Exploring the internal kinematics of Galactic Globular Cluster cores

Flash talk

Silvia Leanza
University of Bologna

MODEST24

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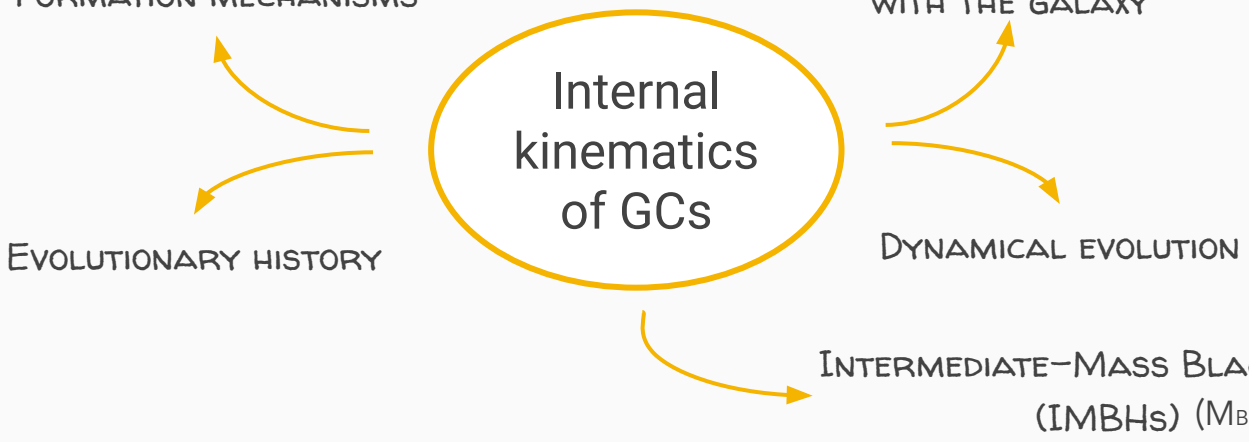
Exploring the internal kinematics of Galactic Globular Cluster cores



Extremely challenging in the high-density GC cores

Exploring the internal kinematics of Galactic Globular Cluster cores

MIKiS
Multi Instruments Kinematics Survey

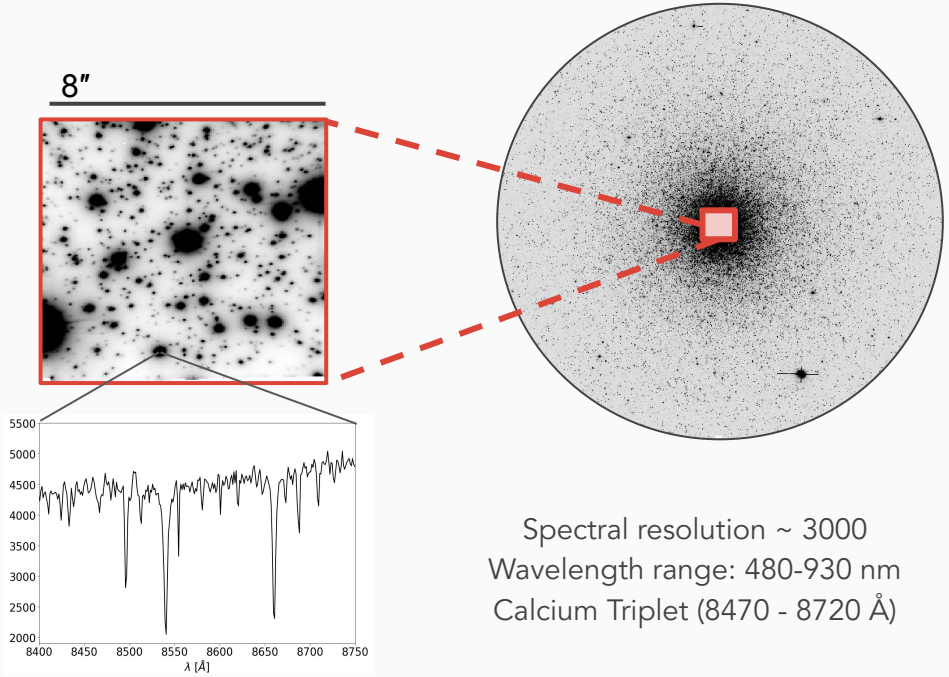
LOS velocities of resolved stars over over the entire cluster extension using a *multi-instrument approach*
(see *Ferraro et al 2018*)

To derive line-of-sight (LOS) velocity of *resolved stars* in the CORE REGIONS
($r < 10''$ from the center)

MUSE@VLT
Narrow Field Mode (NFM)

AO-assisted

FoV: 7.43" x 7.43"
Spatial sampling: 0.025"/pix
Spatial resolution (FWHM): 55 - 80 mas



Spectral resolution ~ 3000
Wavelength range: 480-930 nm
Calcium Triplet (8470 - 8720 Å)

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MIKiS
Multi Instruments Kinematics Survey

→ LOS velocities of resolved stars over over the entire cluster extension using a *multi-instrument approach*
(see *Ferraro et al 2018*)

MUSE multi unit spectroscopic explorer

To derive line-of-sight (LOS) velocity of *resolved stars* in the CORE REGIONS
($r < 10''$ from the center)

MUSE@VLT
Narrow Field Mode (NFM)

AO-assisted

FoV: 7.43" x 7.43"
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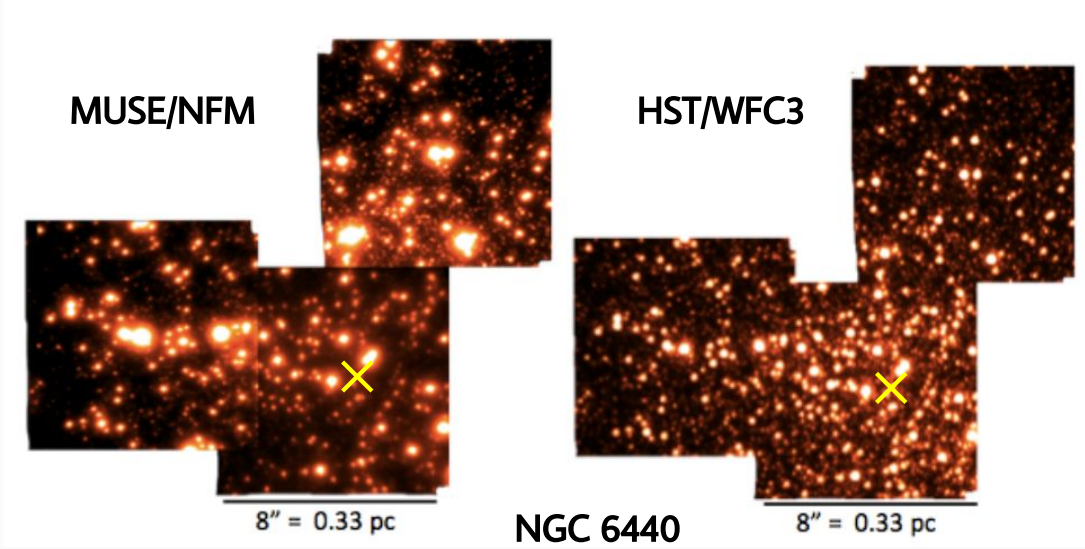
High-performance AO → *High spatial resolution*



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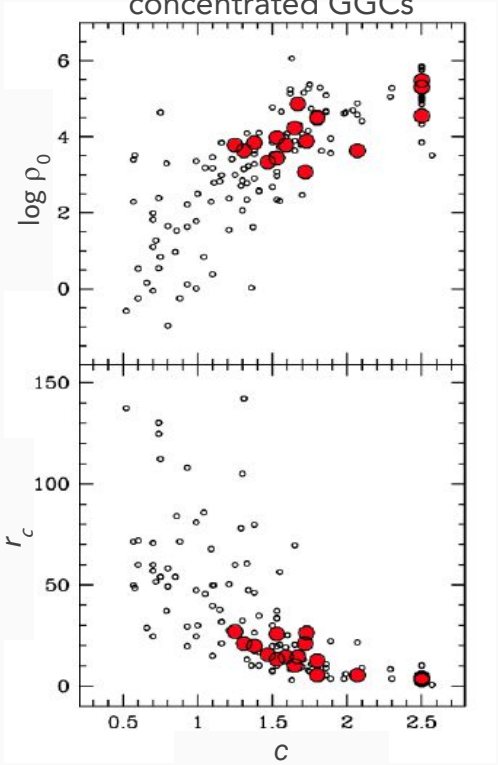
First Kinematics Survey of High-Density GC cores

MUSE/NFM ESO Large Programme:
Unveiling the core kinematics at sub-arcsec scale
(PI: Ferraro) – 145 hours

- ➔ Most sensitive to the internal dynamics
- ➔ Critically unexplored so far

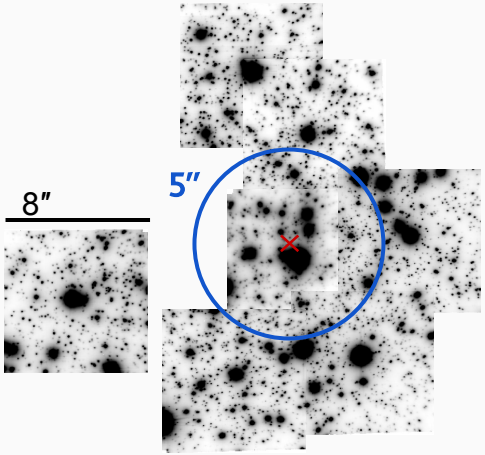
Highly dense and concentrated GGCs



Exploring the internal kinematics of Galactic Globular Cluster cores

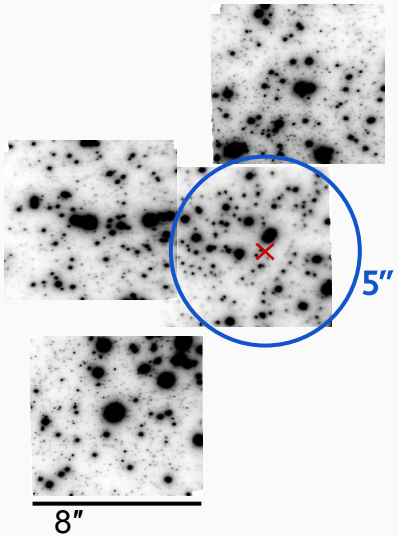
NGC 1904

$\log \rho_0 = 4.08\ L_\odot/pc^3$



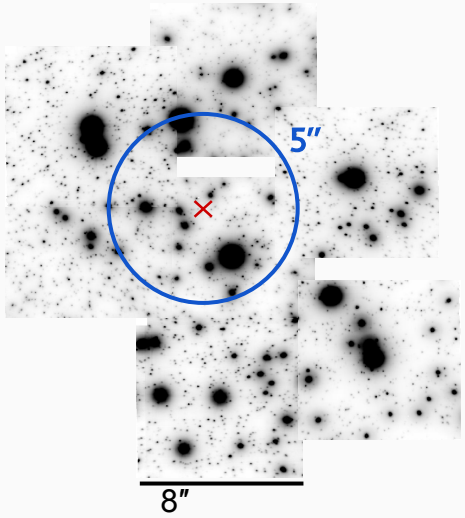
NGC 6440

$\log \rho_0 = 5.24\ L_\odot/pc^3$



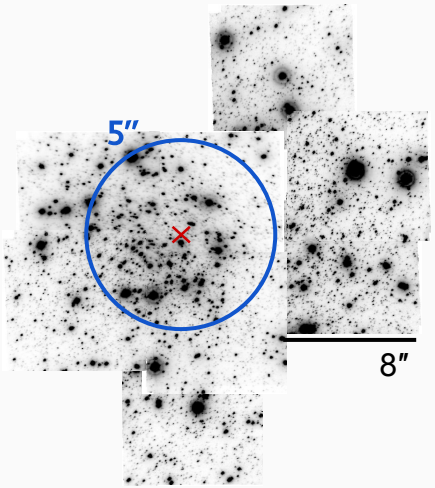
NGC 6569

$\log \rho_0 = 3.63\ L_\odot/pc^3$



M75

$\log \rho_0 = 4.51\ L_\odot/pc^3$



MUSE/NFM

Hundreds of LOS velocity measures of individual stars in the GC cores

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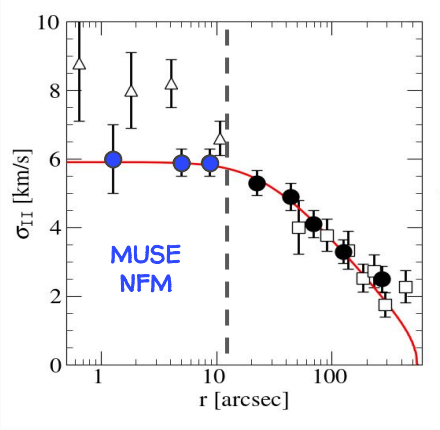
NGC 1904

Leanza et al. 2022, ApJ 929, 186



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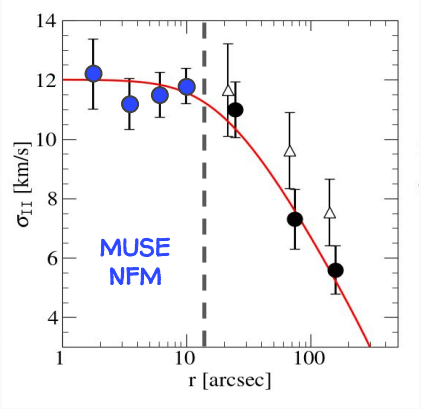
Leanza et al. 2023, ApJ 944, 162



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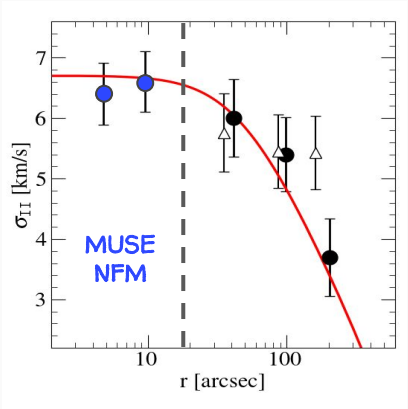
Pallanca, Leanza et al. 2023, ApJ 950, 138



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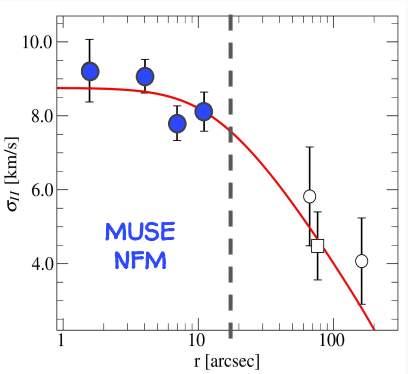
Leanza et al. 2024, A&A, 688, A133



- ➔ Significant improvements to LOS VD profiles in central regions
- ➔ MUSE/NFM + KMOS + FLAMES (*multi-instrument approach*) to sample the full velocity dispersion (VD) profile
- ➔ No evidence of massive IMHBs

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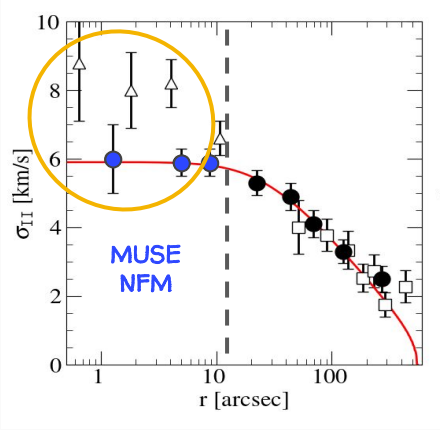

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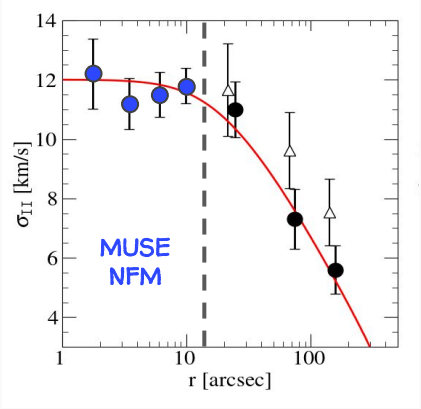

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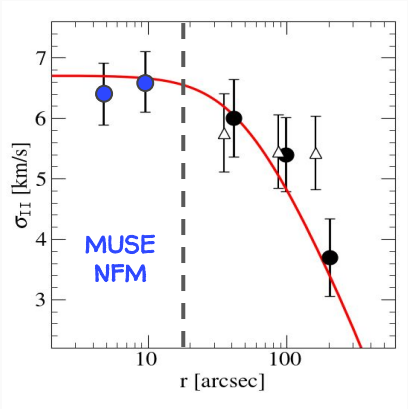

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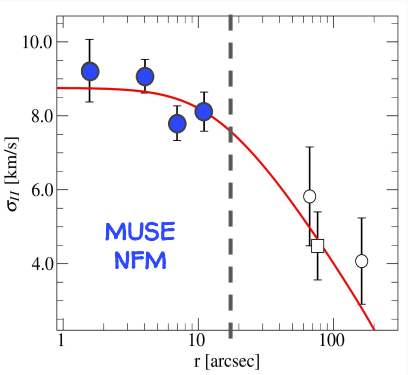

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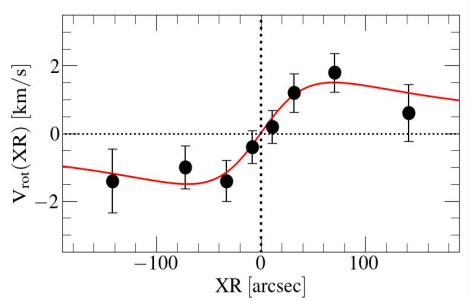

A_{peak} ~ 1.5 km/s

NGC 6440

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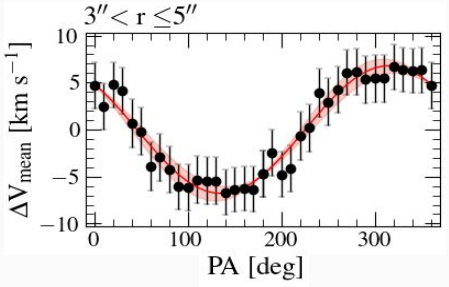
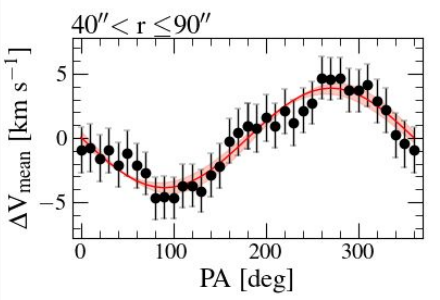


A_{peak} ~ 3.4 km/s

NGC 6569

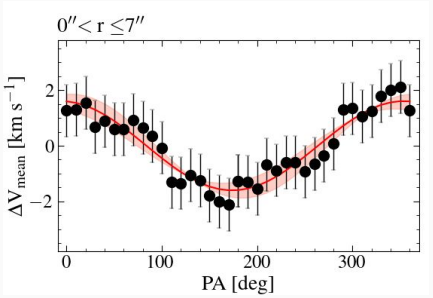
Pallanca, Leanza et al. 2023, ApJ 950, 138



A_{peak} ~ 1.9 km/s

M75

Leanza et al. 2024, A&A, 688, A133



A_{peak} ~ 1.0 km/s

➔ Evidence of internal rotation in each GC

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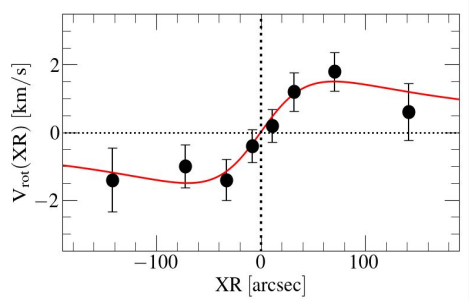

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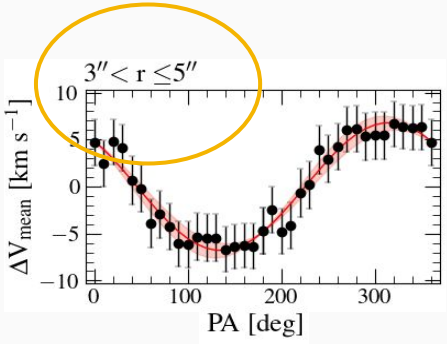

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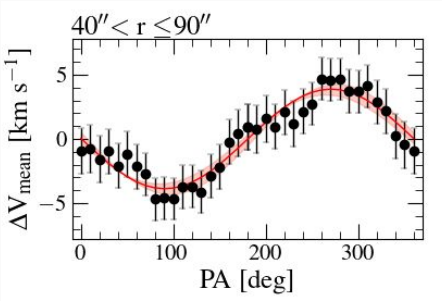

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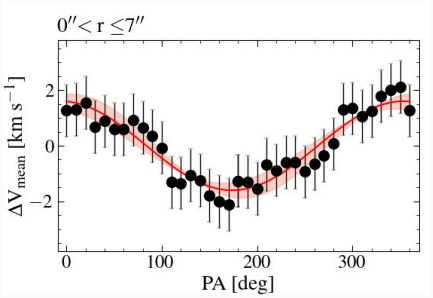

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Thanks

For more details scan here