Highlights of the LAMOST survey

刘超 (NAOC)
Outlines

• Current status of LAMOST survey
• Highlights of science works
• Summary
Big questions

• How is the Milky Way assembled? How does it evolve?
  • Disk: structure; kinematics; chemo-dynamics; thick disk; outskirt region; mass distribution;
  • Halo: total mass, anisotropy, substructure; extremely metal-poor stars; hypervelocity stars
• From MW to general galaxies, how does a galaxy form and evolve in the universe? Is our Galaxy special?
Pilot Survey
2011.10-2012.6
PDR: 2012.8

Regular survey
1st year: 2012.9-2013.6
DR1 (2013.9) public
2nd year: 2013.9-2014.6
DR2 (2014.12)
3rd year: 2014.9-2015.6
DR3 (2015.12)

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### DR3 (-2015.06) +1.5 mil/1 mil
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DR1 (-2013-06)

DR2 (2014-06)
Publications

• ~100 paper have been published and 20+ on the way

• RAA special issue 12 (2012): 7 mostly survey designs and scientific plans, 3 of them have awarded the most cited papers by RAA (citation 100+)

• RAA special issue 15 (2015): 20+ mostly scientific results
The highlight works

• The bulk motions in the Galactic disk (Carlin et al. 2013 ApJL)
• The first hypervelocity star (Zheng et al. 2014 ApJL)
• The local velocity structures (Xia et al. 2015 MNRAS)
• Local stellar kinematics (Tian et al. 2015 ApJ)
• Local dark matter density (Xia et al. submitted to MNRAS)
• Radial migration in the solar neighborhood (Liu et al. submitted to ApJ)
• A disrupted globular cluster (Vickers & Smith submitted to ApJL)
And some relevant works

• The latest catalog for the early type emission line stars (Hou et al. submitted)

• The pre-main sequence group co-moving with Taurus (Fang et al. submitted)

• The open cluster membership from LAMOST (Zhang et al. RAA)
Bulk motions in the Galactic disk

Bulk motions in the Galactic disk

Bulk motions in the Galactic disk

Hypervelocity stars

Velocity substructure

Dehnen 1998

Hipparcos

V_\Phi

V_R

Xia, CL et al. 2015

LAMOST

MNRAS

Teff as the age proxy
Local dark matter density
Xia, CL et al. ArXiv:1510.06810
New evidence for radial migration

CL et al. ArXiv:1510.06123
New evidence for radial migration

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CL et al. ArXiv:1510.06123

Time machine!
New evidence for radial migration

CL et al. ArXiv:1510.06123

Median
VR=2.6+/−1.8 km/s

Time machine!

Narrow stripe
slope=1.1±0.1 kpc Gyr−1

Main sample
slope=−0.3±0.1 kpc Gyr−1

1.1 km/s
A new disrupted globular cluster

Vickers & Smith submitted to ApJL
Early-type emission line stars

- Hou et al. submitted to RAA
- 10395 early-type Hα emission stars from LAMOST DR2
  - single-peak emission
  - single-peak emission in absorption line
  - double-peak emission
  - double-peak emission in absorption line
  - P-Cygni profile
- Classical Be, Herbig Ae/Be and binary systems
pre-main sequence group

Fang, CL et al. to be submitted
pre-main sequence group

Fang, CL et al. to be submitted
Cluster membership

Kernel Smoothed Distribution

Fitted Membership Probability Distribution
Cluster membership

2189 candidate members of 24 clusters are identified.
Summary

• LAMOST science is blooming from this year

• It is never late to actively get involved in the LAMOST survey in such ways:
  • Use the data to do science
  • Propose add-on targets
  • Collaborate with LAMOST people