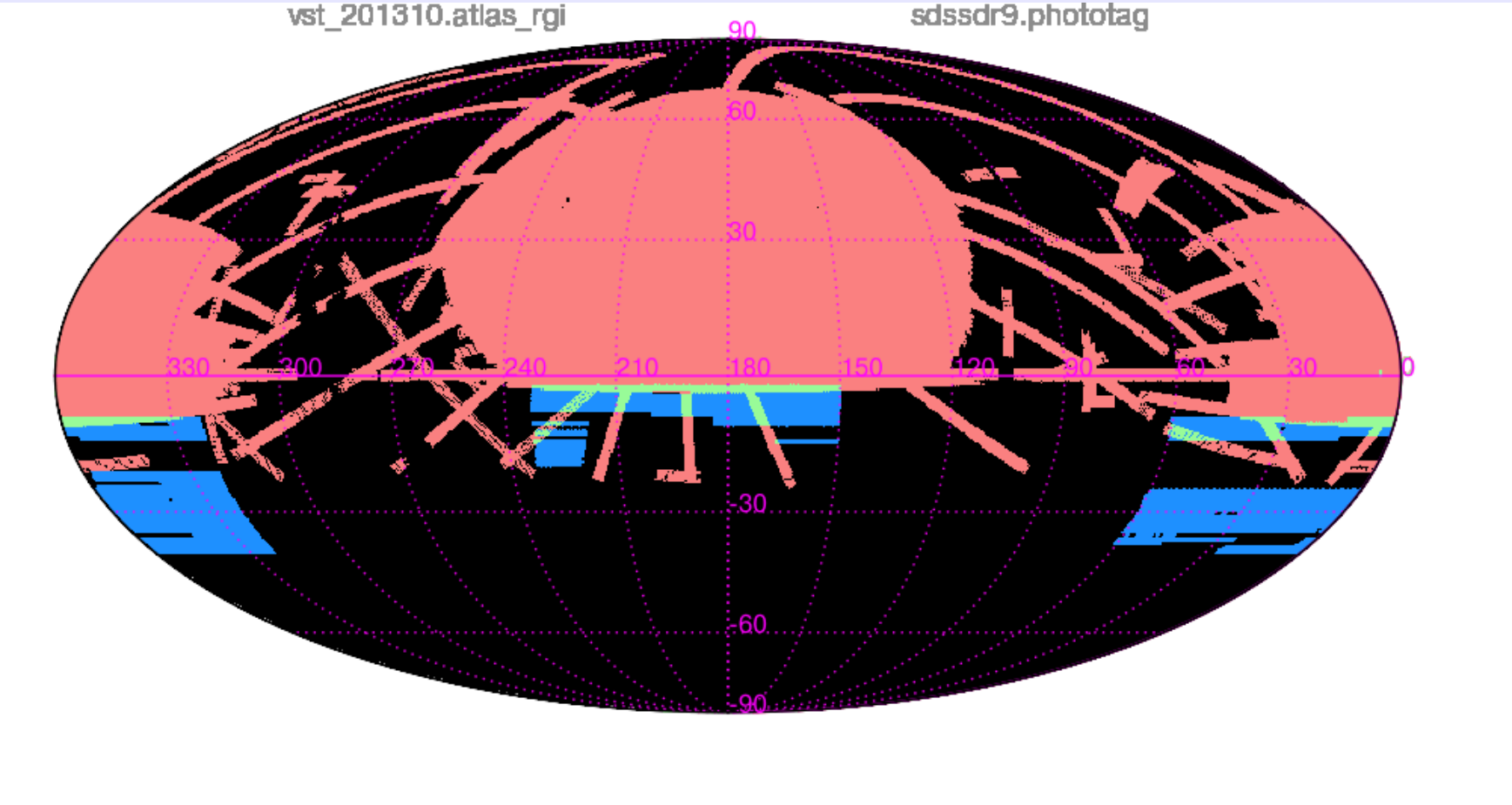


- VST ATLAS: ugriz (<22mag)
- VST KIDS: ugriz (<24mag)
- VPHAS: ugri+Halpha (<21mag) (analogous to IPHAS)

VST processing: CASU



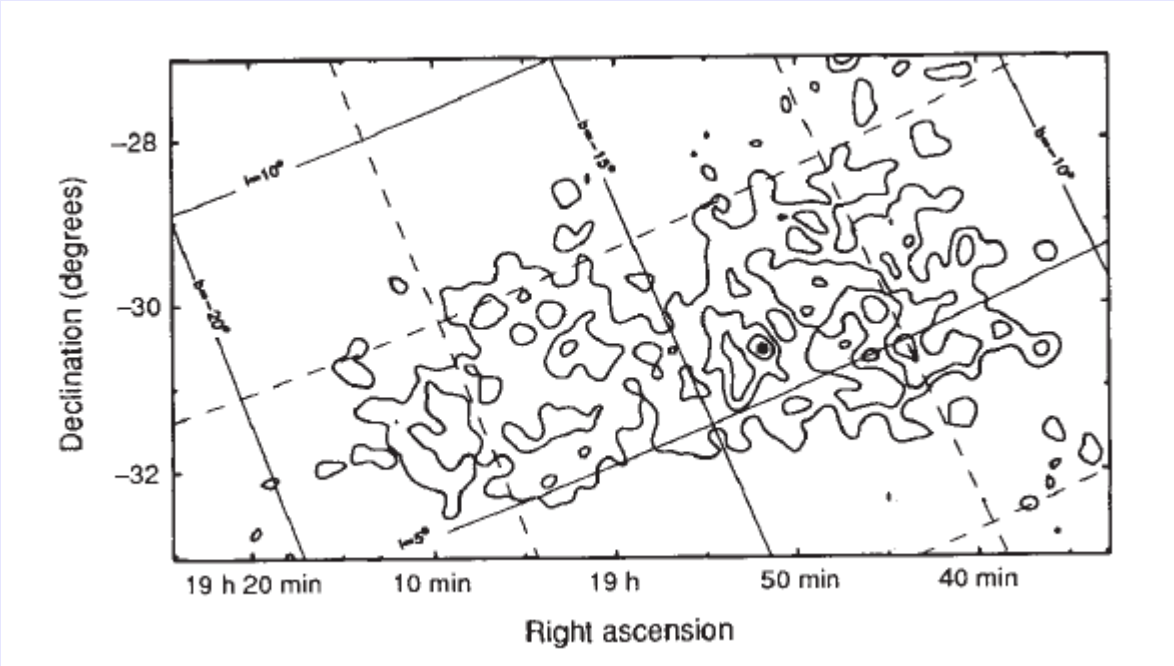
Complementary to SDSS



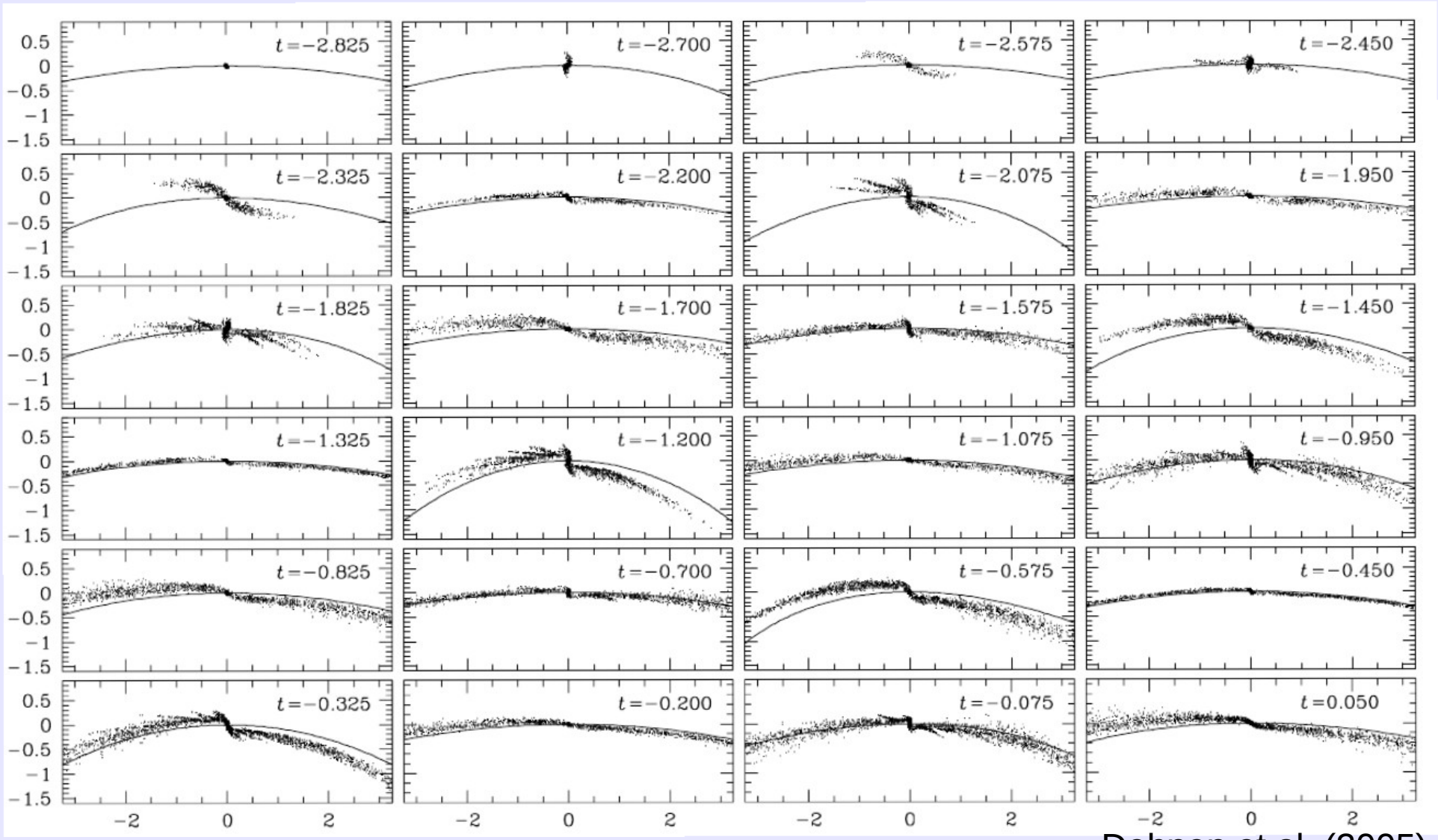
Stellar streams in last years

- Searle&Zinn 1978: Halo built out of small accreted fragments
- First evidence: Sgr dwarf and Sgr stream

  Ibata, Gilmore & Irwin 1994



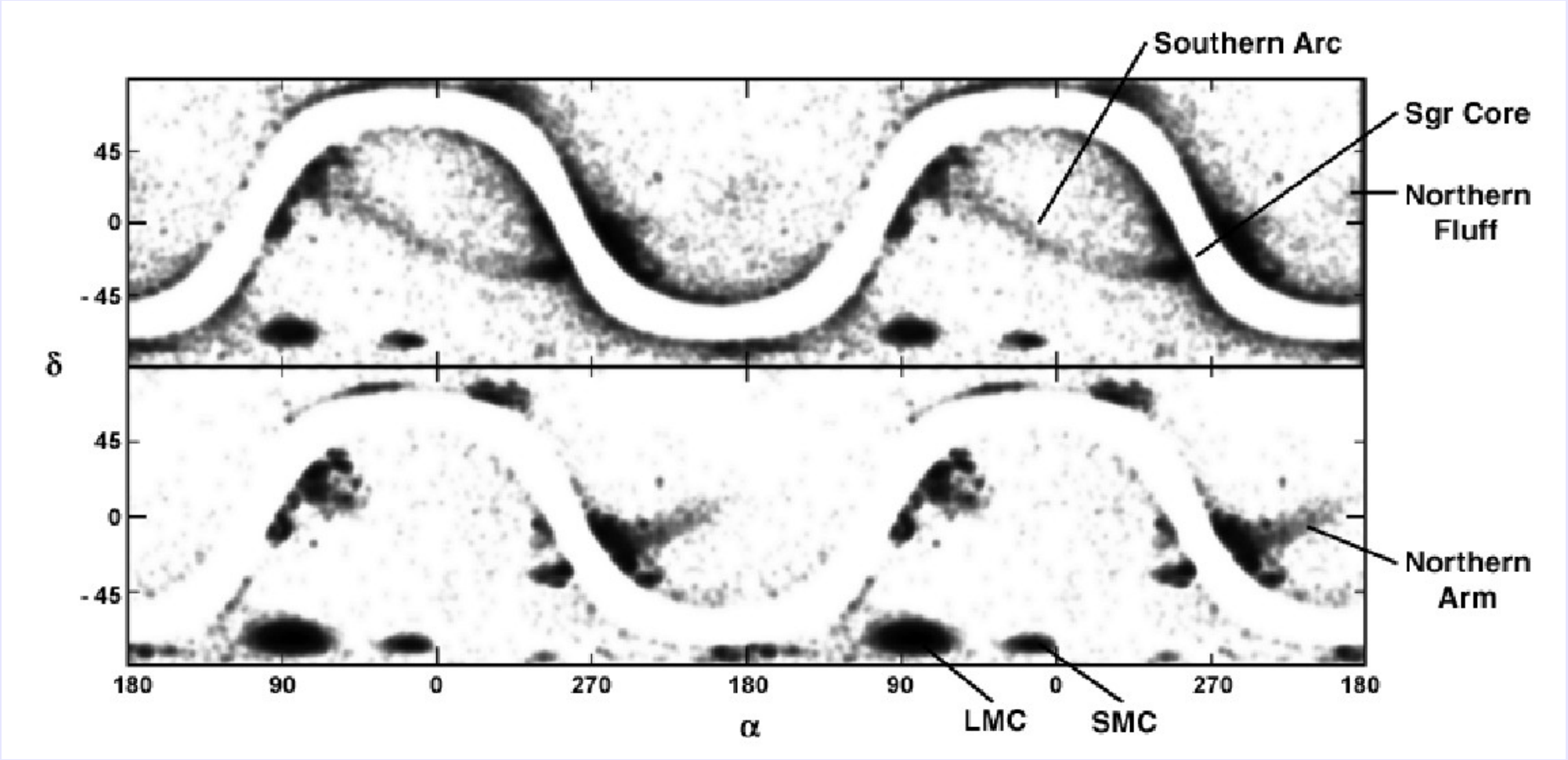
Mechanics of tidal streams



Dehnen et al. (2005)

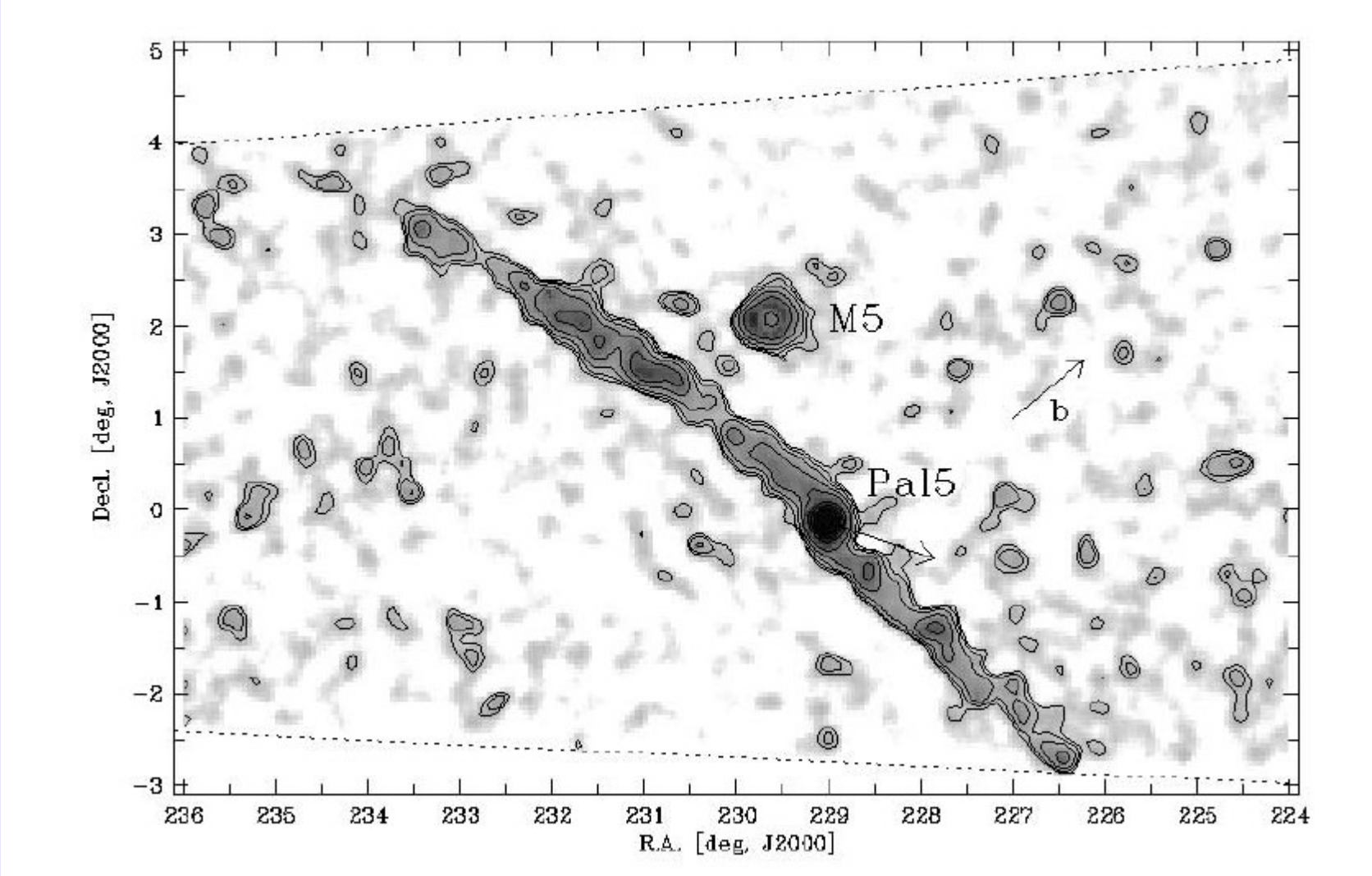
Era of large surveys

- 2MASS



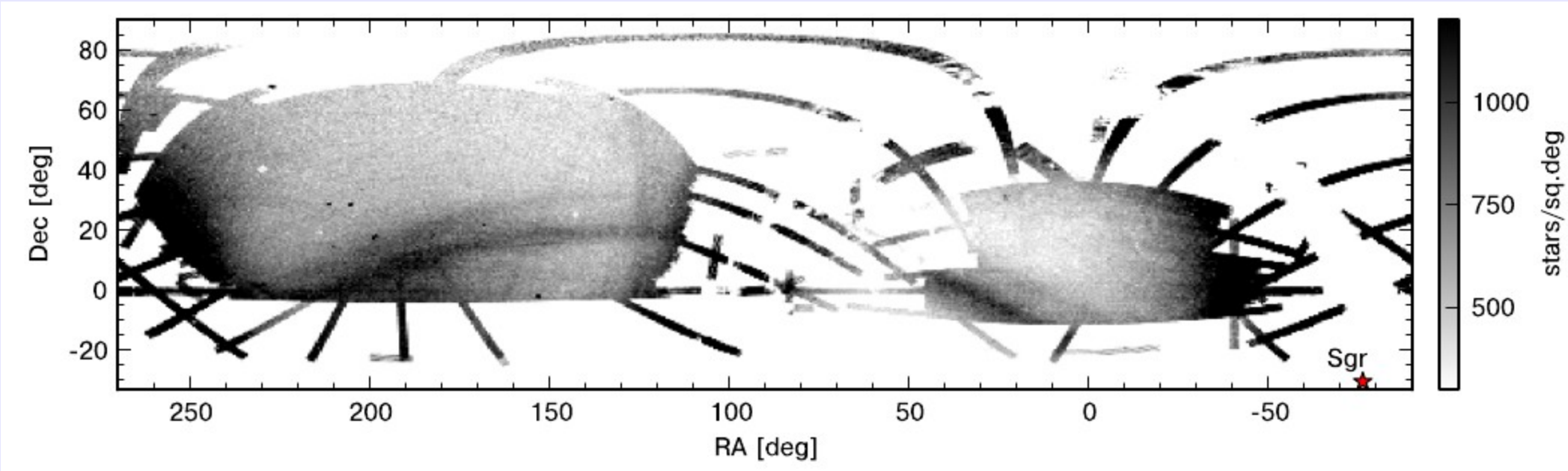
SDSS

- Palomar 5: Odenkirchen et al (2001,2003)



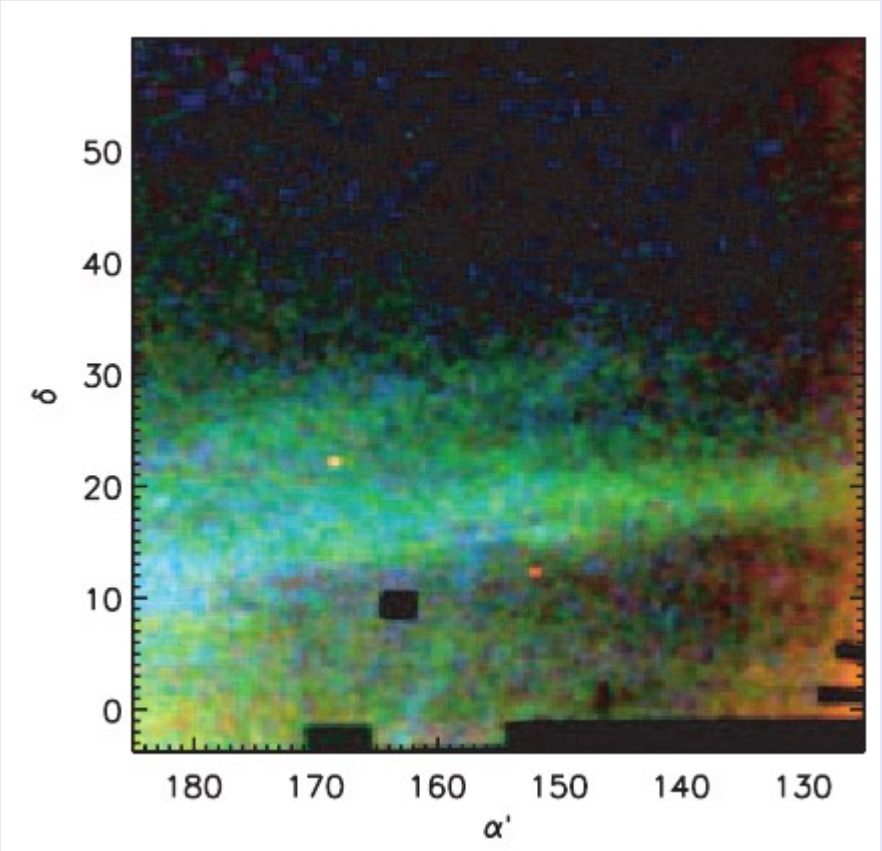
Sagittarius again

- Newberg et al (2002), Belokurov et al (2006), Koposov et al (2013)

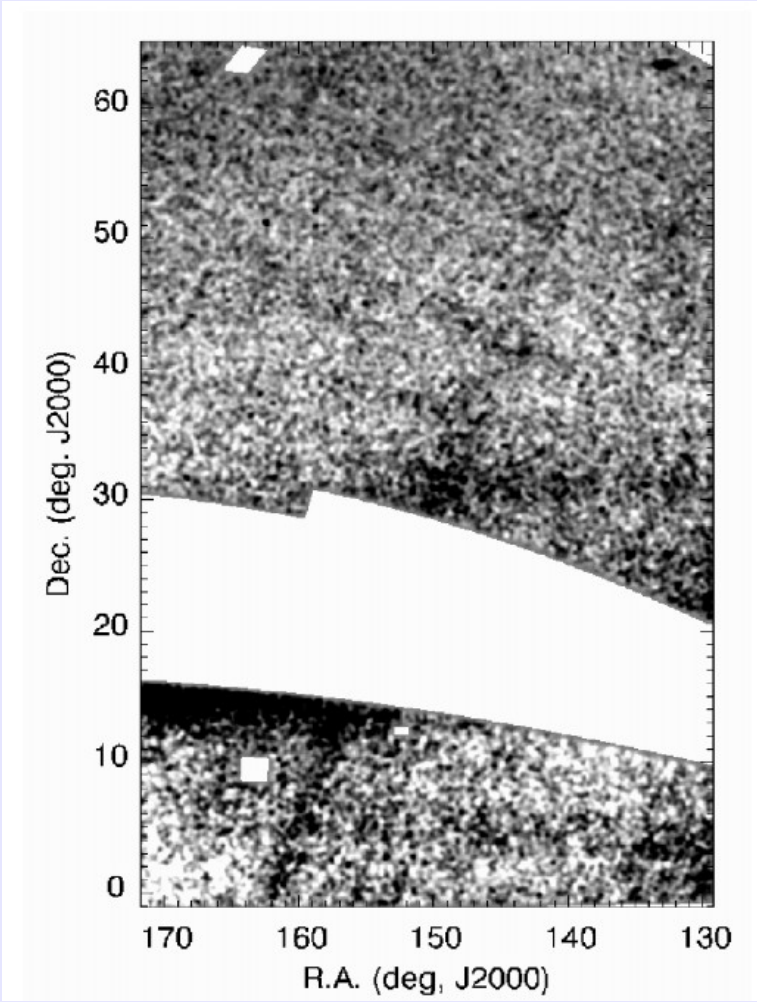


Orphan stream

- Dwarf galaxy stream: Belokurov et al (2006) Grillmair (2006)



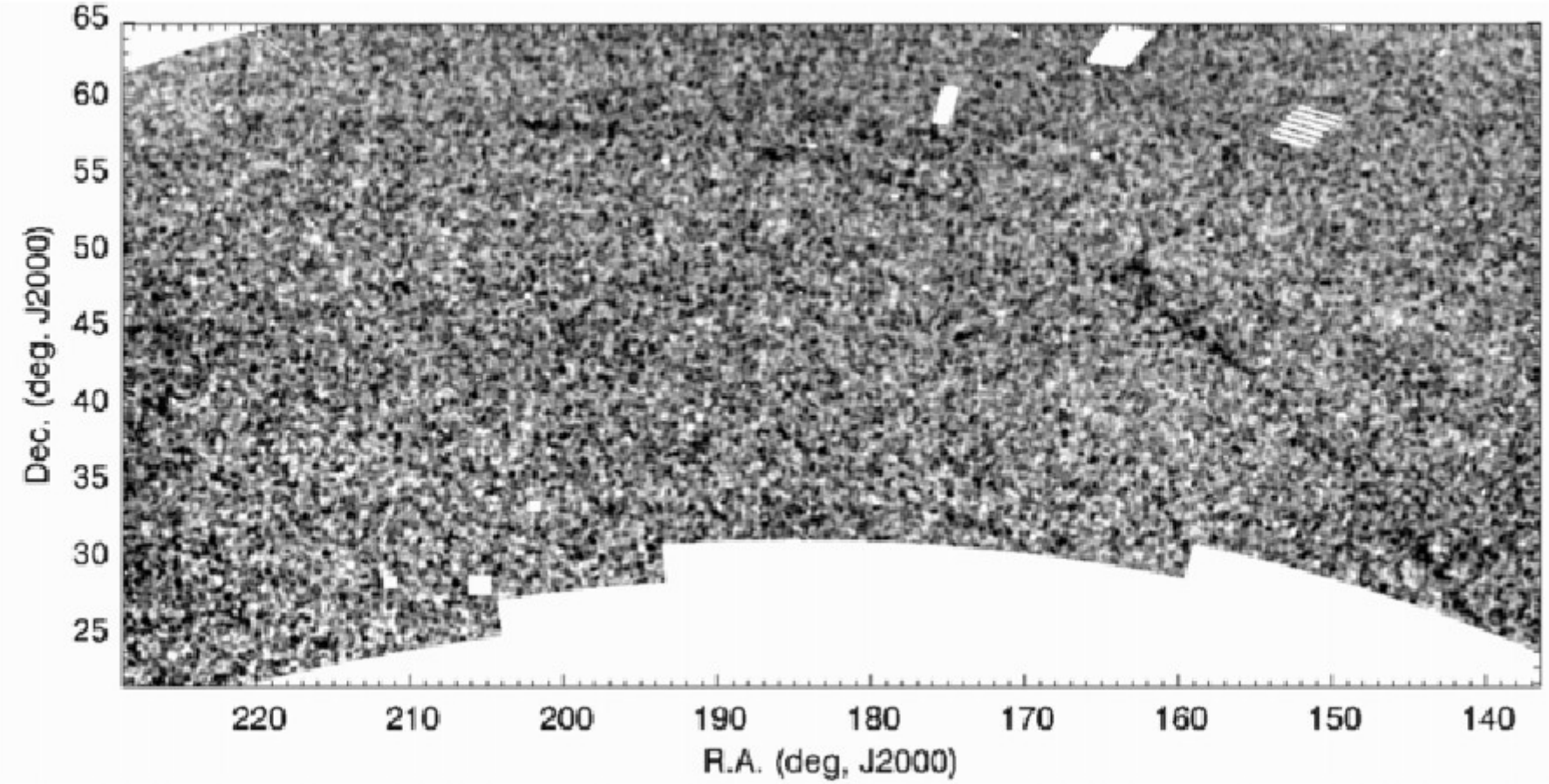
Belokurov et al (2006)



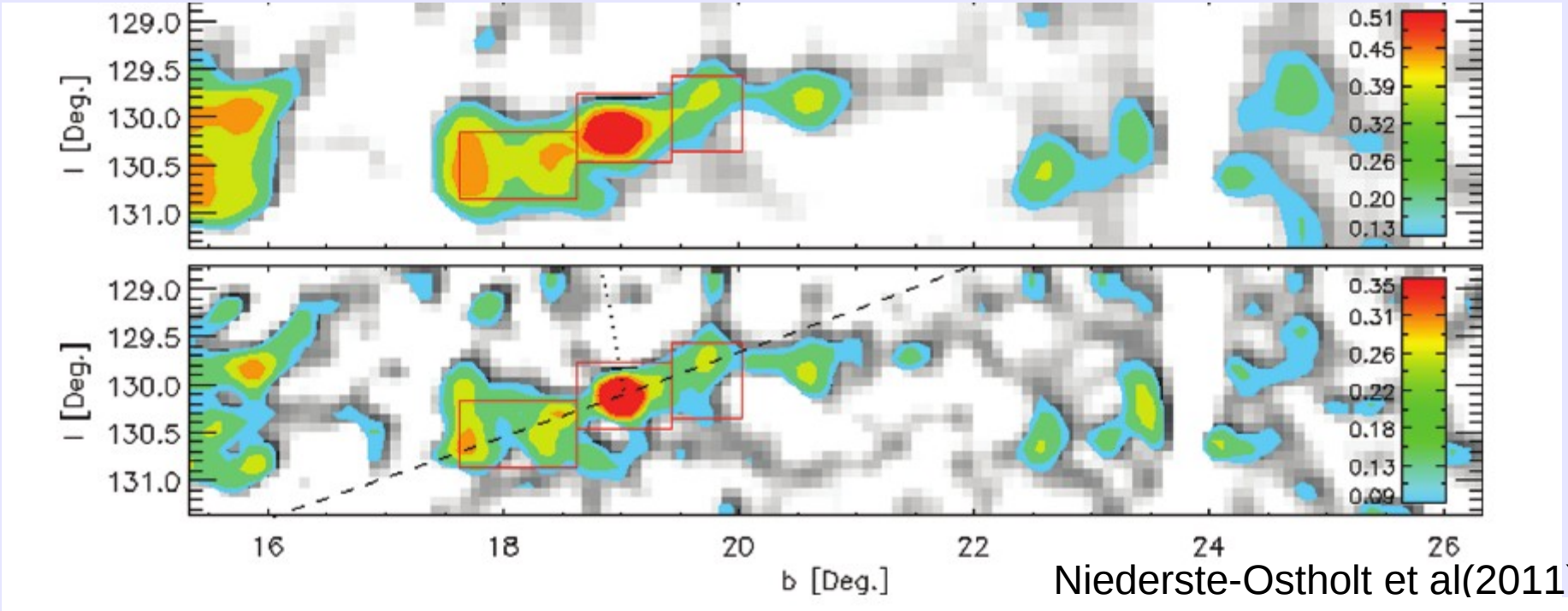
Grillmair (2006)

GD-1

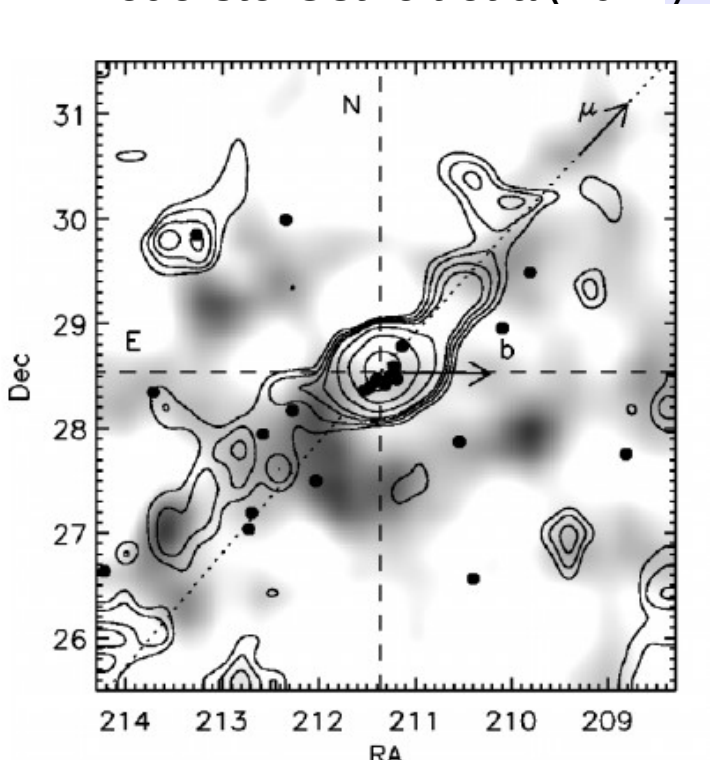
- Globular cluster stream: Grillmair, Dionatos (2006)



NGC 5466, Pal1

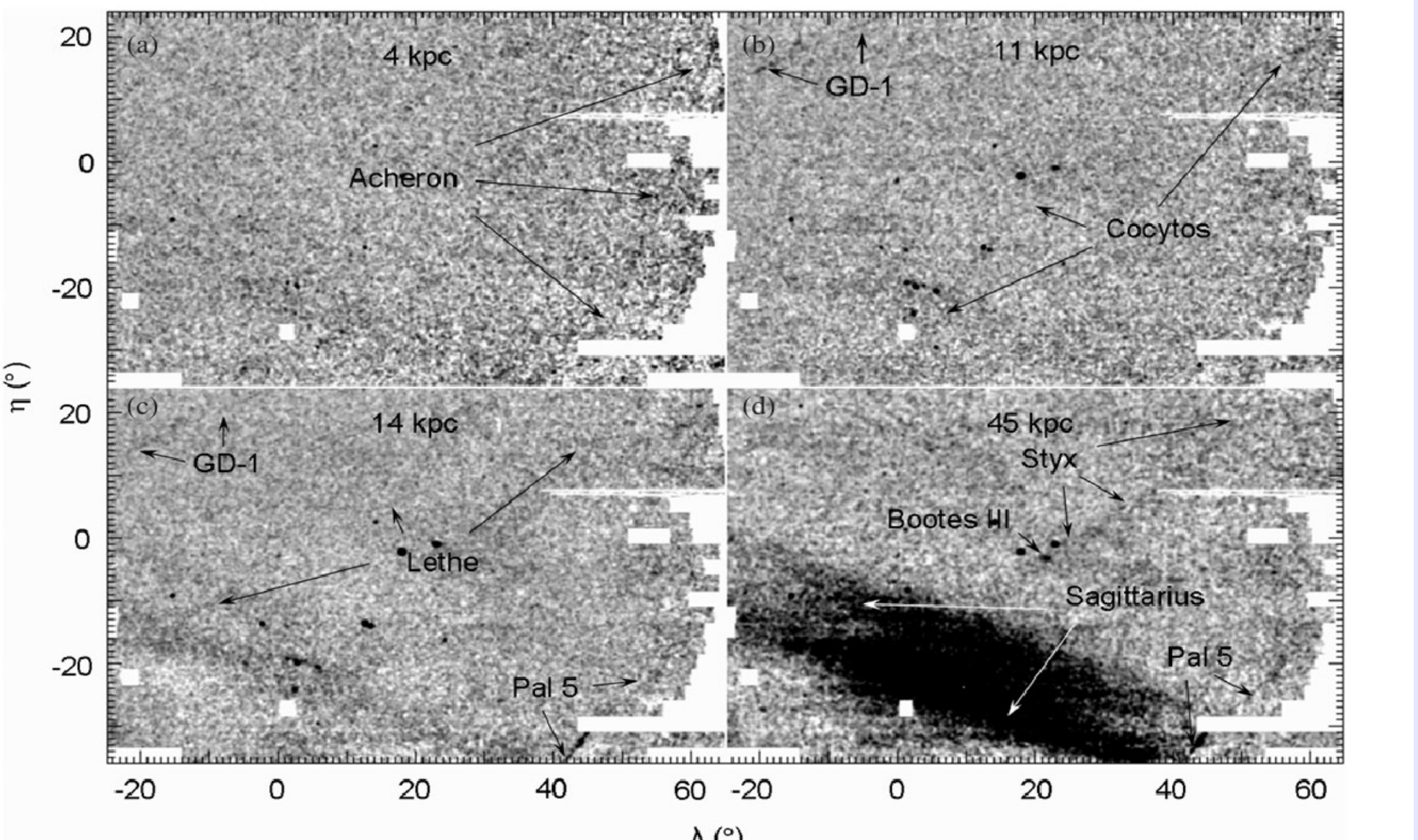


Niederste-Ostholt et al(2011)



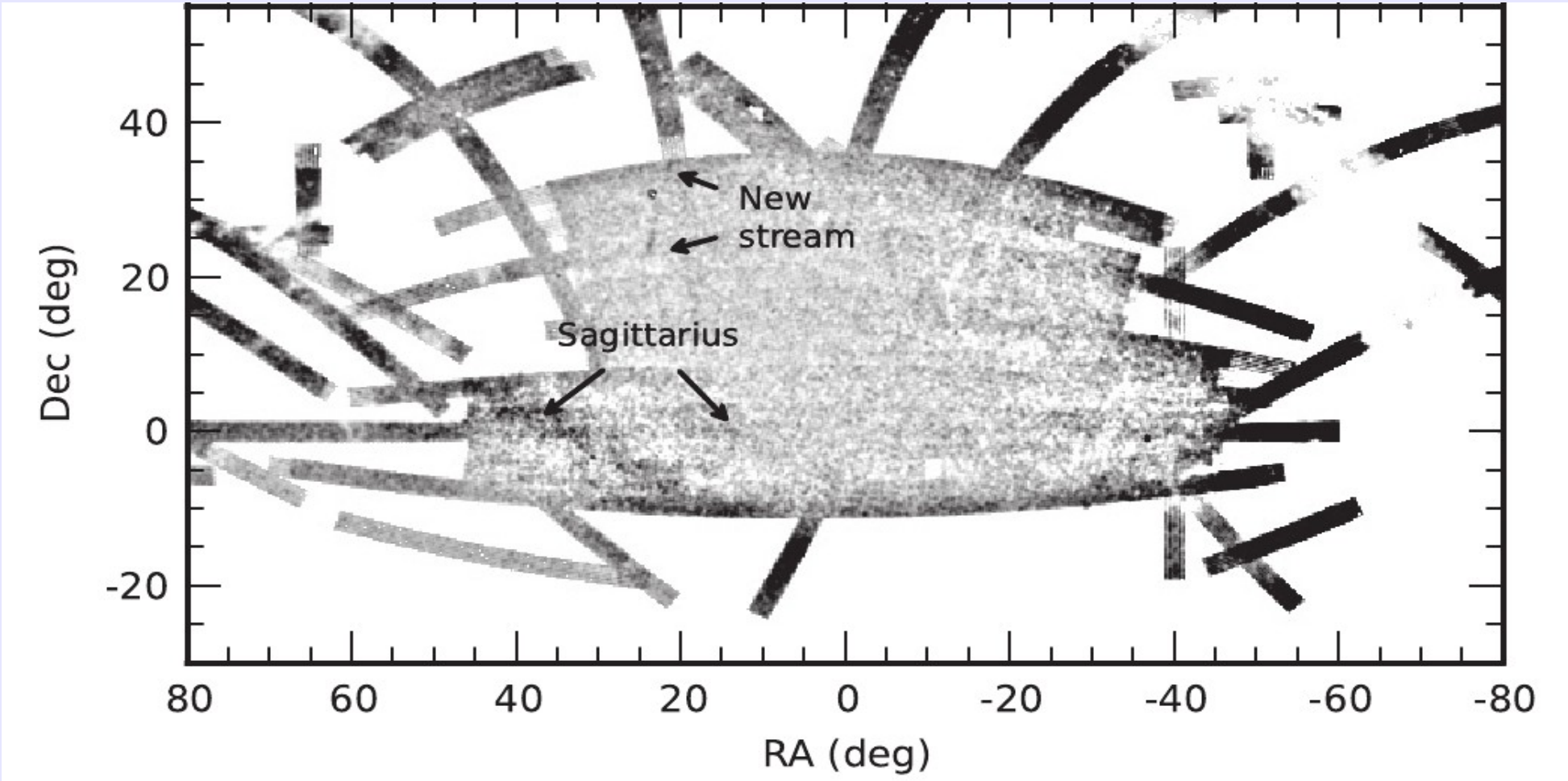
More faint streams ?

- Grillmair (2009)

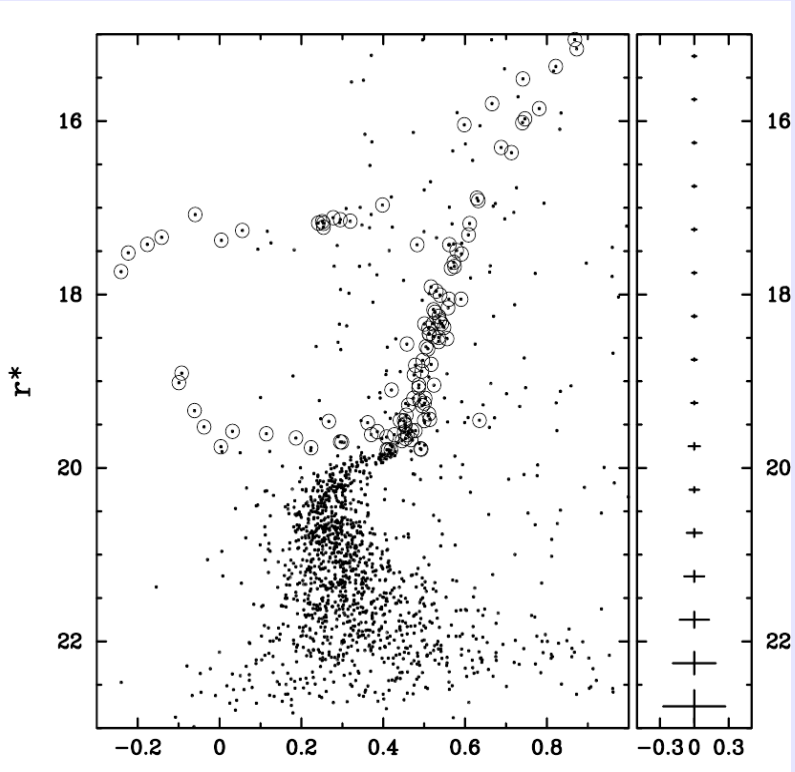


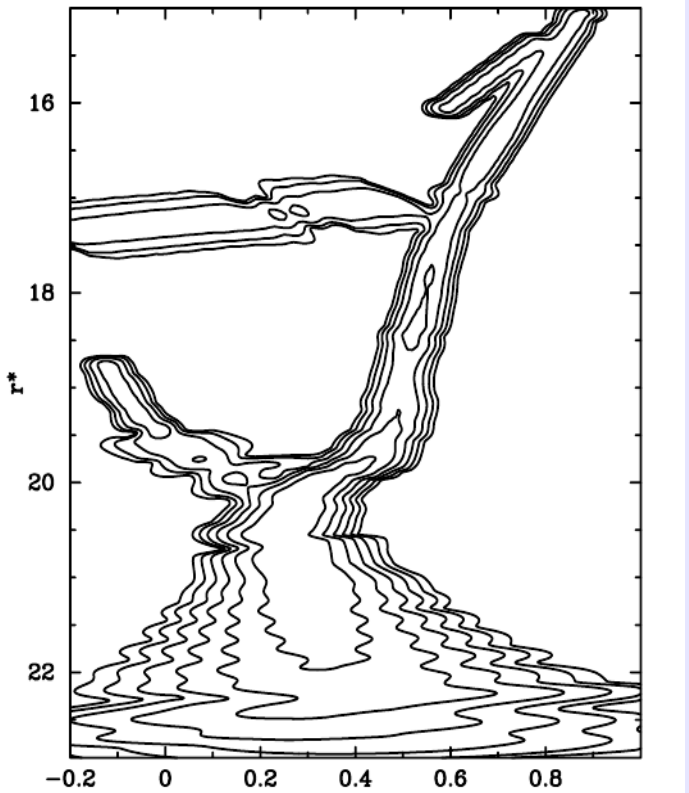
Triangulum/Andromeda stream

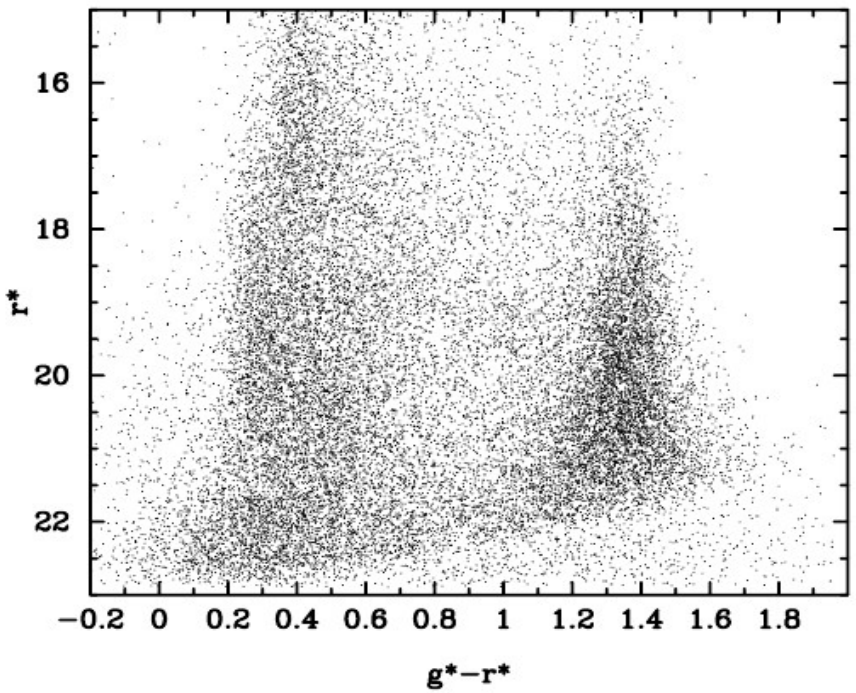
- Bonaca et al (2012)

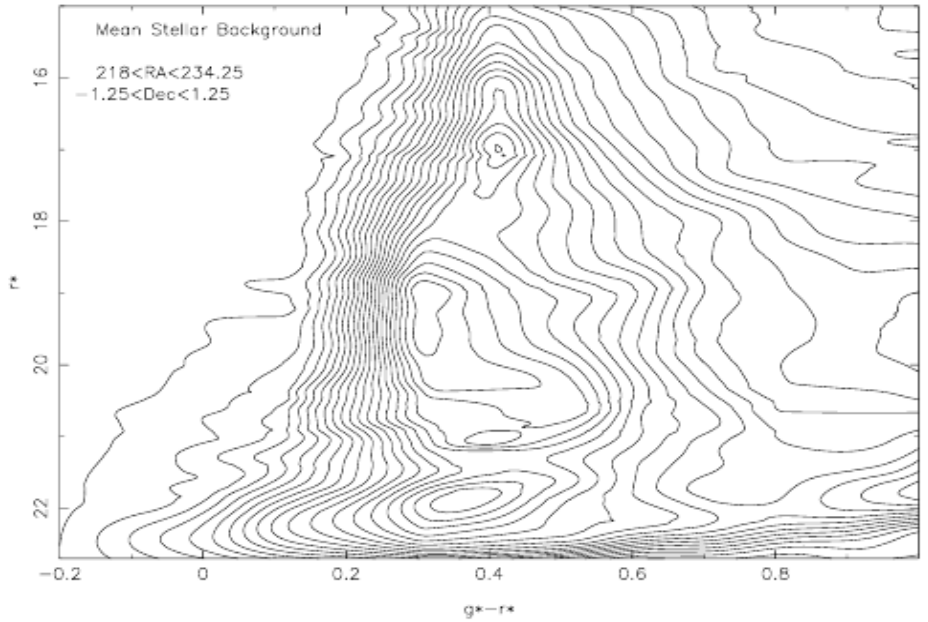


Search idea: Matched filter

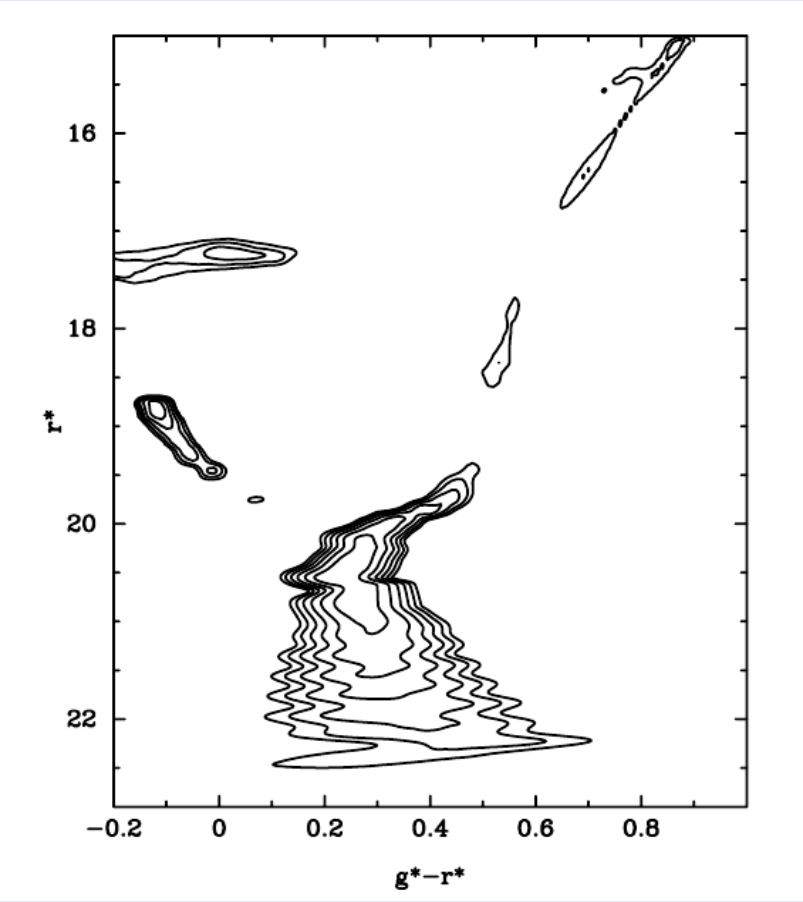






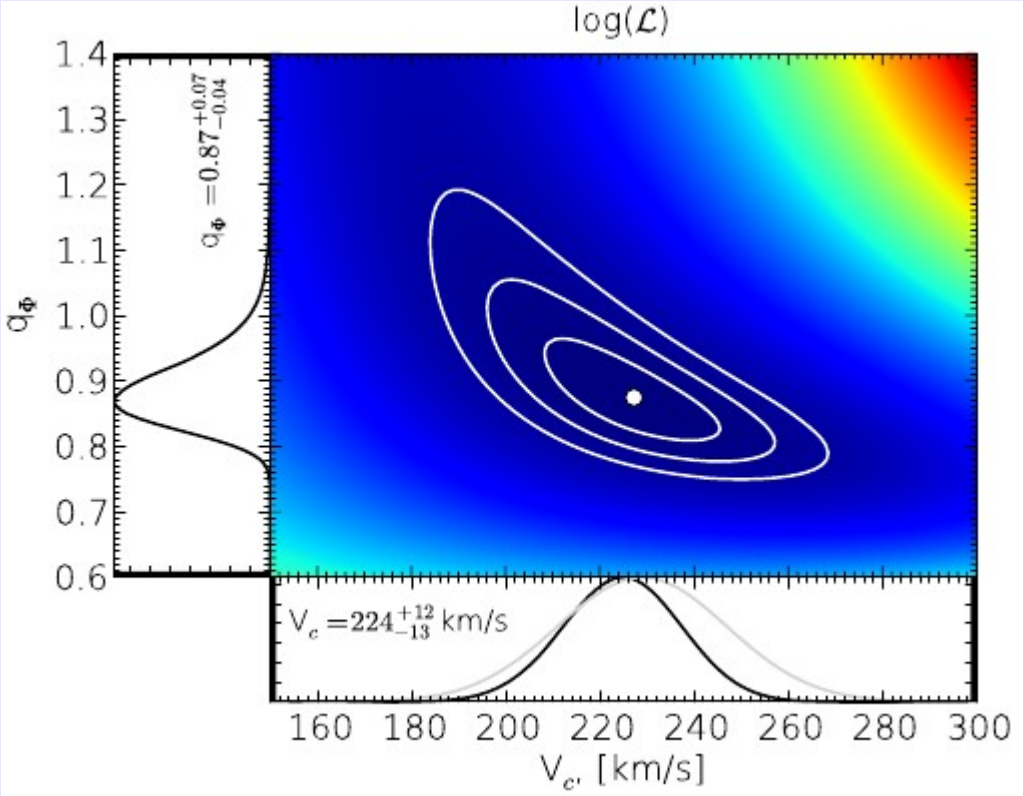


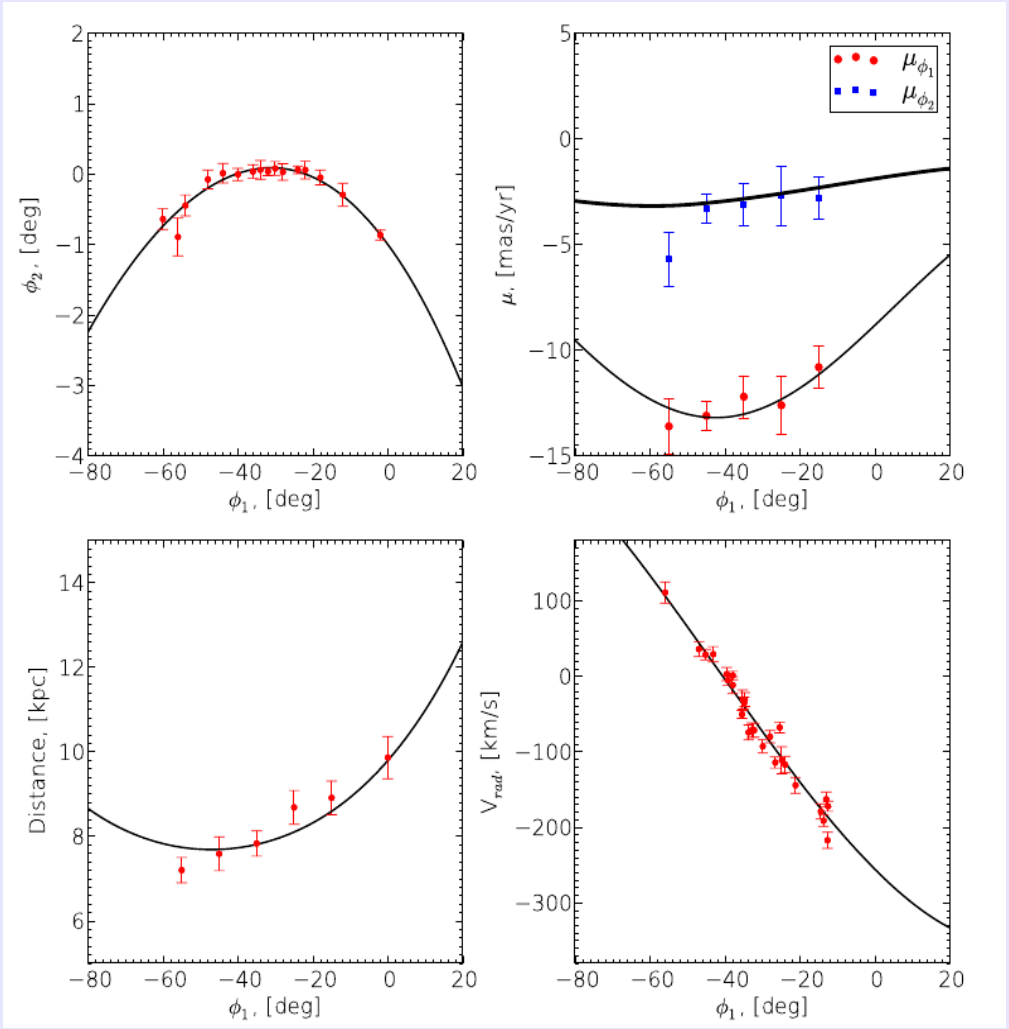
Weighting



Science motivation for stream studies

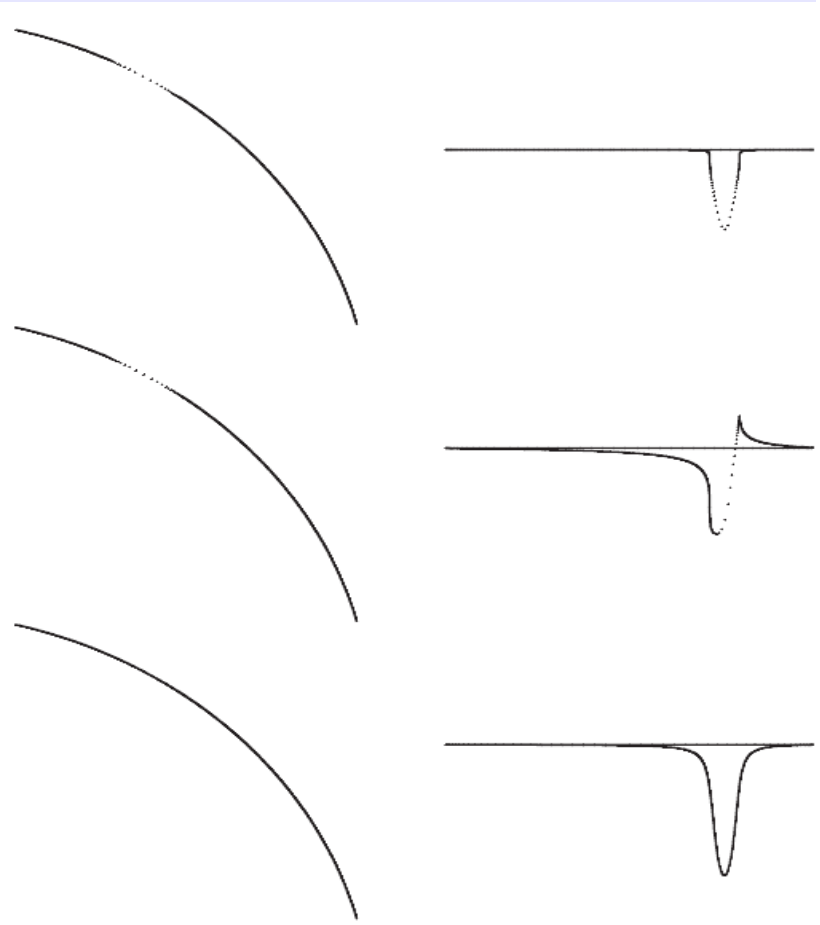
- Probes of the potential:
- Fitting 6-D information

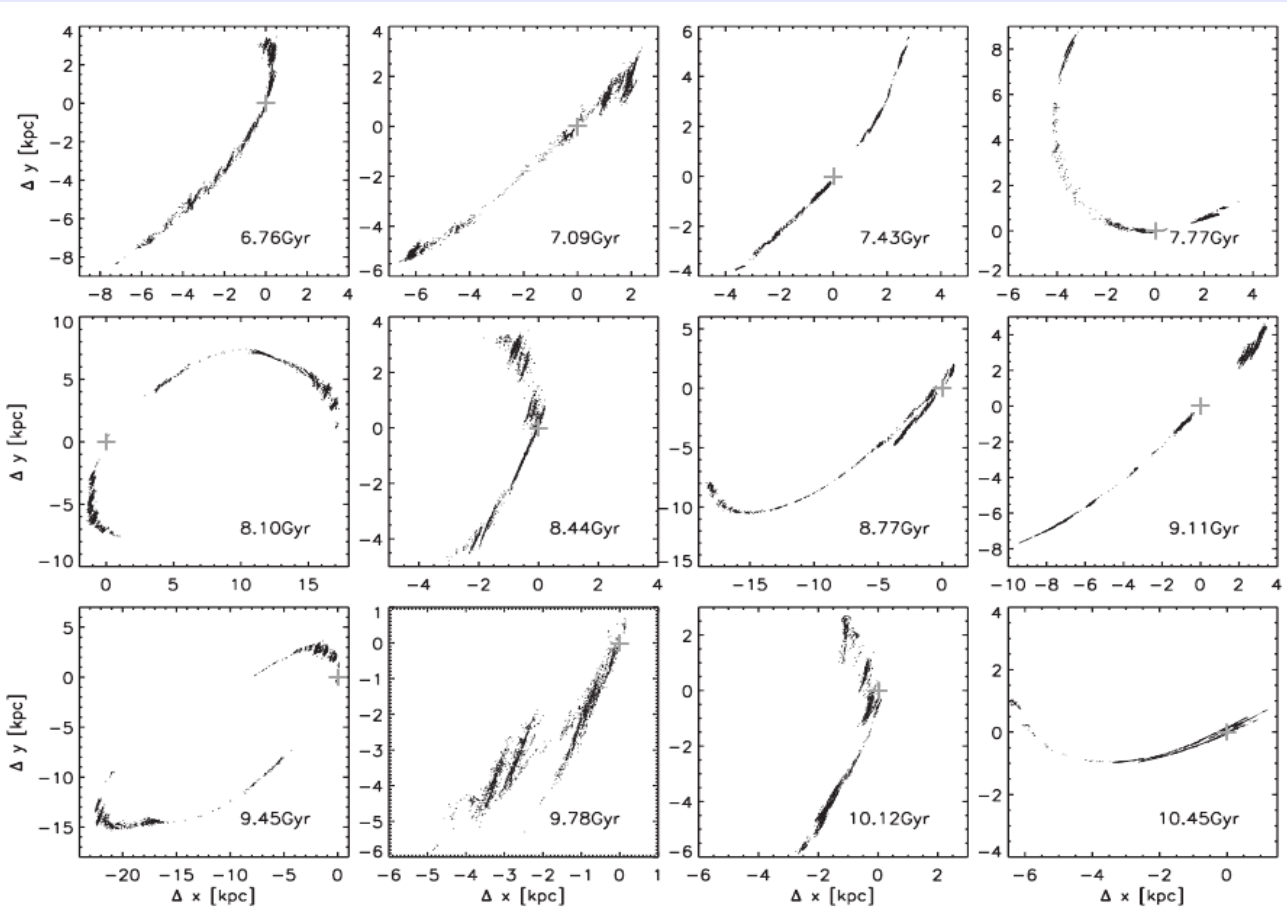




Koposov et al (2009)

Probing of the small DM subhalos

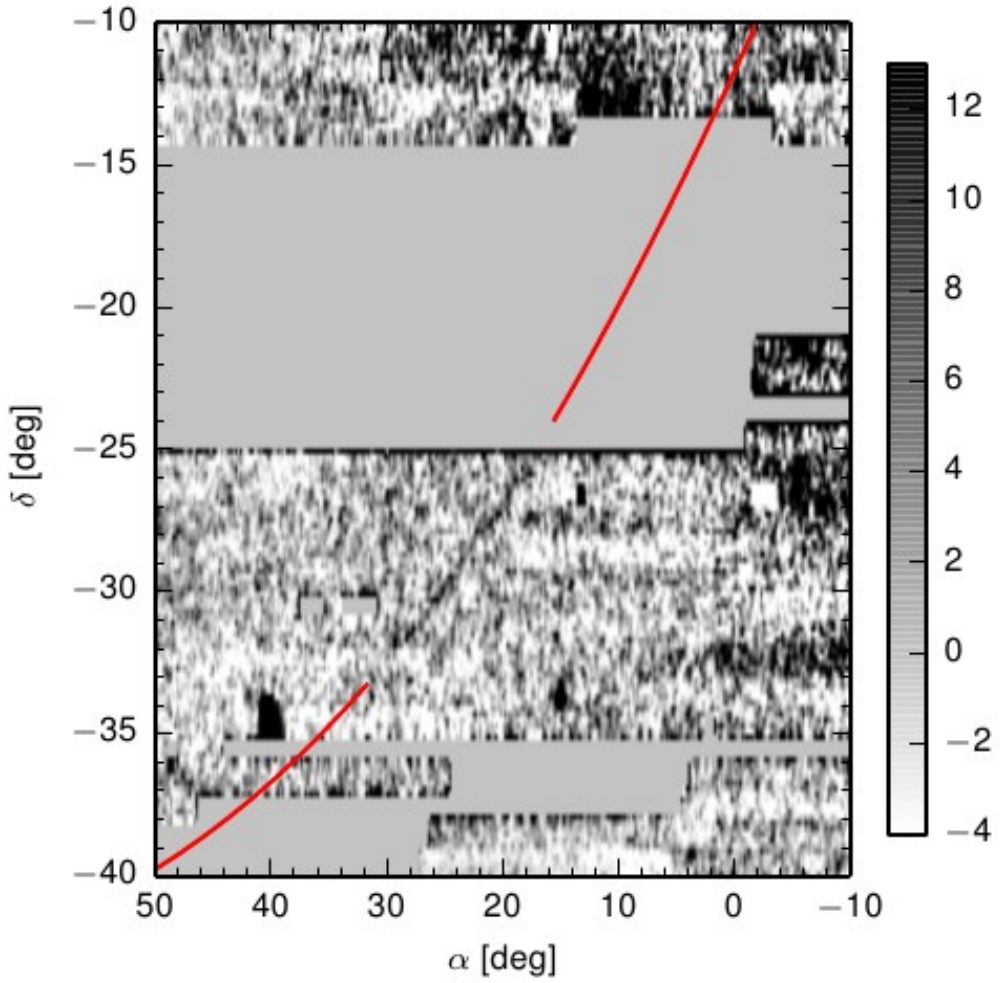


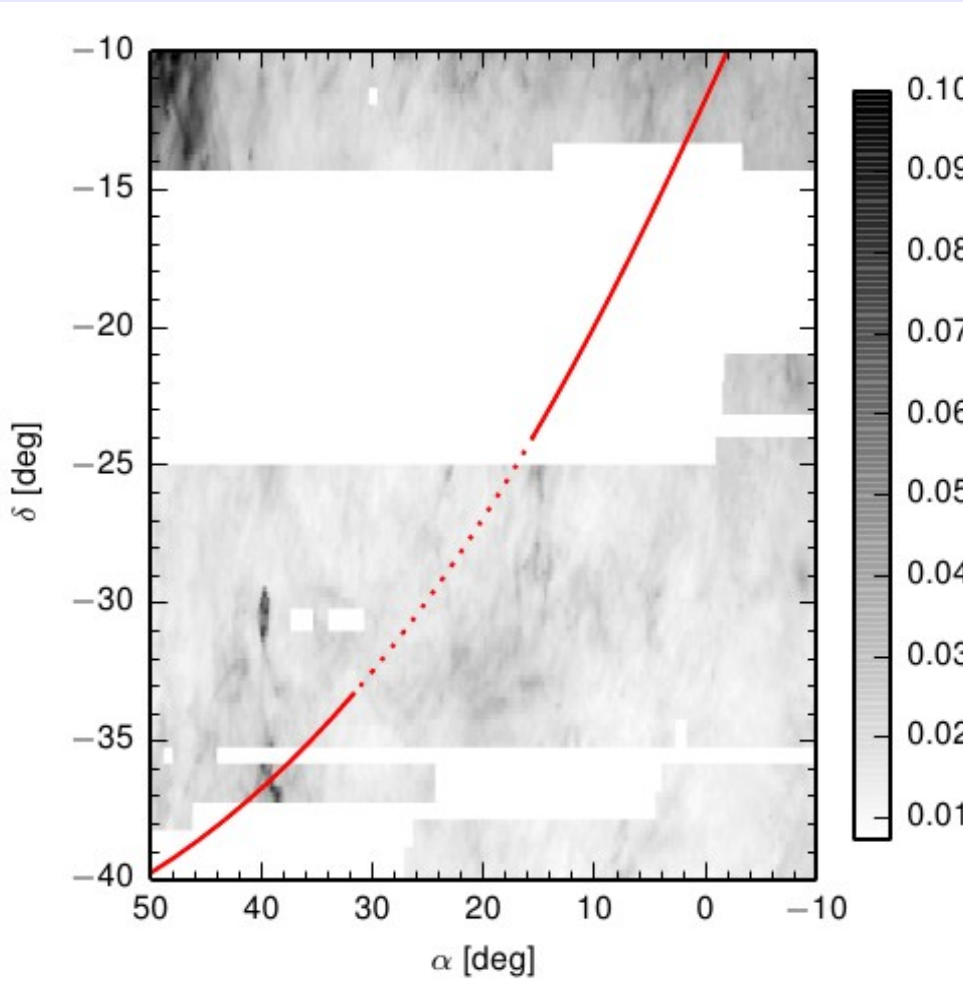


Carlberg (2012)

Yoon et al (2011)

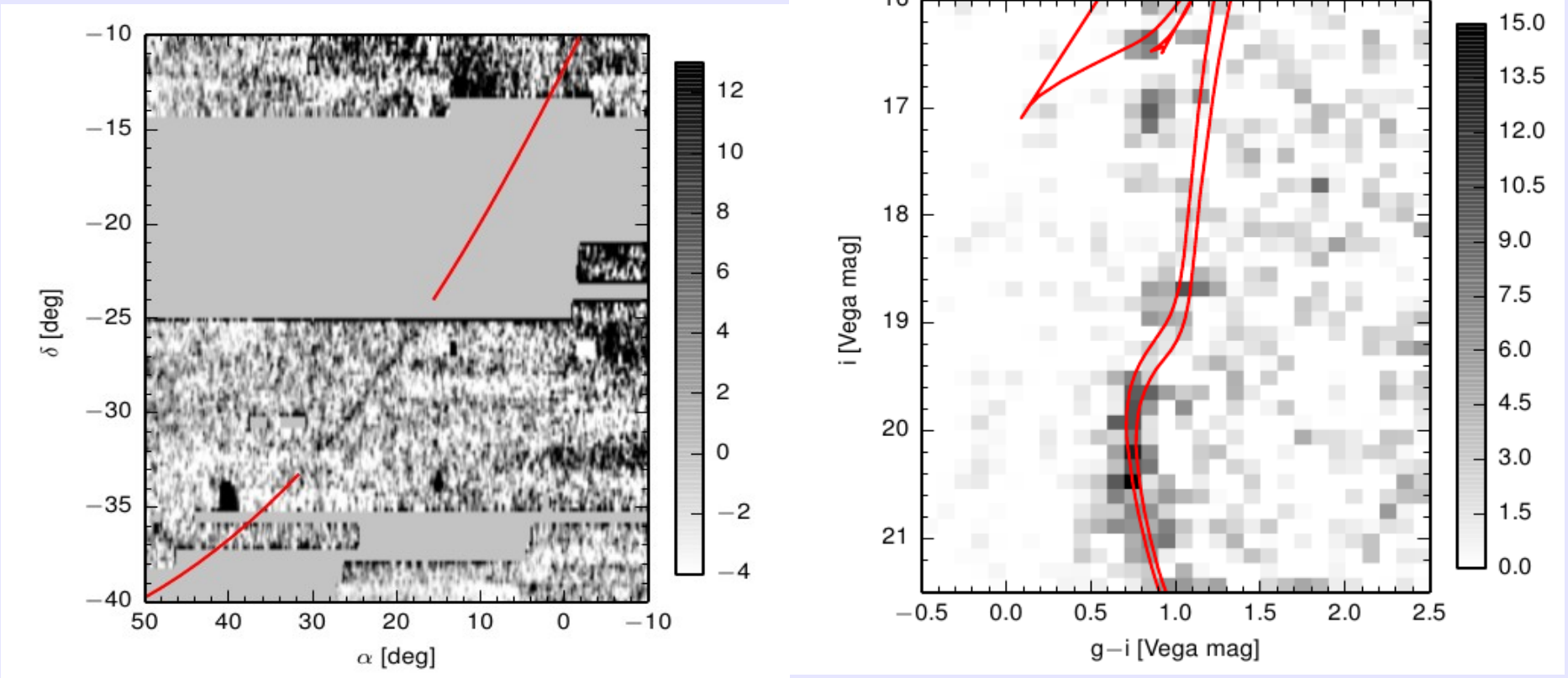
ATLAS stream





- 12 degree long
- Doesn't match extinction features
- Doesn't match footprint features

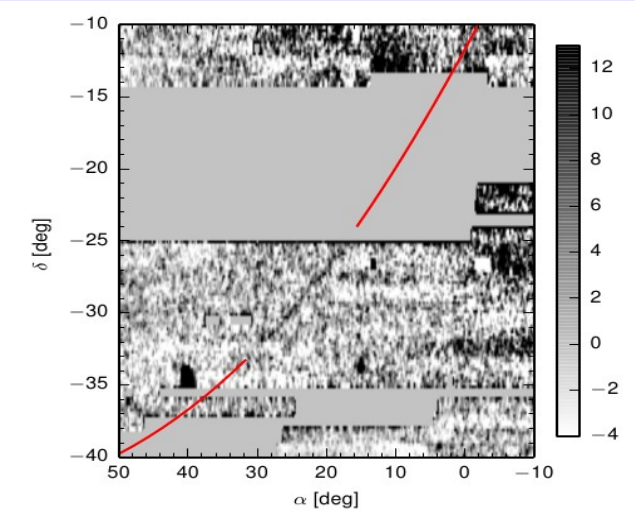
Color-magnitude

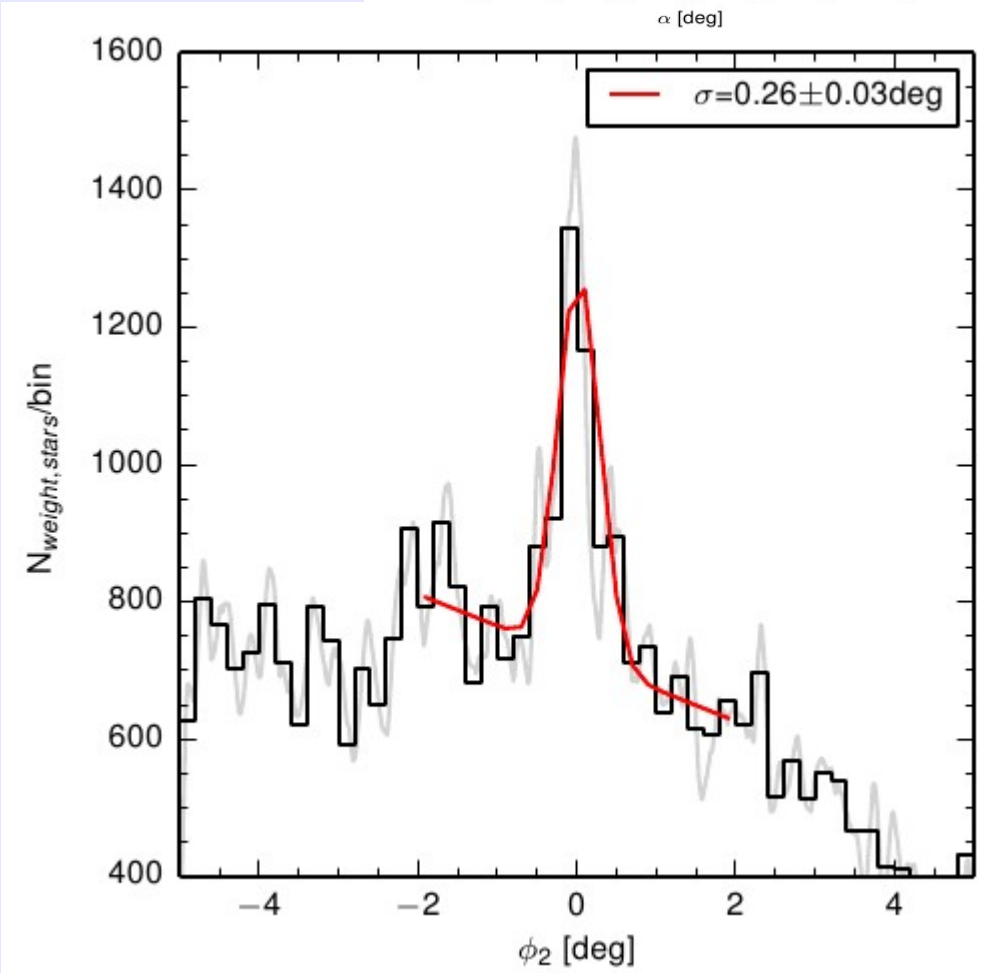


- Consistent with old metal-poor stellar population at ~ 20 kpc
- Need spectroscopy to confirm metallicity

Stream properties

- Highly significant
- Distance of ~ 17 kpc
- Width 0.25 deg (~70pc)
- Consistent with Globular or tiny dwarf

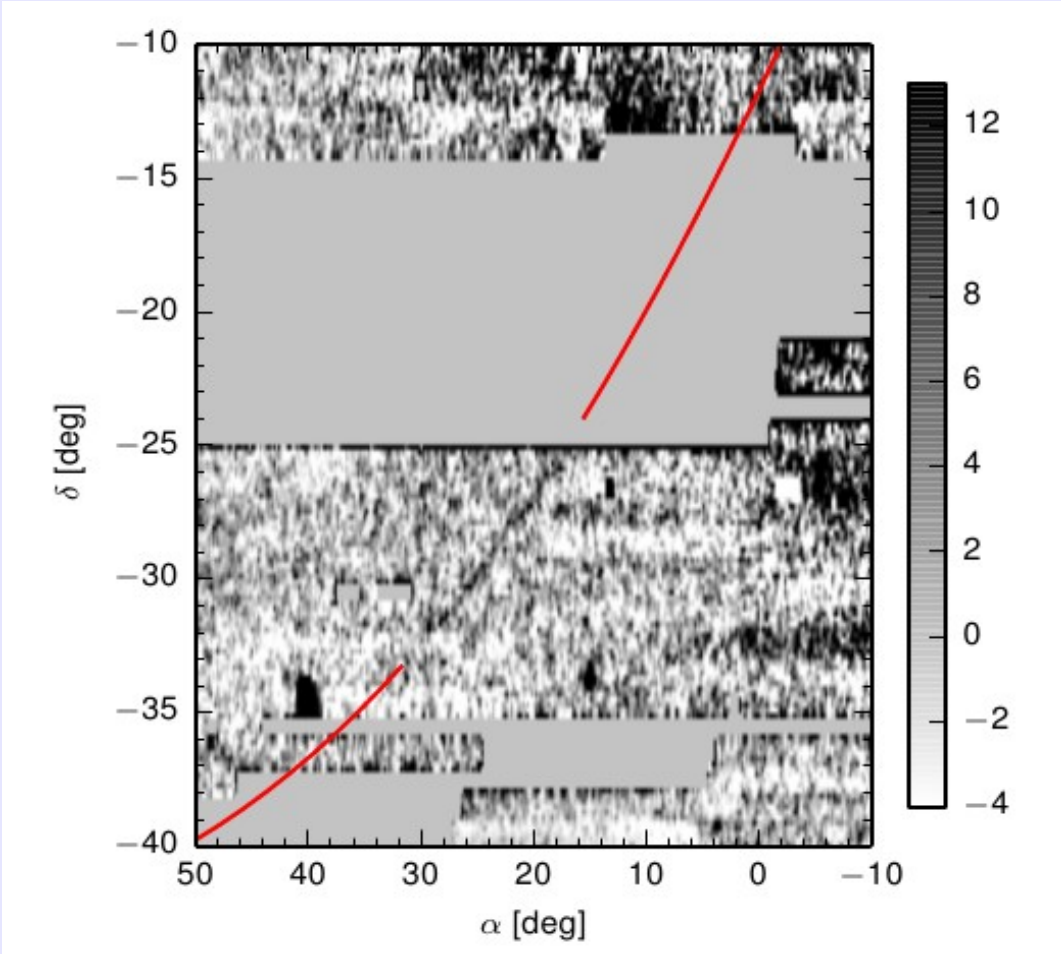




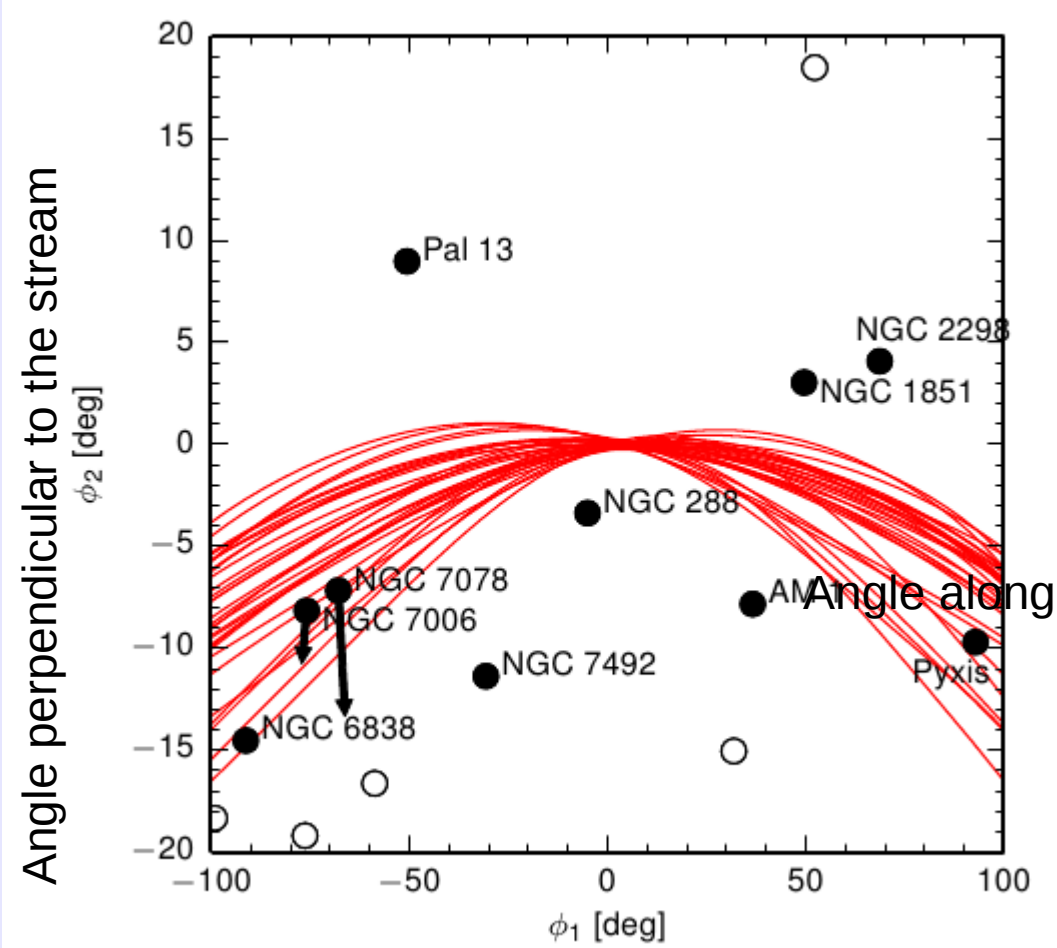
Stream properties

- Stream seems to “disappear” on one edge
- Distance gradient unknown
- Total mass 3e4 Msun
- Surface brightness

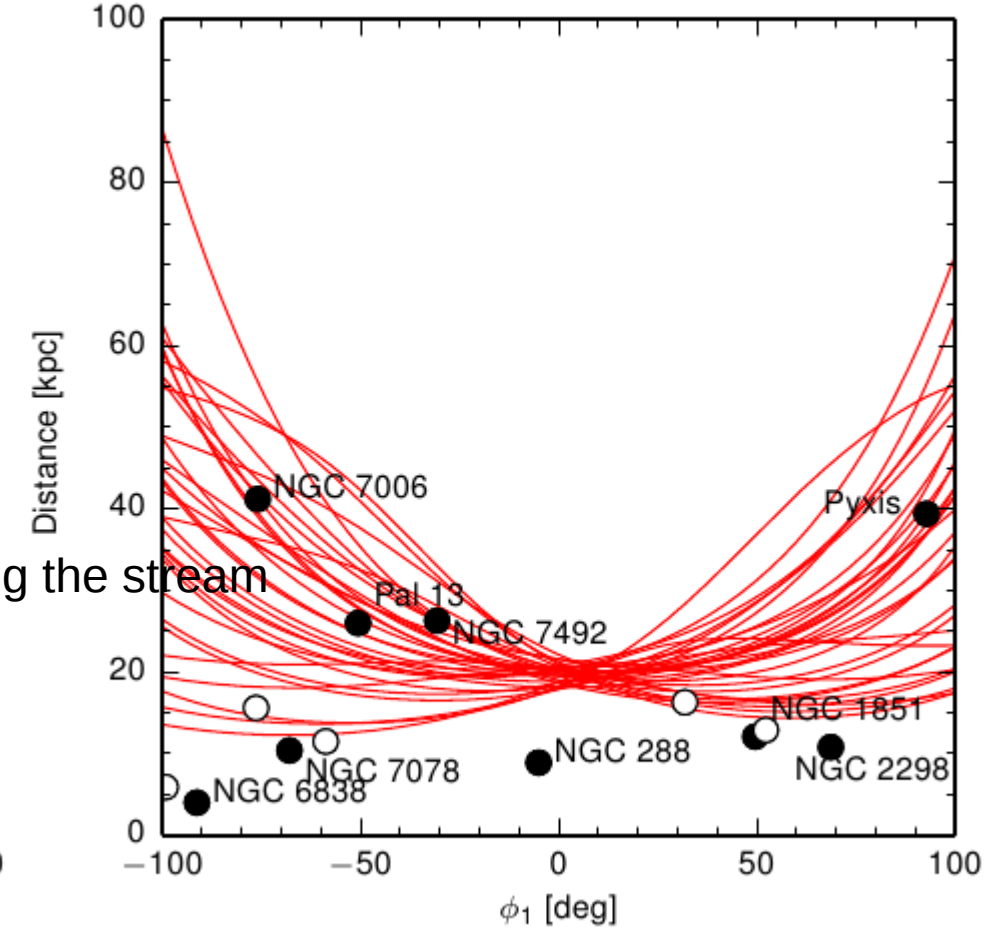
  29 mag/sq. arcsec



Orbits



Angle along the stream



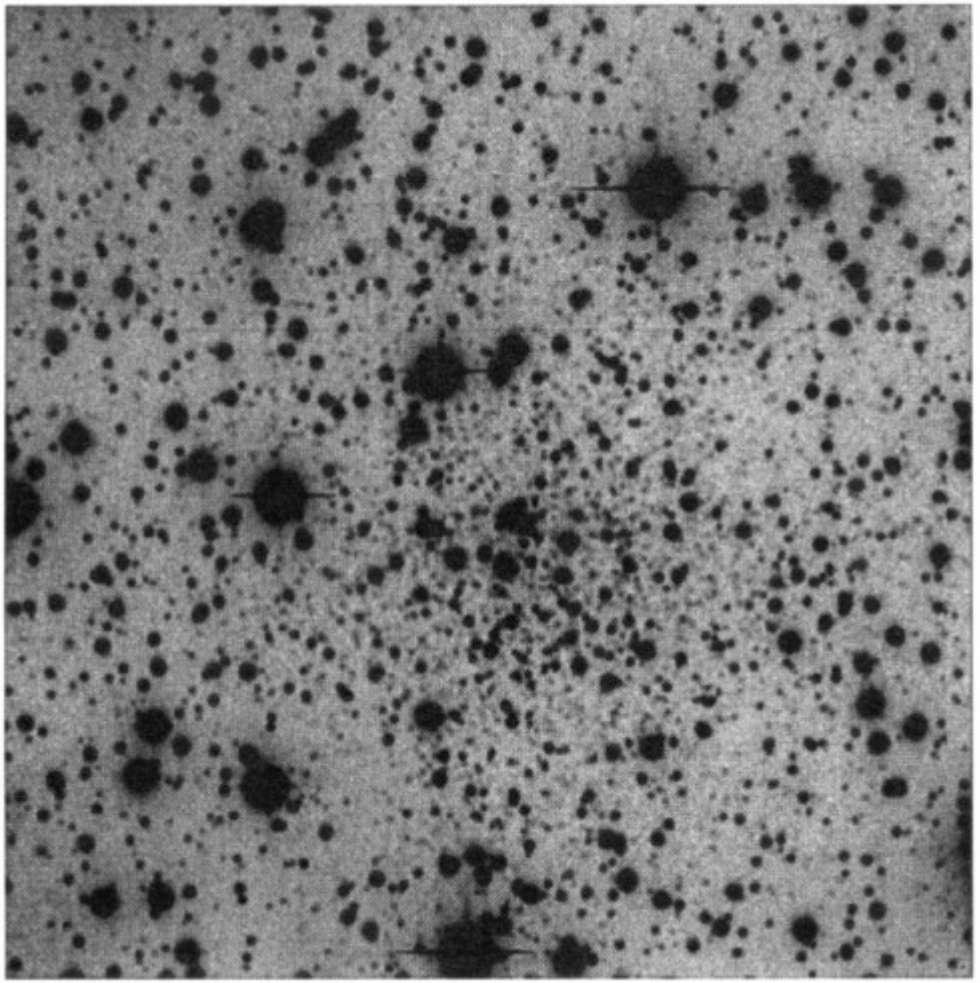
Angle along the stream

- No good handle on the orbit
- Few possible associations

Pyxis ?

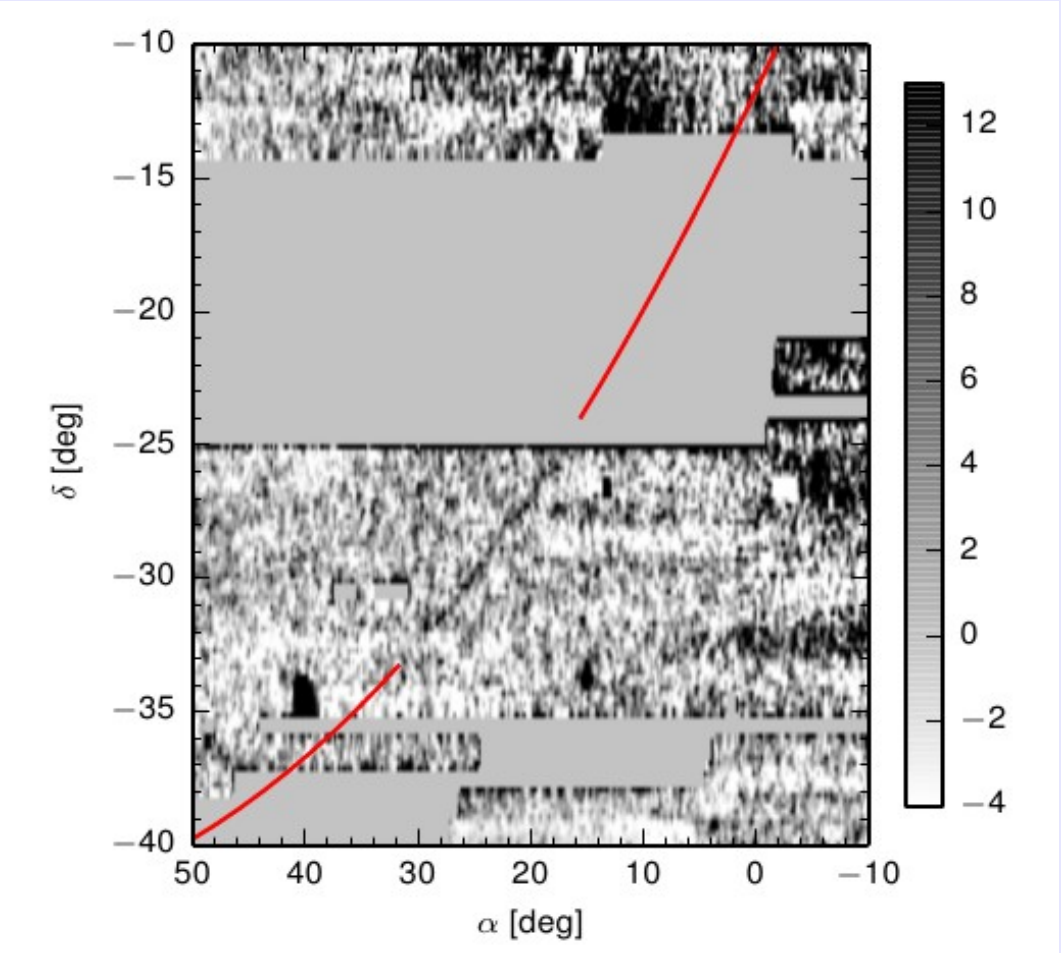
- Large, faint poorly studied cluster

  Irwin et al (1995)
- Seems to be young, outer halo cluster (Dotter et al 2011)
- Deep imaging to test for tidal signatures



Plans for future

- Spectroscopy to get RVs, metallicities
- More area from VST
- Deeper imaging – DES proposal (Thomas de Boer) – constraints on the substructure
-



Conclusions

- A new stream discovered
- The progenitor is unclear, but GC is more likely
- Pyxis could be related to the stream (speculative)
- Uniform **optical** crucial for more faint discoveries
- There are many more to be found (and Gaia won't necessary help).