Gaia Errors

1. Gaia Error Model (astrometry, photometry, spectroscopy)
2. Code to simulate Gaia errors: public in github
3. Simulating Gaia data: GOG (Gaia Object Generation)
4. Gaia intermediate releases and TGAS solution:
    - Errors expected
    - Simulated catalogue (BGM)
5. **Tutorial example:**
    - **Young Local Associations (YLA)**

The Young Local Associations

A Gaia Challenge?

The Young Local Associations

Index:

1. What are they?
2. YLA as seen by Hipparcos
3. YLA as seen by TGAS and Gaia data releases
4. Additional on-ground data needed?
5. Modeling YLA: origin and evolution
   YLA as a Gaia Challenge?

YLA, what are they?

Several groups of young (mainly low-mass) stars in the solar neighborhood (r<100pc)

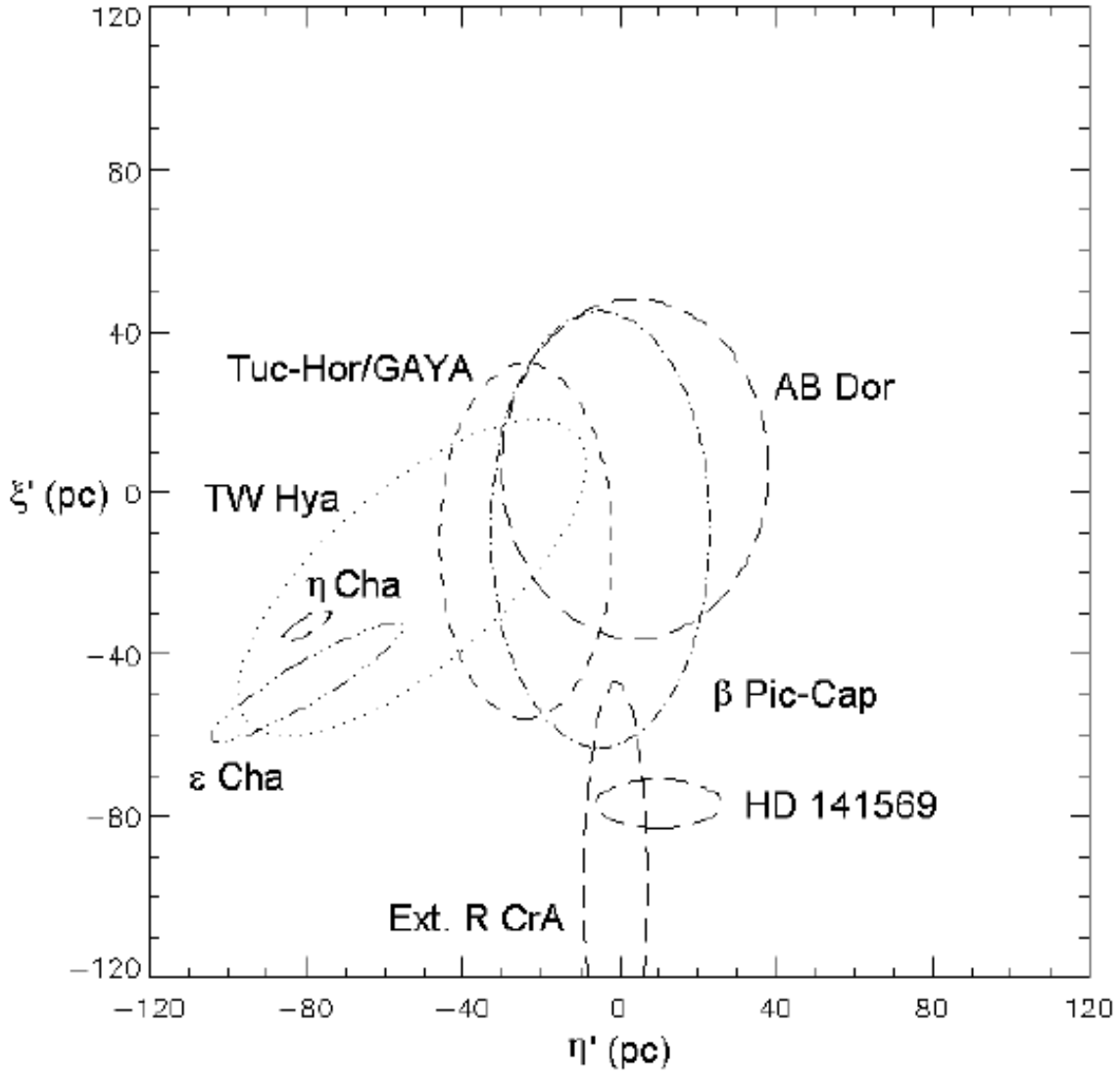
Groups: They share common properties when looking at the X-ray, optical spectroscopy and kinematics data

Very young: spectroscopic ages between 10 – 100 Myr

Local: precise data

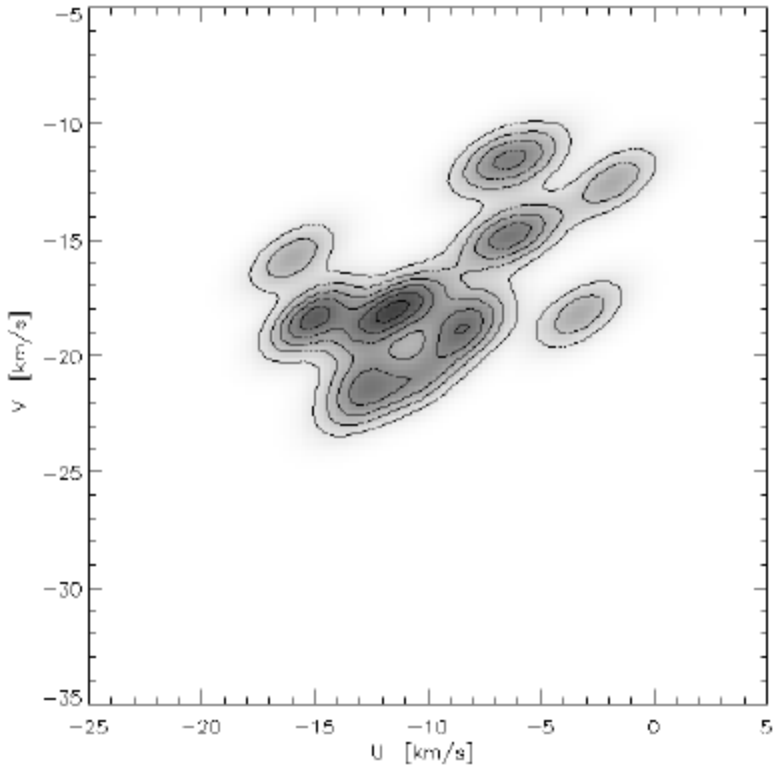
Why Important?
They offer us new insights into the star formation process in the solar neighborhood (low-density environments)

YLA: location in the Solar Neighborhood

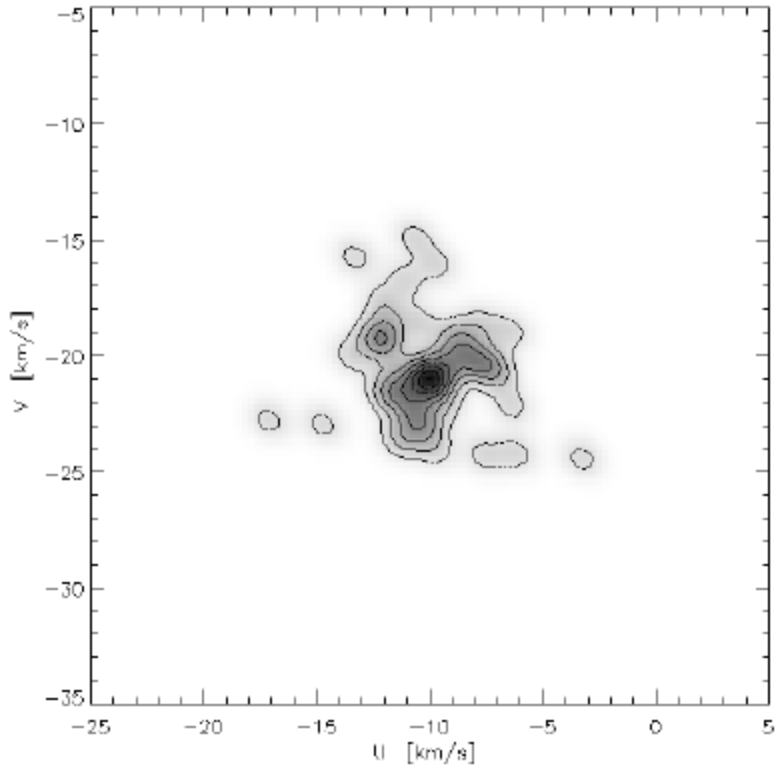


Fernández et al., 2008

YLA: kinematics from Hipparcos data



TW HYA



Tuc-Hor/GAYA

Fernández et al., 2008

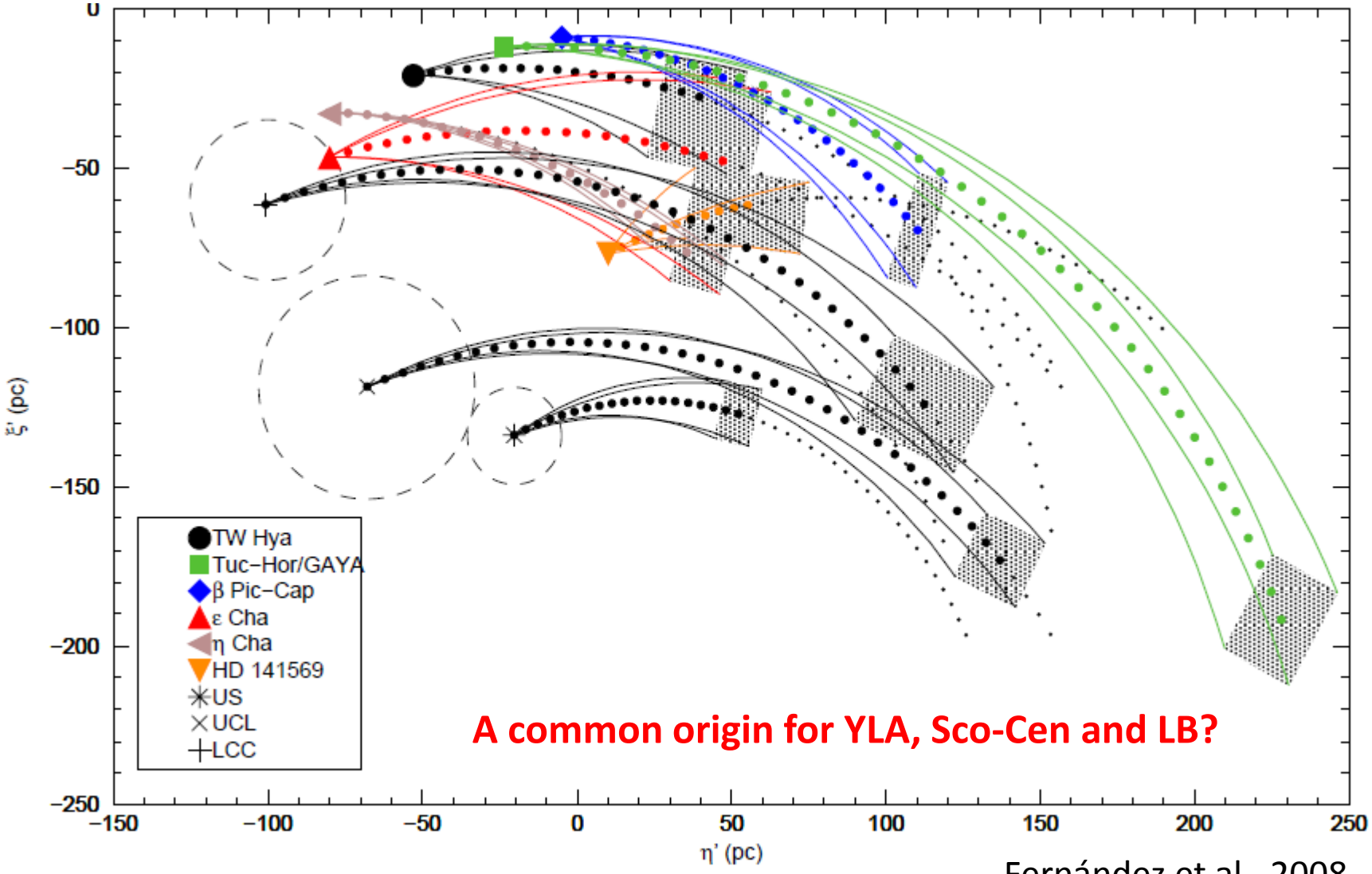
YLA: estimated ages

Association	Estimated age	Method
TW Hya	10^{+10}_{-5} Myr	Spectroscopy + HR diagram (BVI)
	~ 8 Myr	HR diagram (JHK)
	5-15 Myr	HD diagram (IR)
	8.3 Myr	Expansion age
	4.7 ± 0.6 Myr	Expansion age
	20^{+25}_{-7} Myr	Expansion age
	8.3 ± 0.8 Myr	Dynamical age
	10^{+10}_{-7} Myr	Spec. + HR diagram (VIJK) + Li + Hα
AB Dor	~ 50 Myr	Hα emission
	75-150 Myr	HR diagram (VK)
	30-50 Myr and 80-120 Myr (2 subgroups)	HR diagram (VI) + Li
	38 Myr	Dynamical age
	118 ± 20 Myr	Dynamical age

Fernández et al., 2008

Spectroscopy HR diagram **?** **Expansion Dynamical**

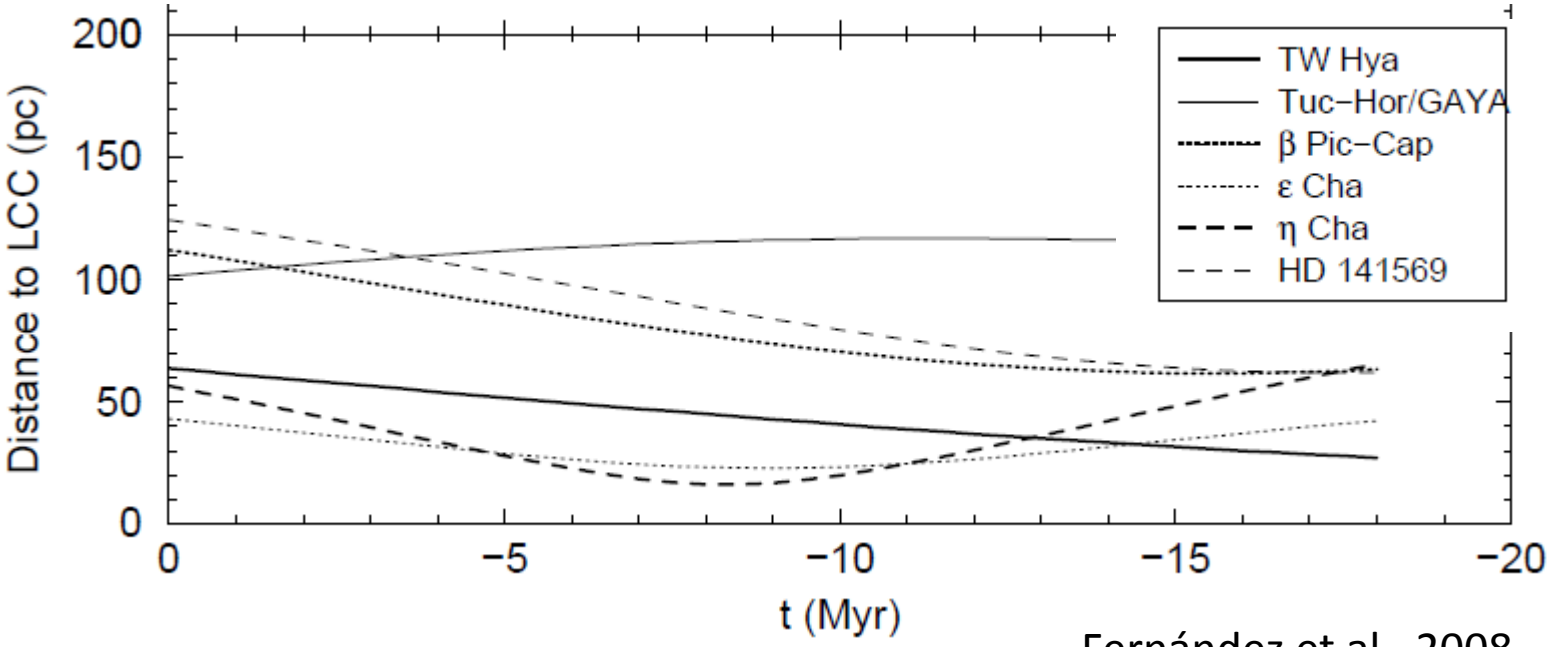
YLA as seen by Hipparcos, kinematic evolution



Fernández et al., 2008

Positions and orbits of YLA and Sco-Cen complex going back in time to their age

YLA as seen by Hipparcos, kinematic evolution



Fernández et al., 2008

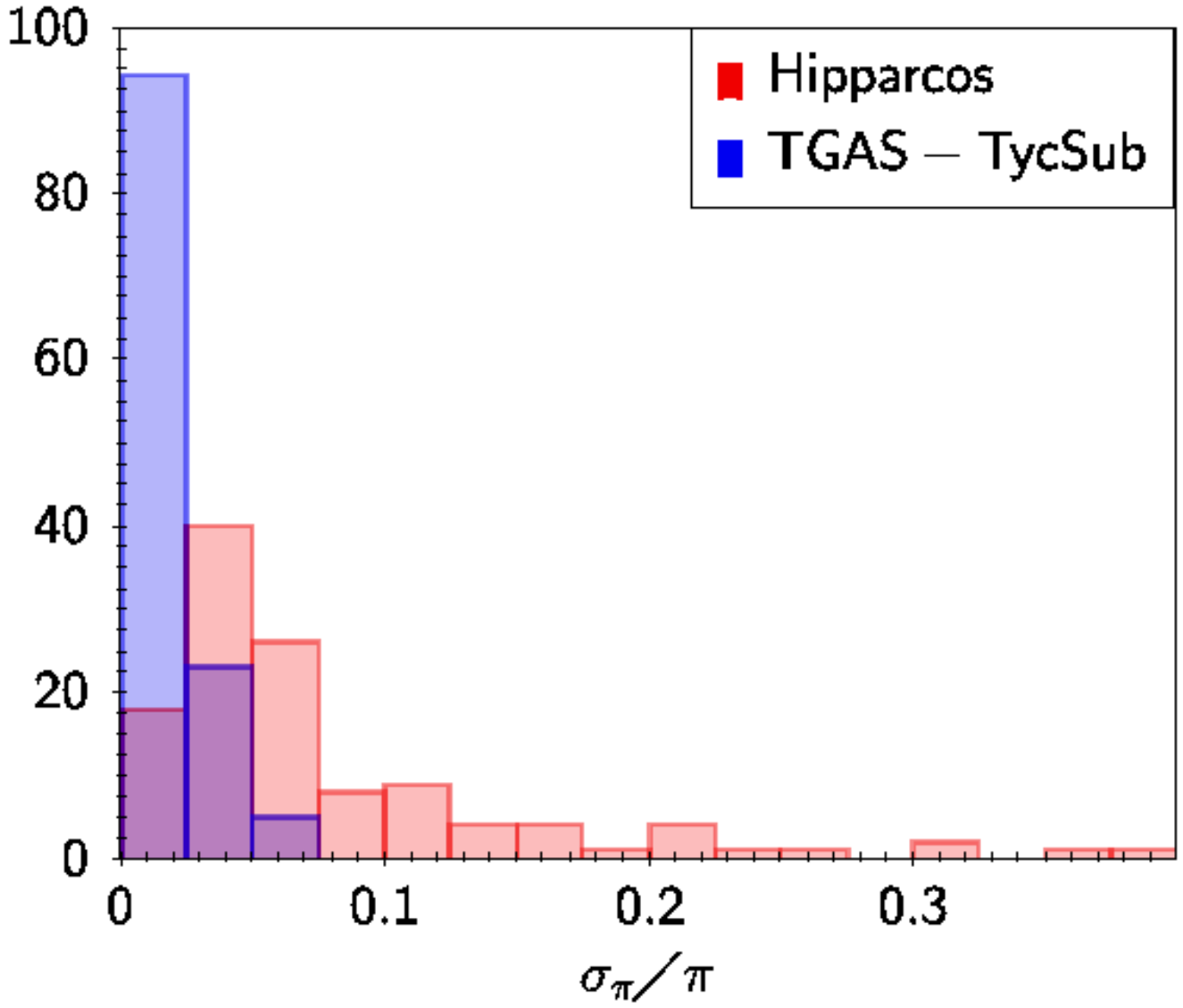
Distances between the centres of the YLA and the centre of LCC Sco-Cen association as a function of time

Observational errors in parallax and velocities makes the study unfinished

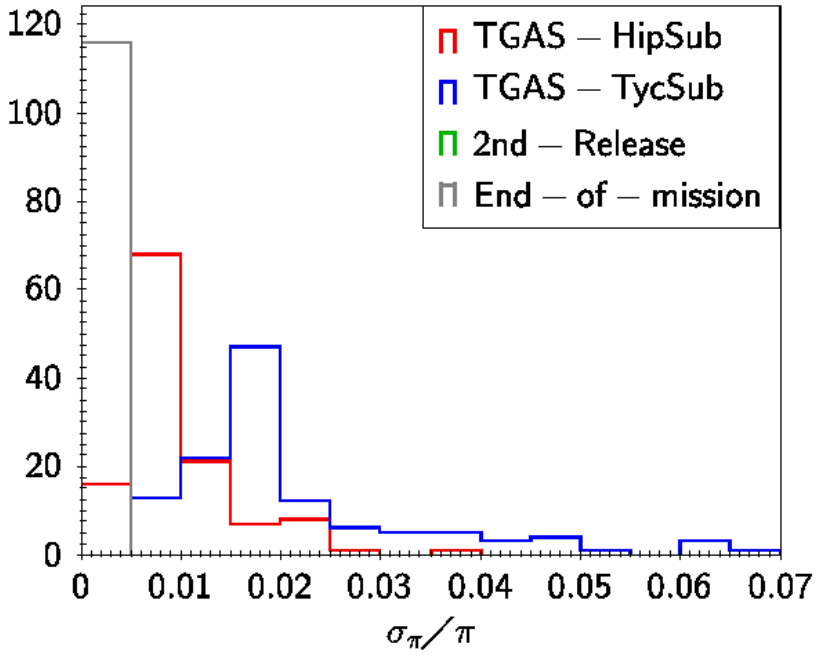
YLA as seen by **TGAS**

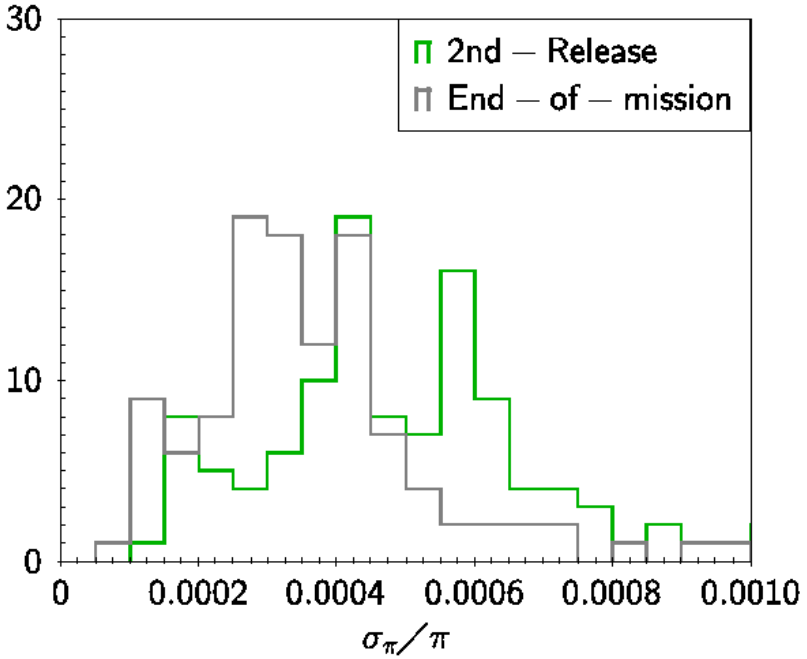
YLA as seen by **Gaia**

YLA expected distance accuracy

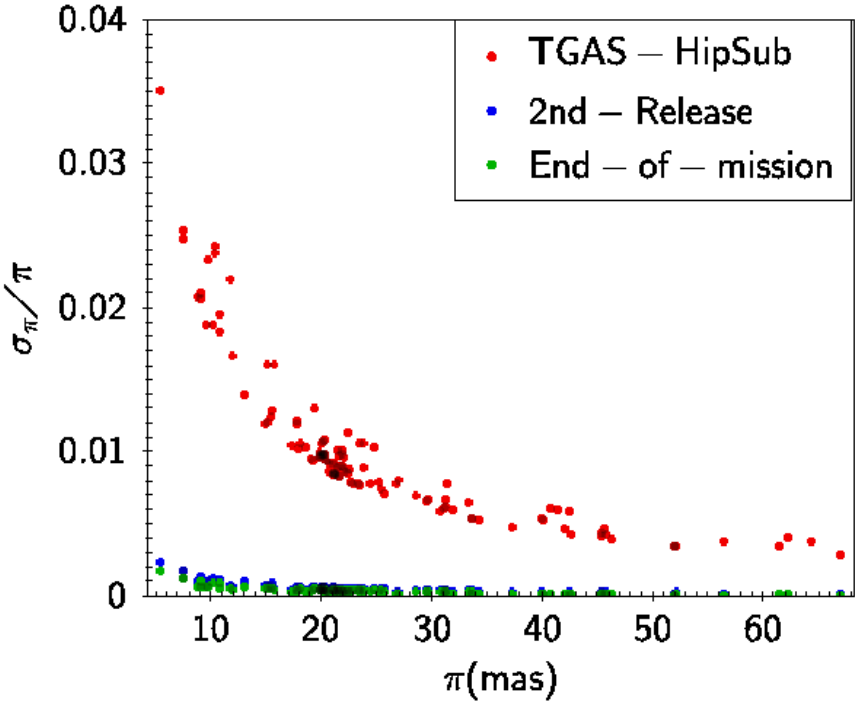


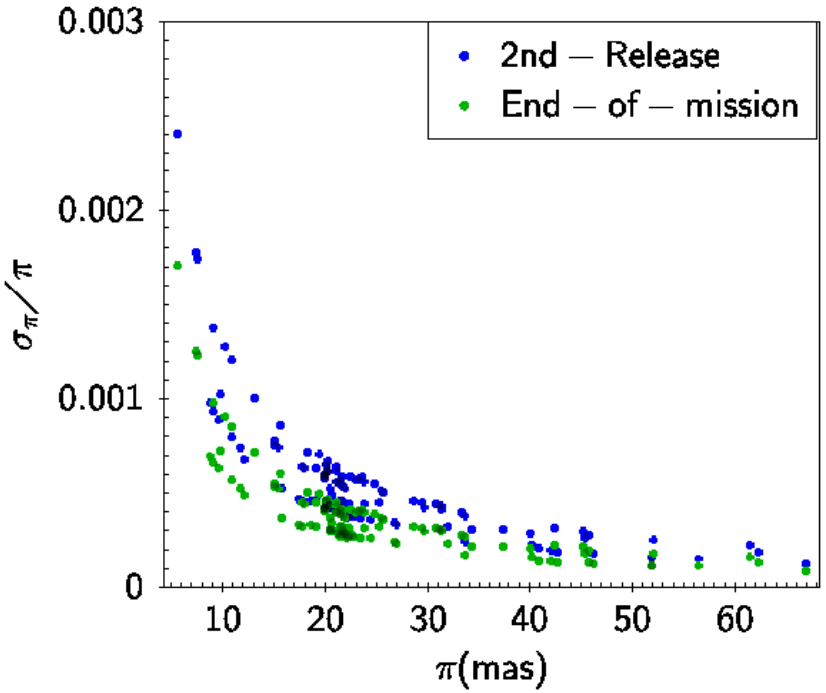
YLA expected distance accuracy



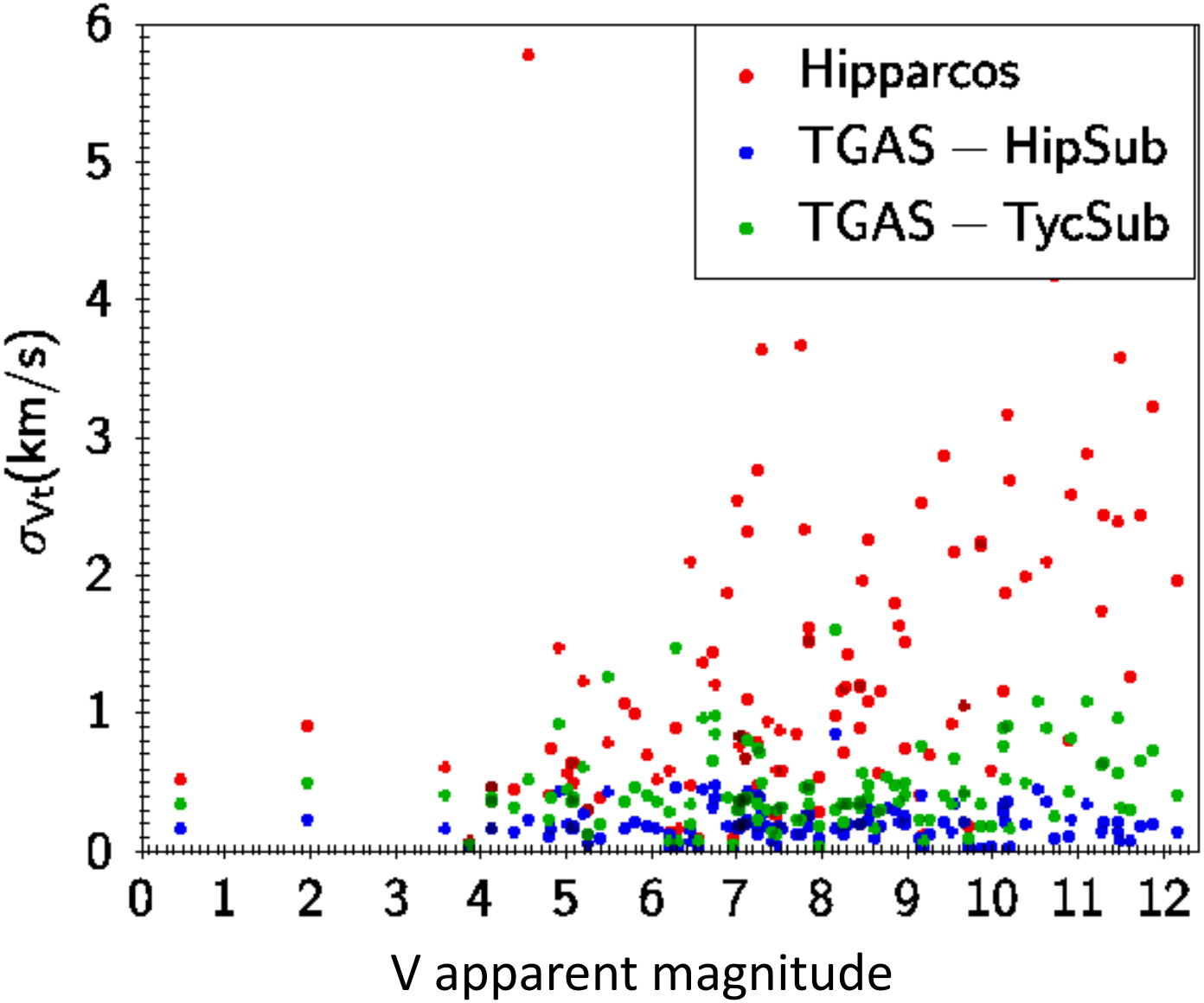


YLA expected distance accuracy

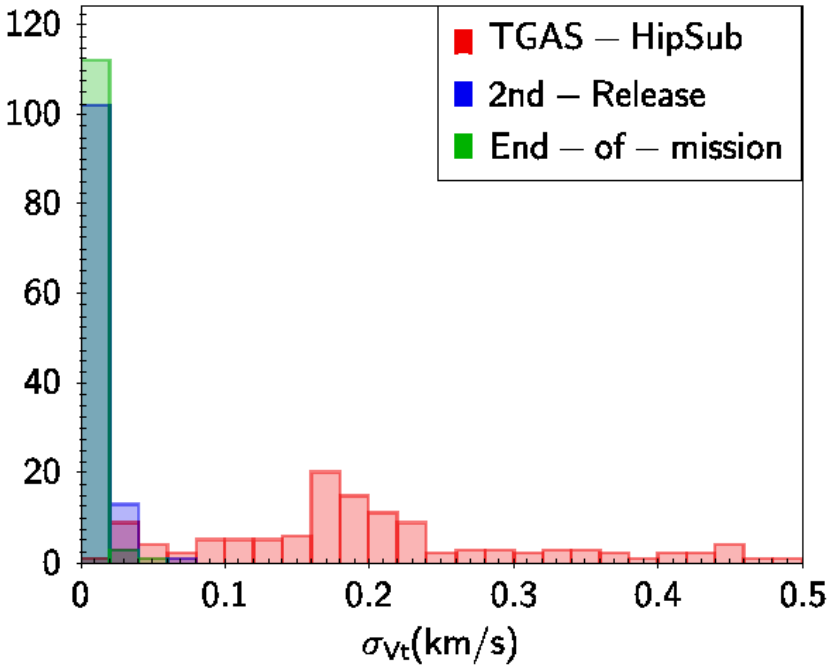


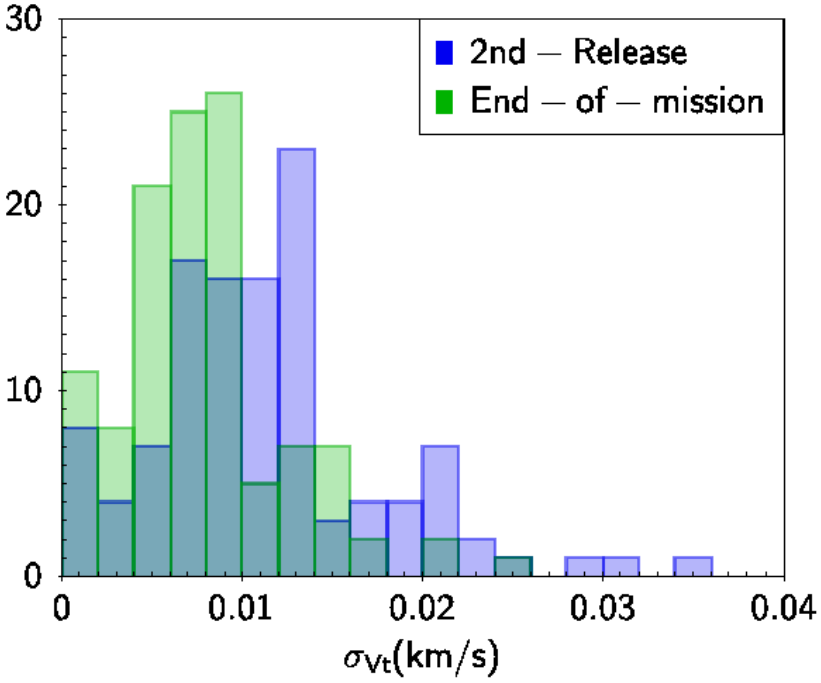


YLA expected accuracy in tangential velocities

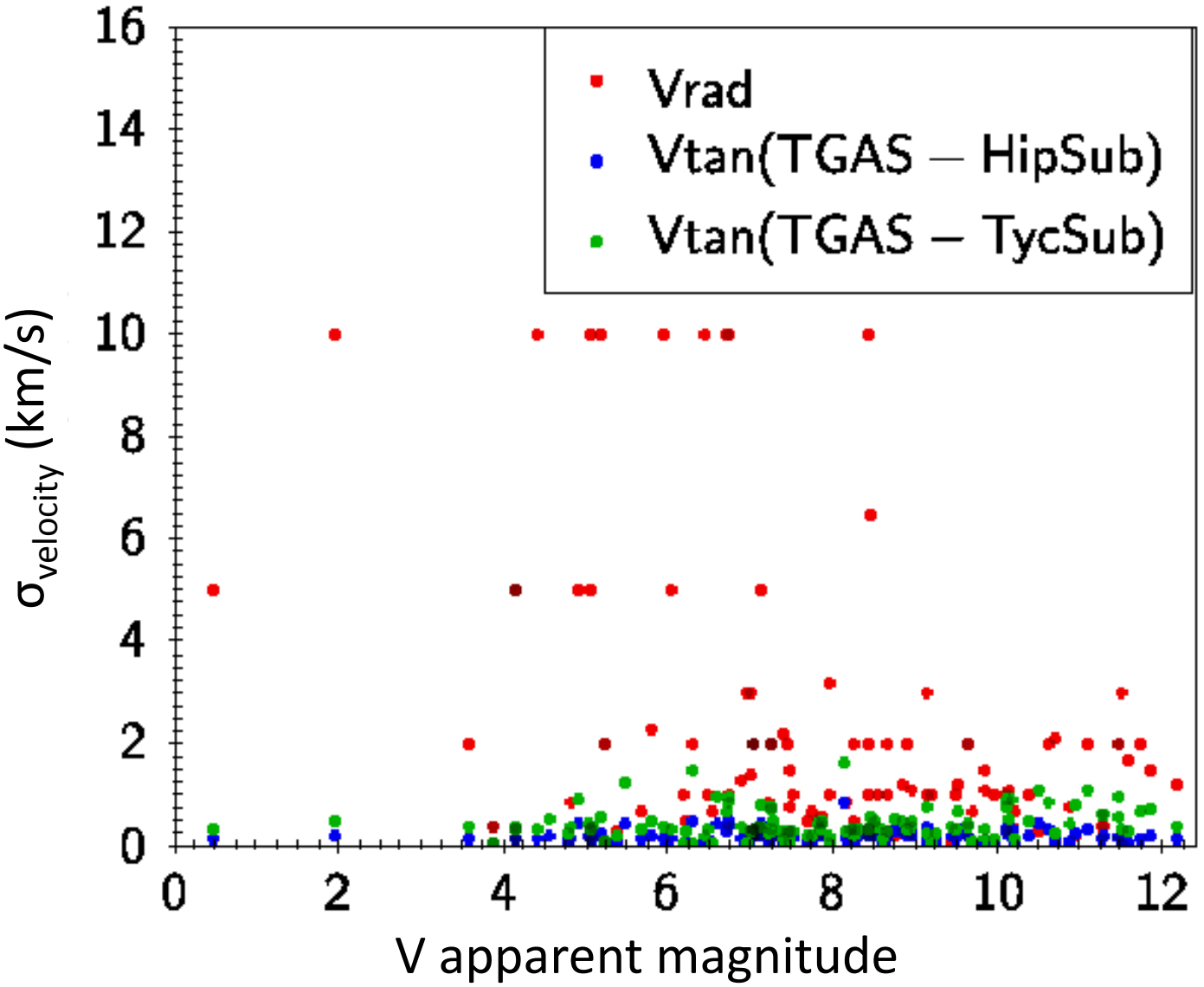


YLA expected accuracy in tangential velocities





YLA at present accuracy in radial velocities



Modeling YLA: origin and evolution

Proposal:

Real Data (TGAS, 1sr release):
Orbit integration back in time

Derivation of a dynamical age for each association. Do they match with HR ages?

Centers of the associations back in time, common origin?

Simulated Data / Modeling:
Origin and evolution?
Star formation in low density environments

Linked to spiral arms' shock wave?

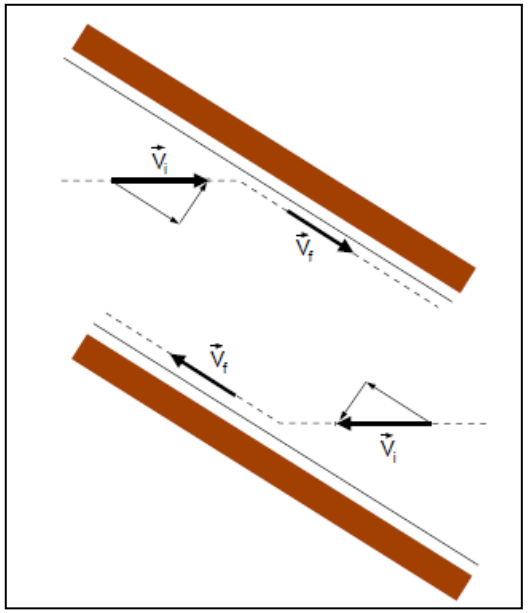
In or out of the corotation radius?

N-bodies? Test-particles? Galactic potential?

Triggered star formation?

Molecular cloud compression?

Accurate data requires accurate modelling



Fernández et al., 2008