Structures of the MW luminous and dark halos revealed from Subaru/HSC survey

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Subaru Strategic Program (SSP) with Hyper Suprime-Cam (HSC)

- MW science from the wide-layer data
  S17A: ~ 580 deg² / 1,400 deg² (goal)

  1) Searches for new MW dSphs
  2) Halo mapping with BHBs
  3) Searches for new stellar streams

FOV: 1.77 sq deg
(1.5 deg diameter)
Filters: grizy
(1) New MW dSphs with HSC

**Virgo I**
- $M_V = -0.33$ mag (!)
- $D = 87$ kpc

**Cetus III**
- $M_V = -2.45$ mag
- $D = 251$ kpc (!)

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Expected number of dSphs in HSC-SSP based on $\Lambda$CDM (over $\sim 1,400$ deg$^2$)

\[ N = 9^{+15}_{-5} \@ M_V < 0.0 \]

HSC-wide survey over $\sim 580$ deg$^2$
\[ \Rightarrow 4^{+6}_{-2} \text{ UFDs} @ M_V < 0.0 \text{ predicted} \]
\[ \Rightarrow 3 \text{ new} + 2 \text{ known UFDs identified} \]

So far it’s consistent with $\Lambda$CDM prediction!

One more found (paper in prep.)

Error from Abundance matching

Dooley+ 2016

So far it’s consistent with $\Lambda$CDM prediction!
Halo mapping with BHBs

BHBs as stellar halo tracers

- BHBs are selected with color cuts in \(g-r\) vs. \(i-z\) and \(g-r\) vs. \(g-z\) space.

\[\Rightarrow 442\] BHB candidates from HSC-Wide s16a data (a lot more from updated data)

- Selection accuracy (using Sextans)
  - completeness \(\sim 67\%\), purity \(\sim 62\%\)


arXiv:1711.10701

see also Deason et al. 2018
Maximum Likelihood results

Halo structure over 50~300 kpc
- single power-law
  $\alpha \sim 3.5$, $q \sim 1.3$ (prolate)
  $\alpha$ : power-law index
  $q$ : axial ratio
- broken power-law
  power-law indices change steeper at $\sim 200$ kpc
  ($\alpha$ changes from 3.2 to 5.3)

a signature of halo boundary?
⇒ work underway with newly released data (s18a)
HSC survey of MW dSphs

Papers in prep.

NB-selected RGBs

Ursa Minor

HSC survey of M31’s halo

Komiyama, MC et al. 2018

RC stars in the NW stream

Draco

All stars

Work in progress

Work in progress for wide-field survey

Deep survey
Next: PFS
(Prime Focus Spectrograph)

FOV: 1.3 deg in diameter
2400 fiber positioners
λ: 380~1,300 nm
(3 channels: Blue, Red, IR)
R: ~3,000 (LR) 5,000 (MR)
Commissioning: 2019~

Three science modes
- Cosmology
- Extra-galaxies & IGM
- Galactic archaeology
  - MW halo/disk/dSphs, M31’s halo