

Stellar populations and link to GAIA

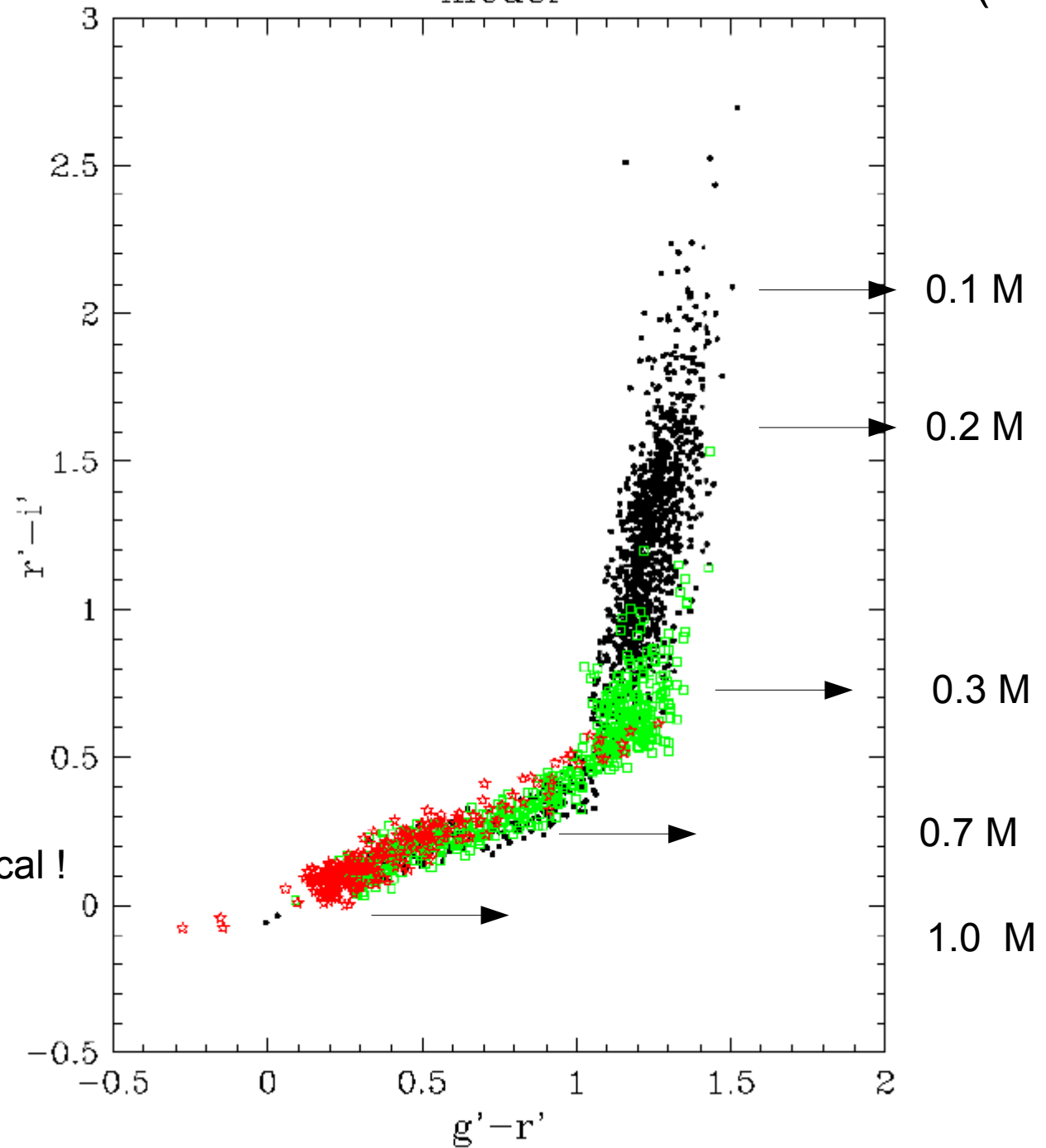
M. Schultheis

Observatoire de la Côte d'Azur

In a perfect world...

Spheroid
Thick disc
Thin disc

BUT :
Star/galaxy separation is critical !
Saturation !



White dwarfs

- Latest stage of stellar evolution
- Coolest white dwarfs age indicator of our Galaxy
- Space density depends on Galactic star formation history and IMF

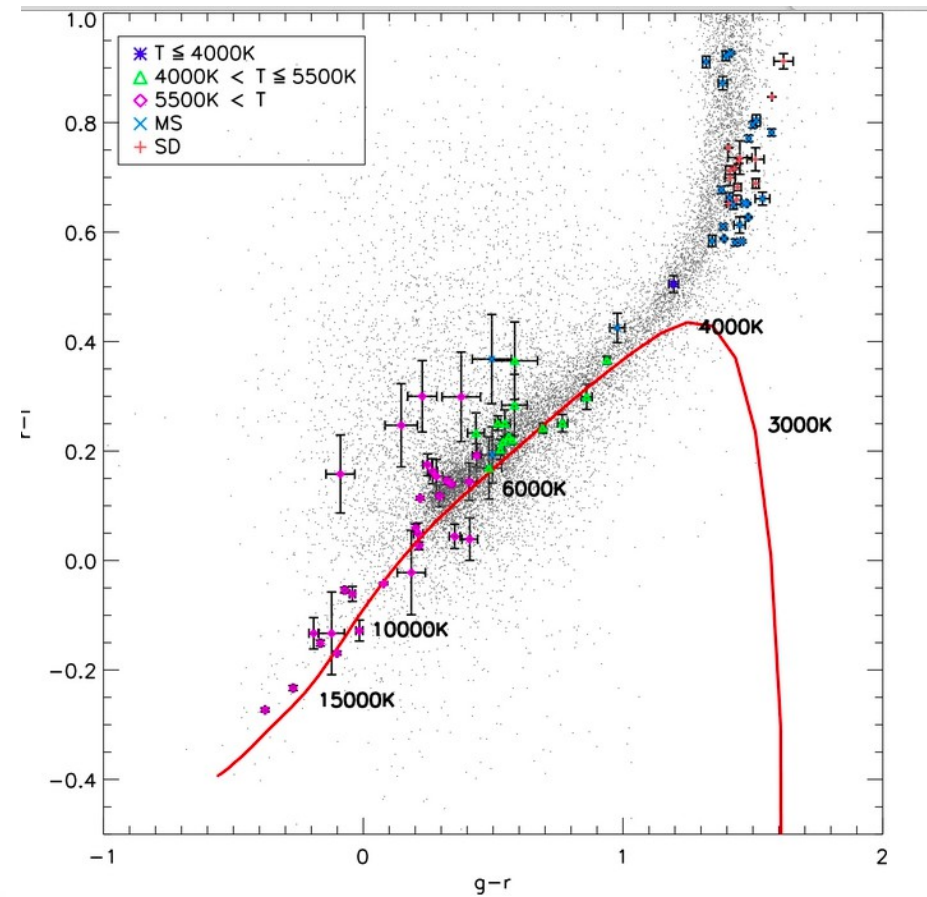
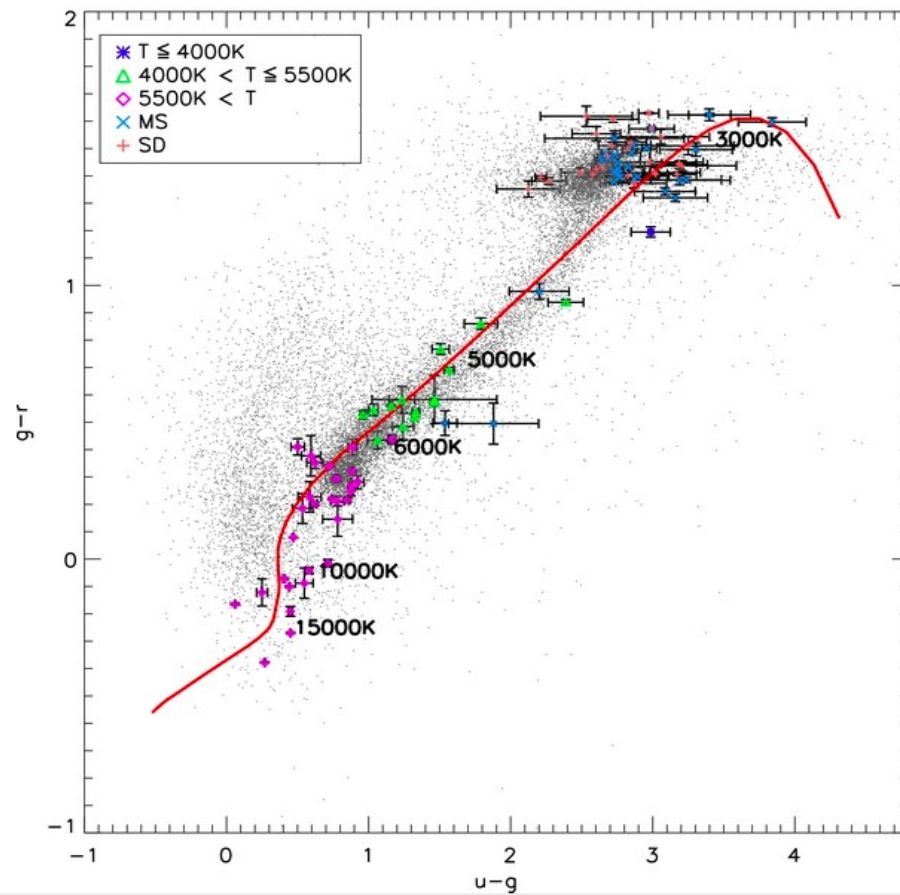


Only luminosity function of local white dwarfs in the thin disc is known ($R < 1$ kpc)

White dwarfs in thick disc and halo ?

Several studies of white dwarfs with CFHTLS

Schultheis et al. (2006), Limboz et al. (2008), Hu et al. (2013)

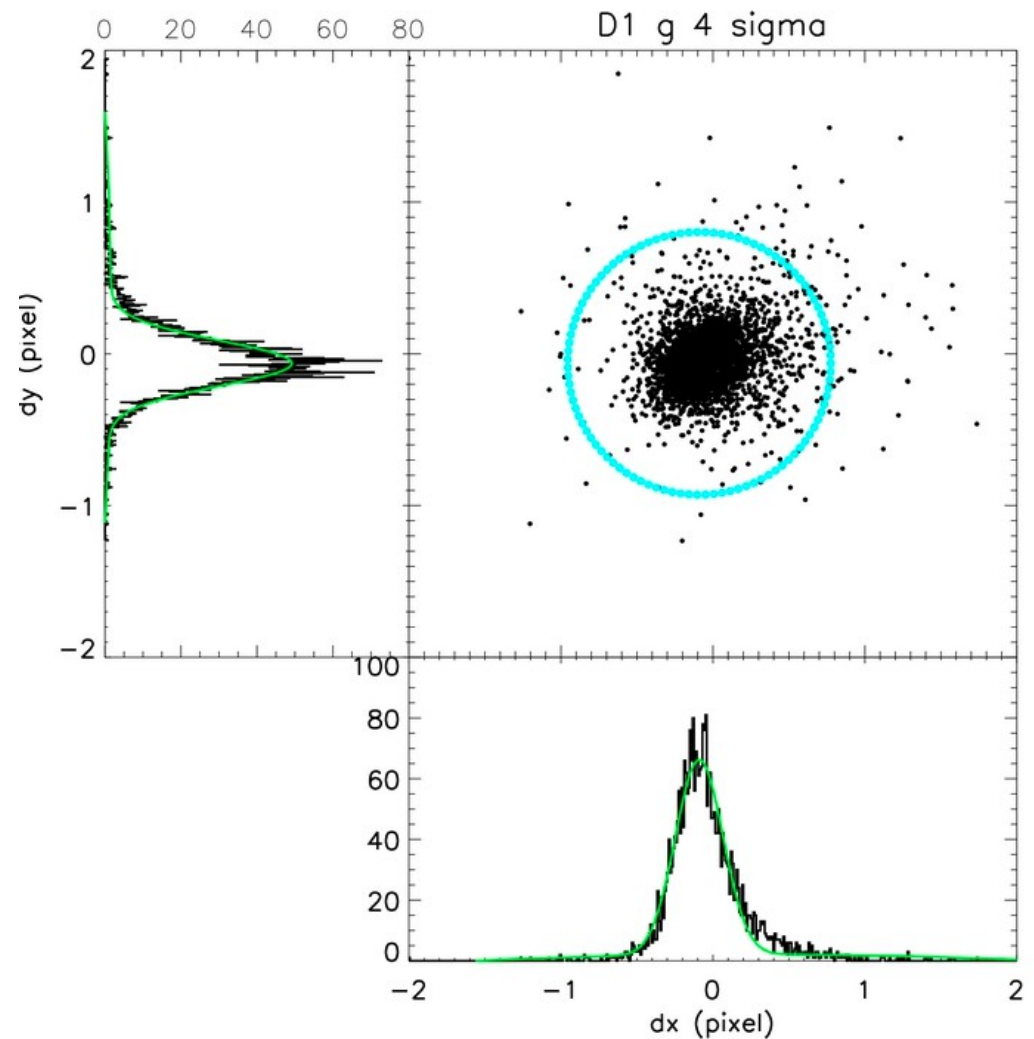


BUT

- Combination with proper motions
- Only for 4 sq degrees

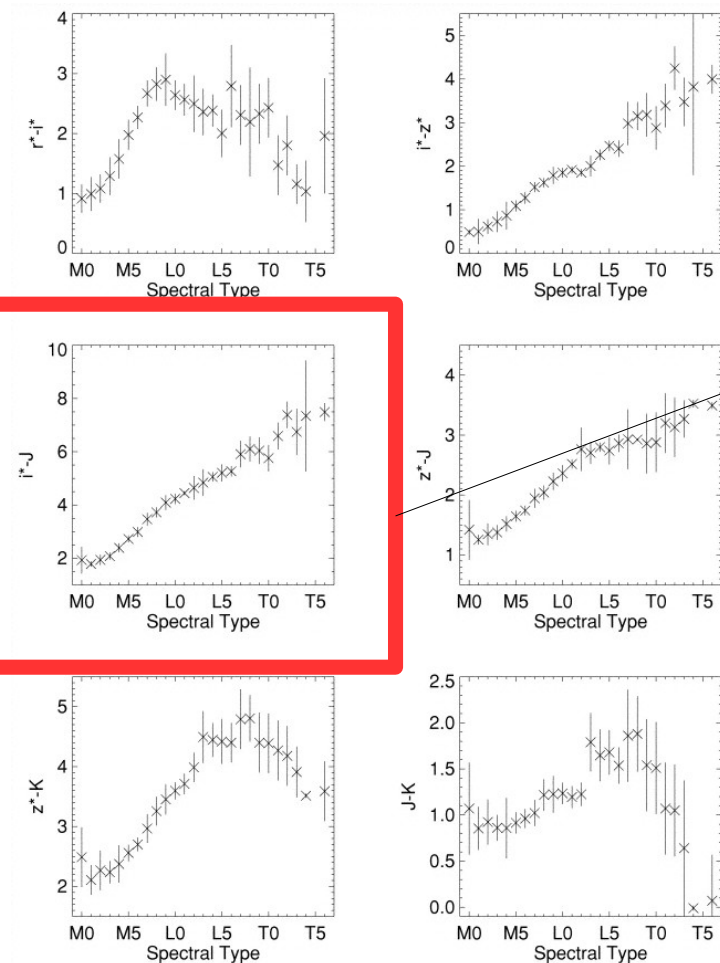
With NSLS one can constrain
LF of WDs in thick disc and halo

Hu et al. (2013)



Late-type stellar and sub-stellar objects

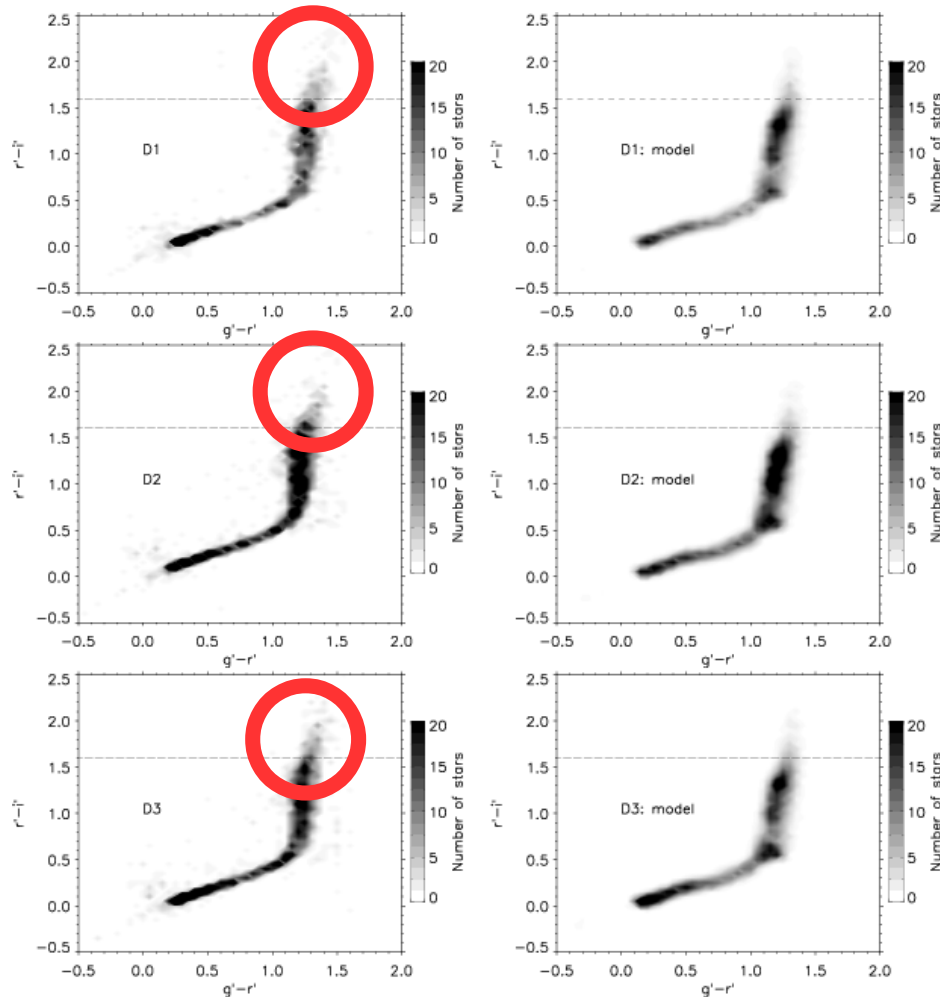
Large surveys are ideal in finding brown dwarfs and getting their LF



I-J best tracer of M,L,T dwarfs !

Constraining the initial mass function

Schultheis et al. (2006)



Excess of low-mass M dwarfs



Important contribution of low-mass Stars ($M < 0.25 M_{\text{sol}}$)

BUT : only for 4sq degrees !

Initial mass and luminosity function is the major parameter for chemical/dynamical evolution models of our Galaxy and for stellar population synthesis models

Does the IMF depend on the stellar environment (metallicity) or is it universal ?

The GAIA mission

- GAIA was launched 19 December 2013
- Duration of mission : 5-6 years
- Actual status : commissioning phase (until July)

- **Complete sky survey $G < 20$**
- **$> 10^9$ point sources**
- **3 instruments : astrometry :
photometry
spectroscopy**



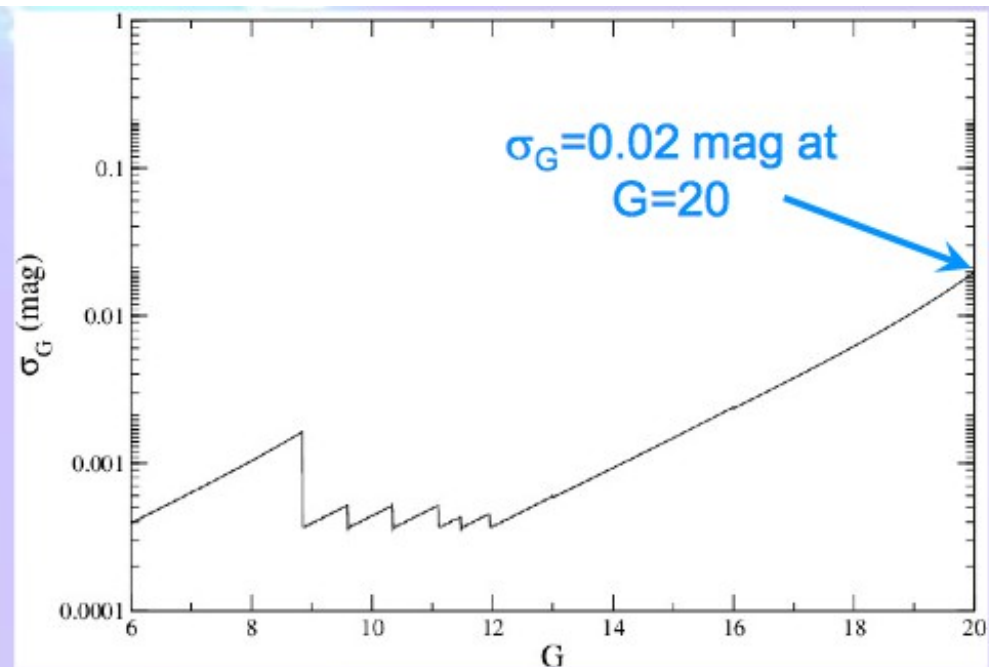
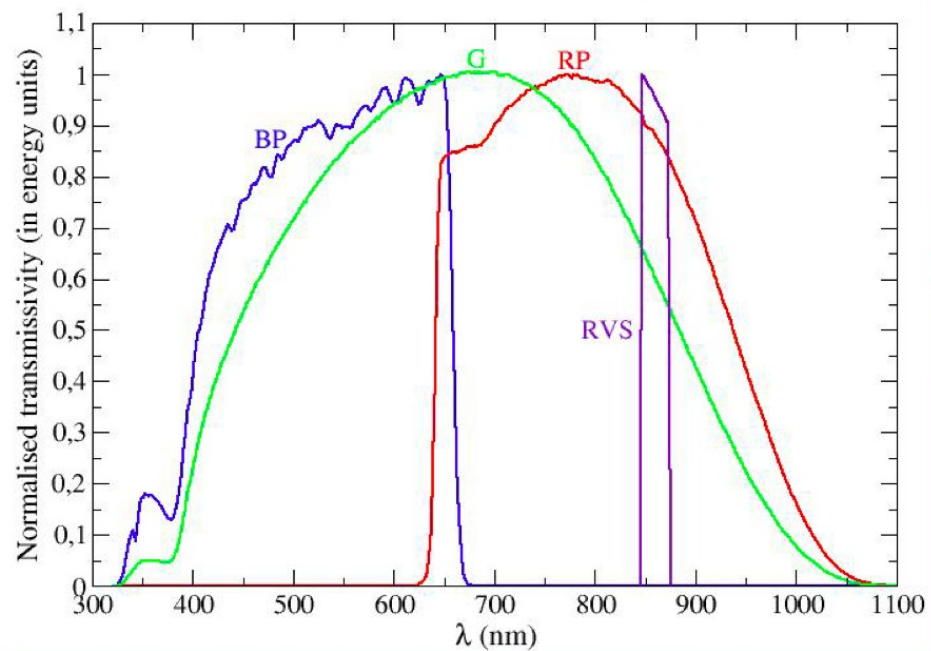
	Hipparcos	Gaia
Magnitude limit	H = 12.4	G = 20.0
No. sources	120 000	~ 1 000 000 000
quasars	0	~ 0.5 million
galaxies	0	~ 5 million
Astrometric accuracy*	~ 1000 μ as	9-26 μ as at G=15
		100-330 μ as at G=20
Photometry	2 bands	spectrophot. 330-1000 nm
Radial velocities*	none	1-13 km/s to G=17
Target selection	input catalogue	real-time onboard selection

*for 72 observations (i.e. average end-of-mission accuracy)

GAIA Data releases

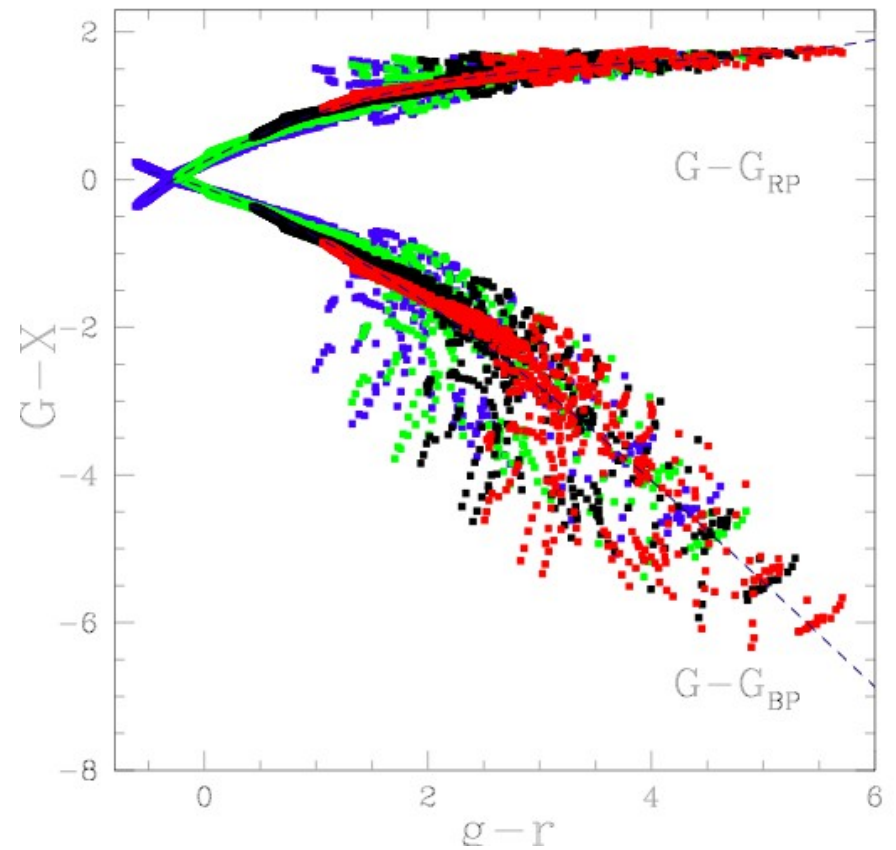
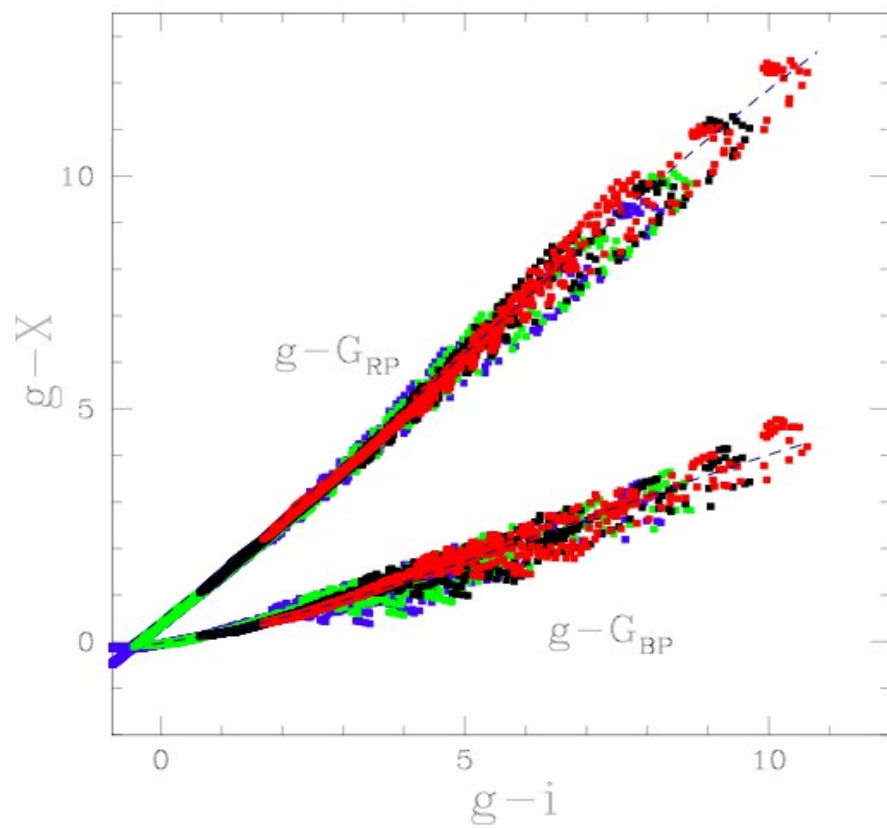
- ★ science operations start: L + 6m
- ★ data releases expected: L + 22m, 28m, 40m, 65m
- ★ end of operations: L + 60m (2019)
- ★ final catalogue: end of operations + 36m
- Data policy: no proprietary period; DPAC does no “astrophysics”

GAIA filter bands



Colour transformations for SDSS system

Jordi et al. (2010)



Link between GAIA and NSLS

Limited overlap in the magnitude range between GAIA and NSLS (2-3 magnitudes?)

Depending on the saturation limit of NSLS



Important parameter

Possible interactions with GAIA

At the faint end of GAIA complementary observations with NSLS

Metallicity maps of thick disc and halo

Is the transition between thin disc and thick disc in metallicity abrupt or continuous ?

Is there a large-scale metallicity gradient in the thick disc and halo ?

Does the disc scale length depend on metallicity ?

Is there an interaction between thick disc and halo ?



Important for all models of Galaxy formation and evolution

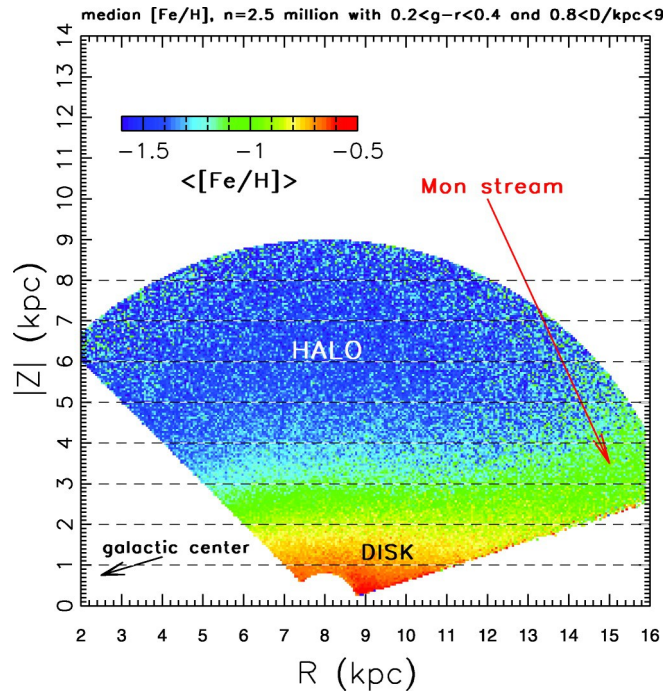
Some important questions and issues

- What is the saturation limit in each filter and therefore the magnitude overlap with GAIA ?
- How deep can we perform a proper star/galaxy separation ?
- Proper motions with a few fields of CFHTLS ?



Large baseline > 10 years !

SDSS -DR8 (Ivecic et al. 2008)



BUT : to trust in photometric metallicities and distances they need to be calibrated and validated with respect to GAIA

In the overlapping magnitude regime between GAIA and NSLS one can calibrate distances and metallicities and apply them to the full NSLS fields covering a much larger distance range

Searching for metal-poor « first stars »

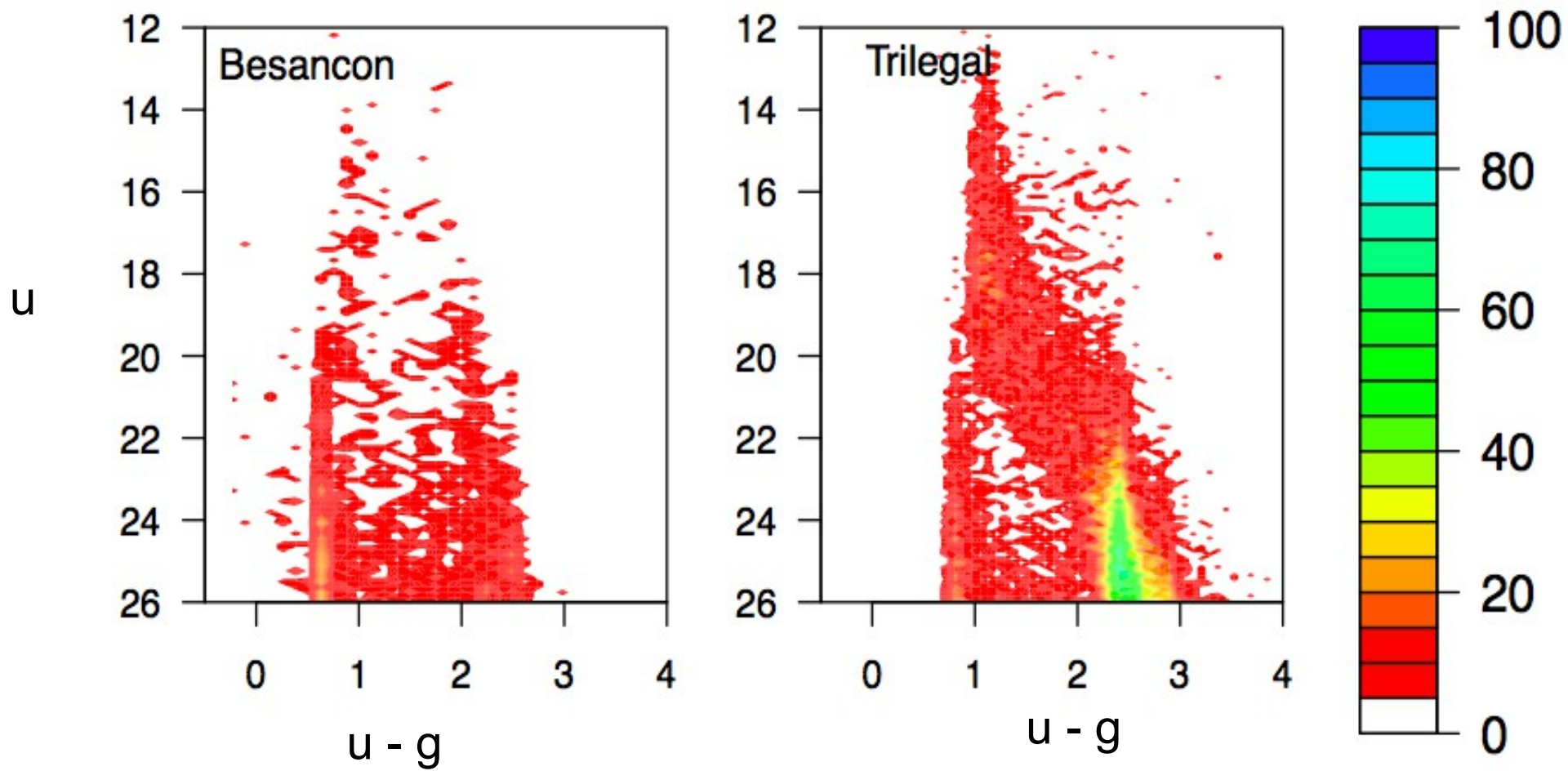
- Important for star formation history and chemical evolution
Of our Galaxy
- Galactic Archaeology (Gaia-ESO survey)
- See talk by N. Martin

Some important questions and issues

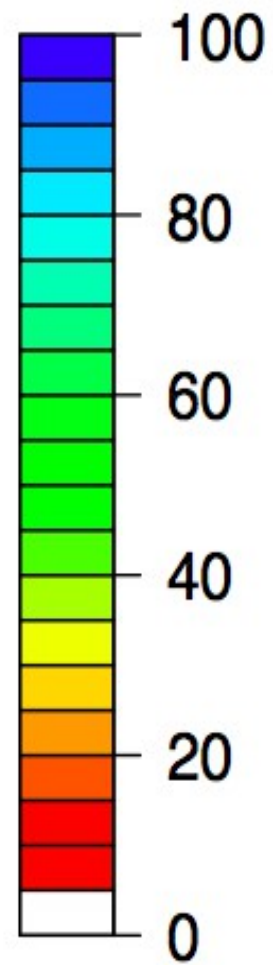
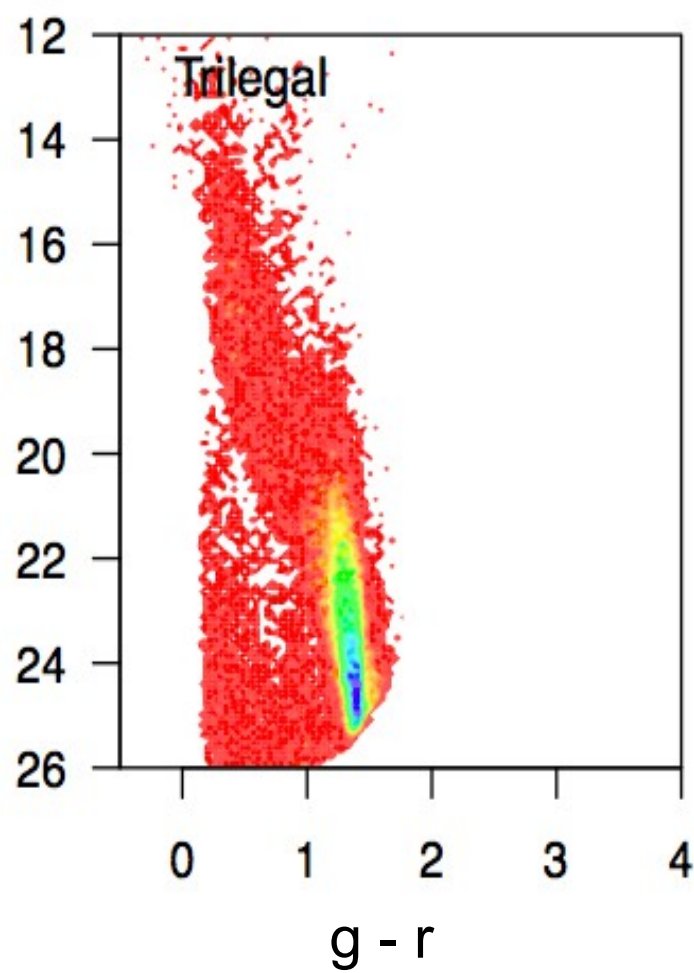
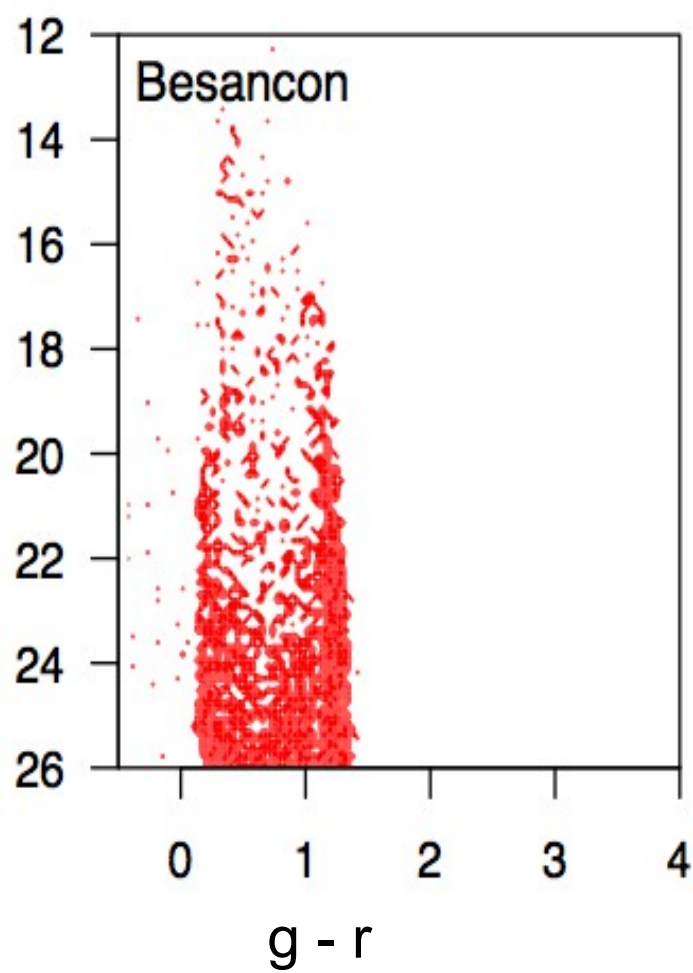
- What is the saturation limit in each filter and therefore the magnitude overlap with GAIA ?
- How deep can we perform a proper star/galaxy separation ?
- Proper motions ? see E. Bertin's talk



Large baseline > 10 years !



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