

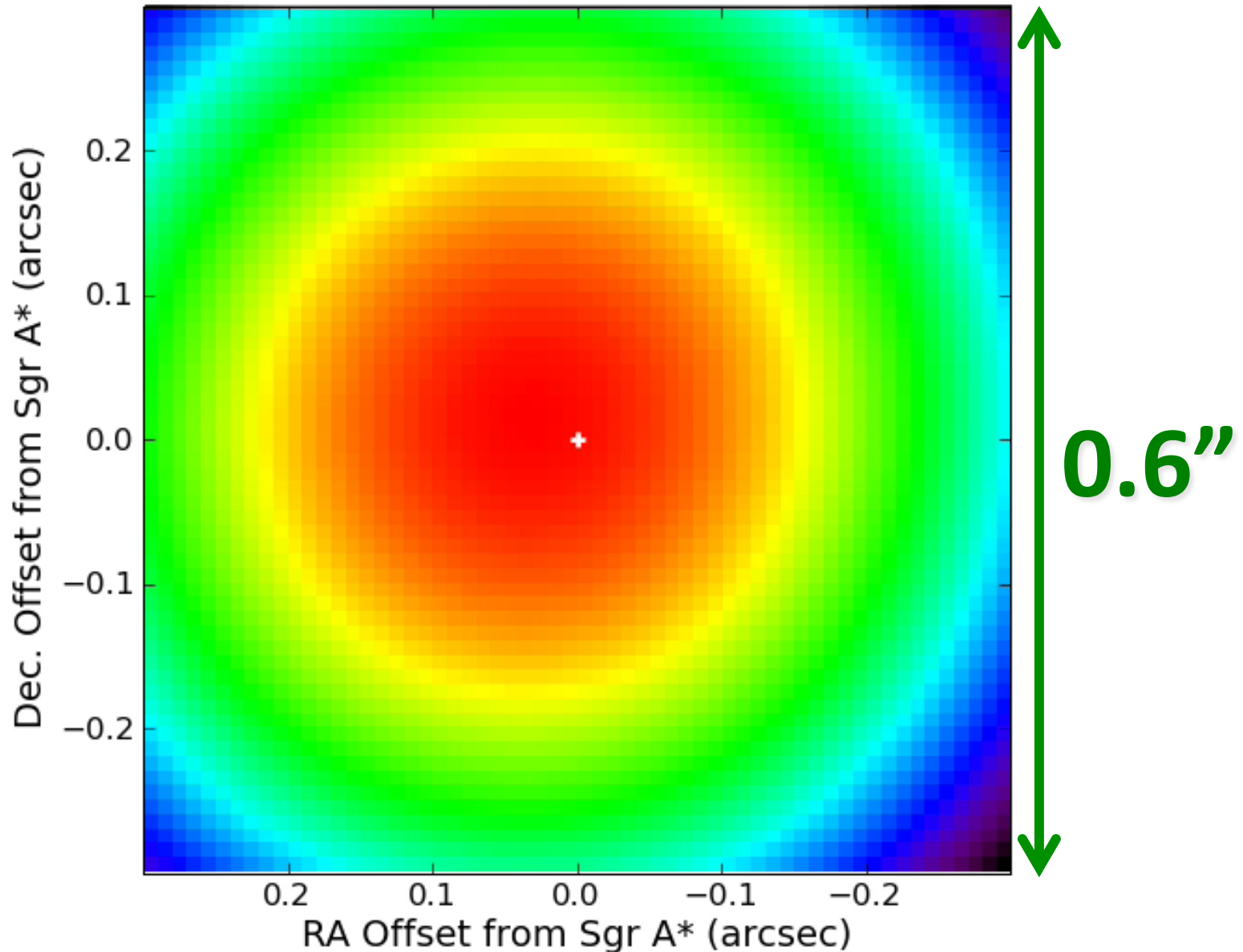
次世代AOの
サイエンスケース 2.
*Astrometry
at the Galactic center
with NGAO*

**Shogo Nishiyama
(NAOJ)**

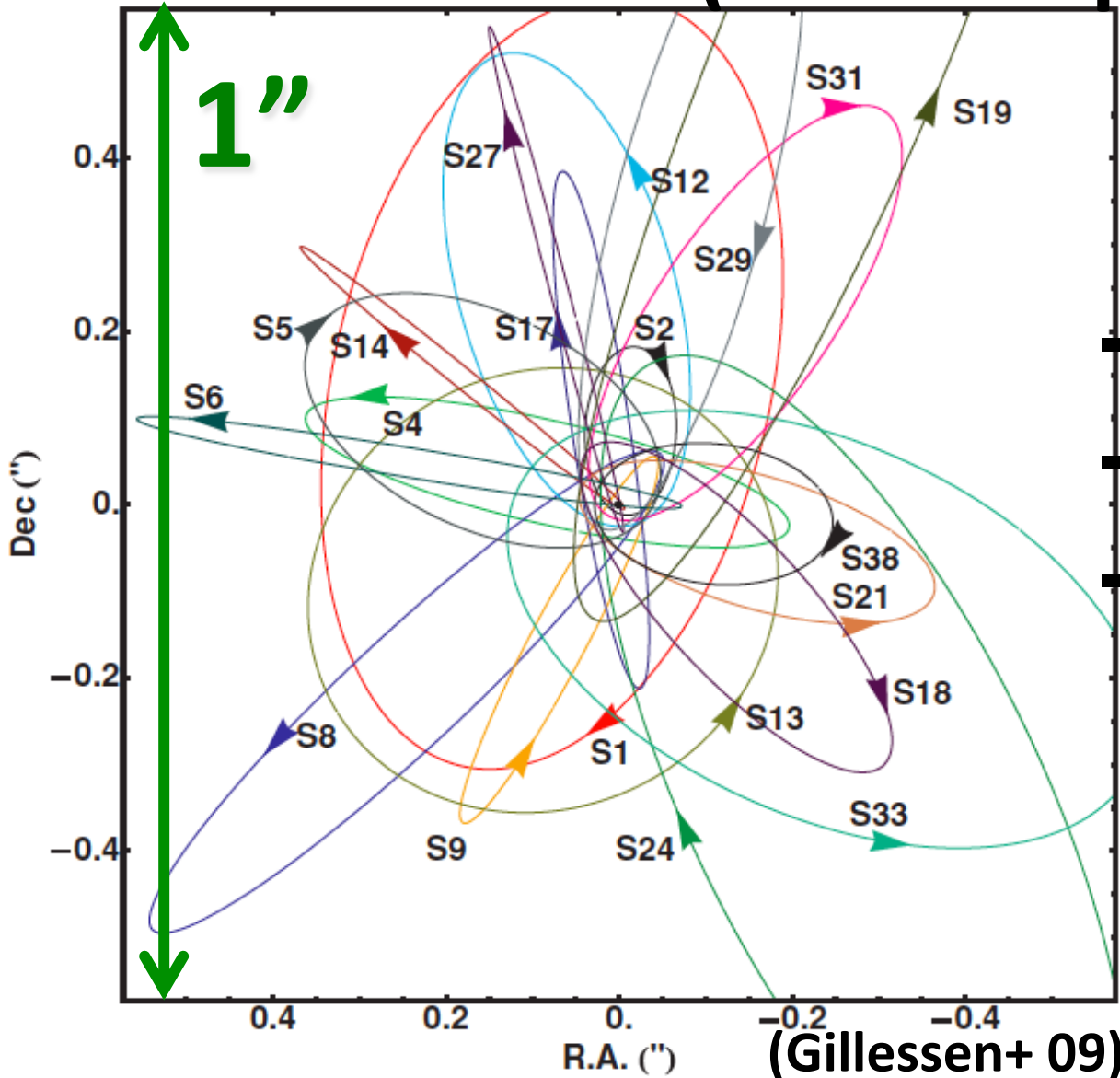
GC Astrometry with AO

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Seeing Limited



Orbits of S-Stars ($<1''=0.04\text{pc}$)



S-stars (BV)



- SMBH mass,
- distance
- density

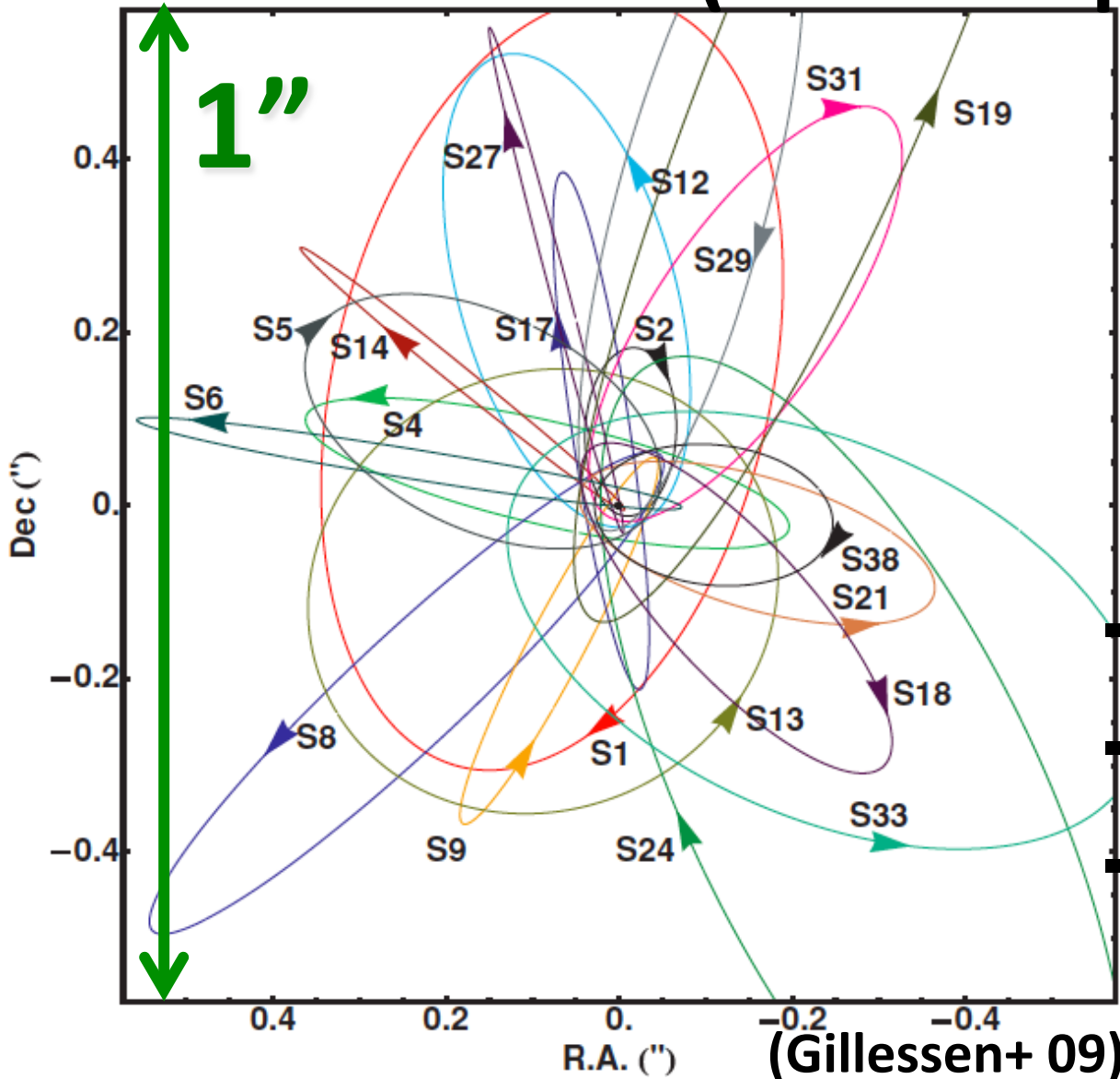
Astrometry at the Galactic center
with wide-field NIR camera & AO

- 1. Hypervelocity stars (HVS)**
- 2. Nuclear stellar cluster (NSC)**
- 3. Hidden cluster in/around NSC**

Hypervelocity Stars

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Orbits of S-Stars ($<1''=0.04\text{pc}$)



paradox
of
youth

S-stars (BV)

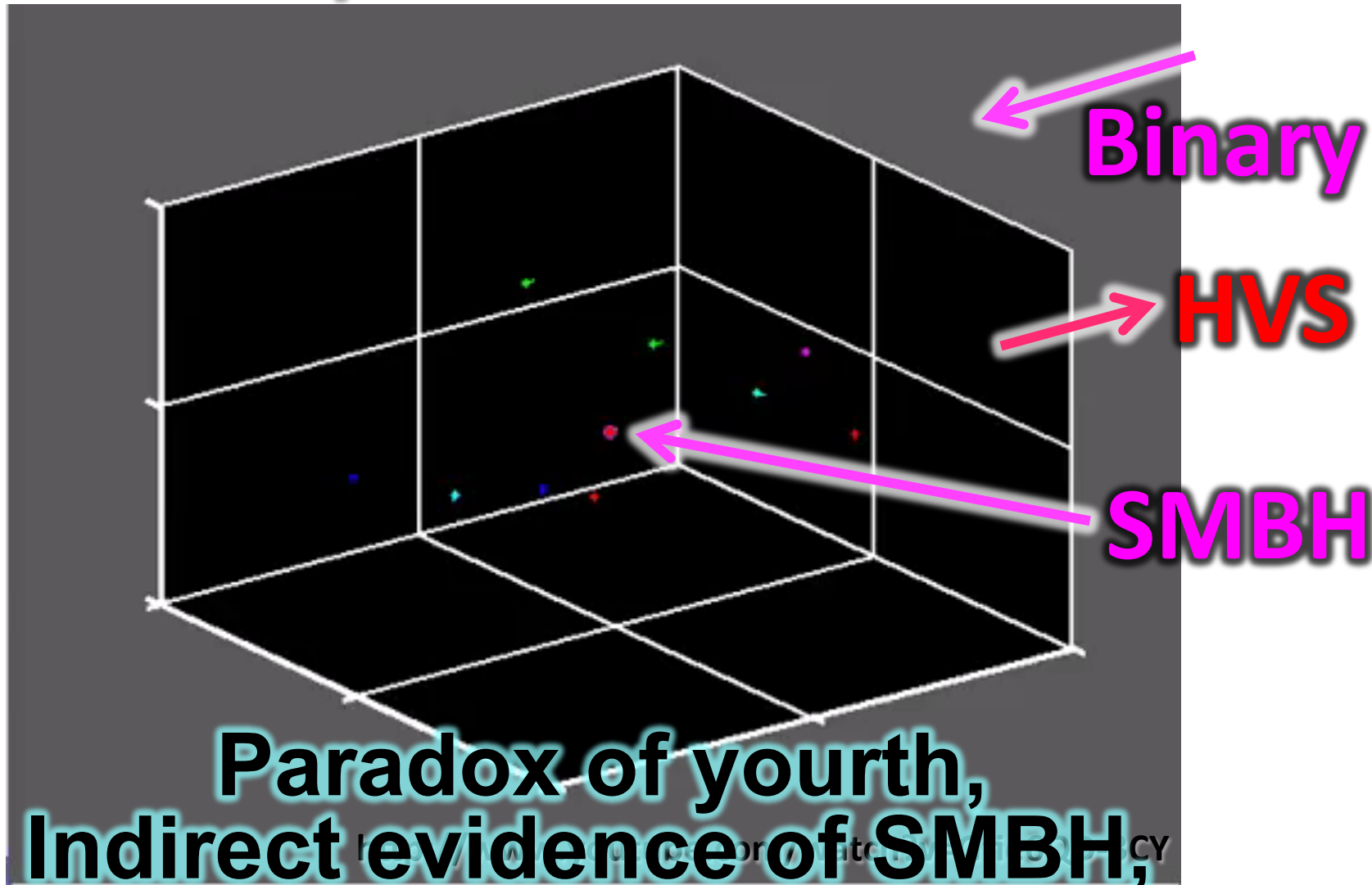


- SMBH mass,
- distance
- density

Hypervelocity Stars

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Hypervelocity stars (HVS; Brown+05, 06, 07, 09)



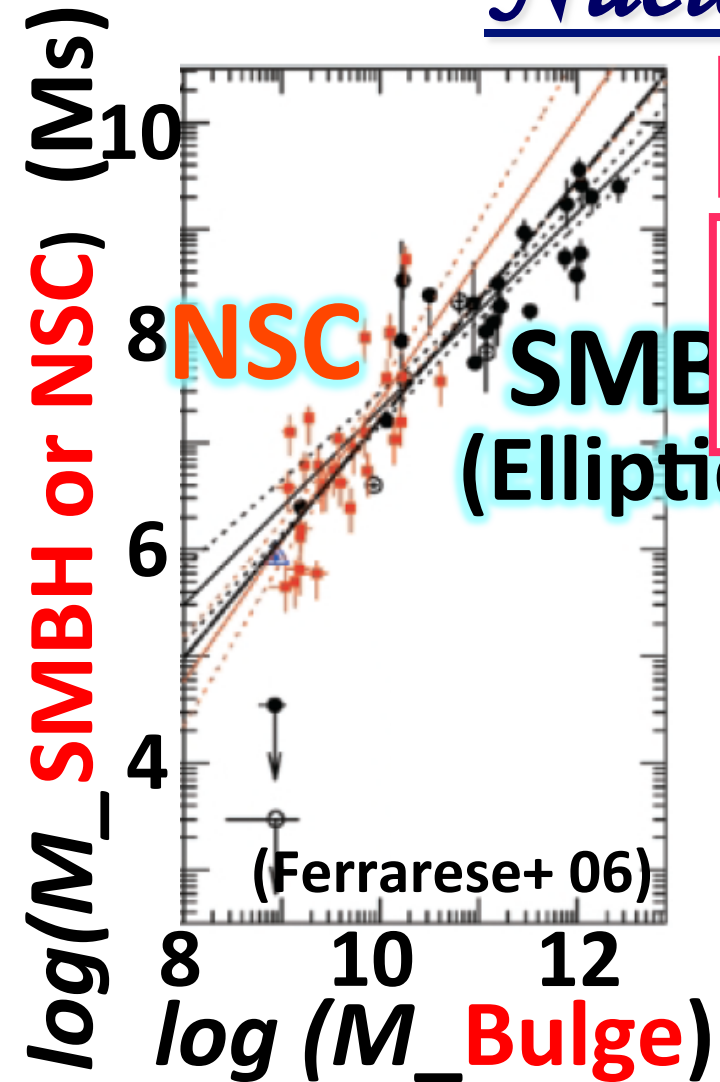
Stellar interactions, Grav. potential

Astrometry at the Galactic center
with wide-field NIR camera & AO

1. Hypervelocity stars (HVS)
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Nuclear Star Cluster

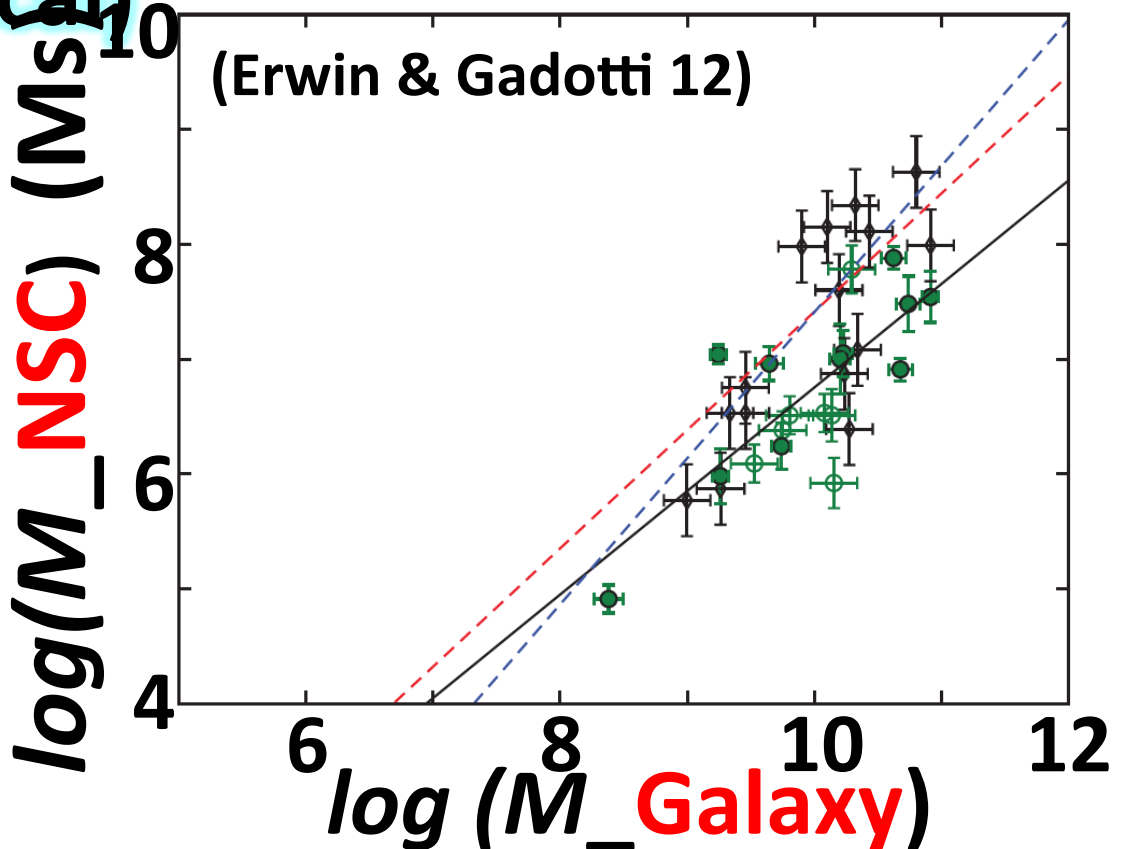
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SMBH or NSC $\leftrightarrow$ Bulge

SMBH $\leftrightarrow$ Bulge

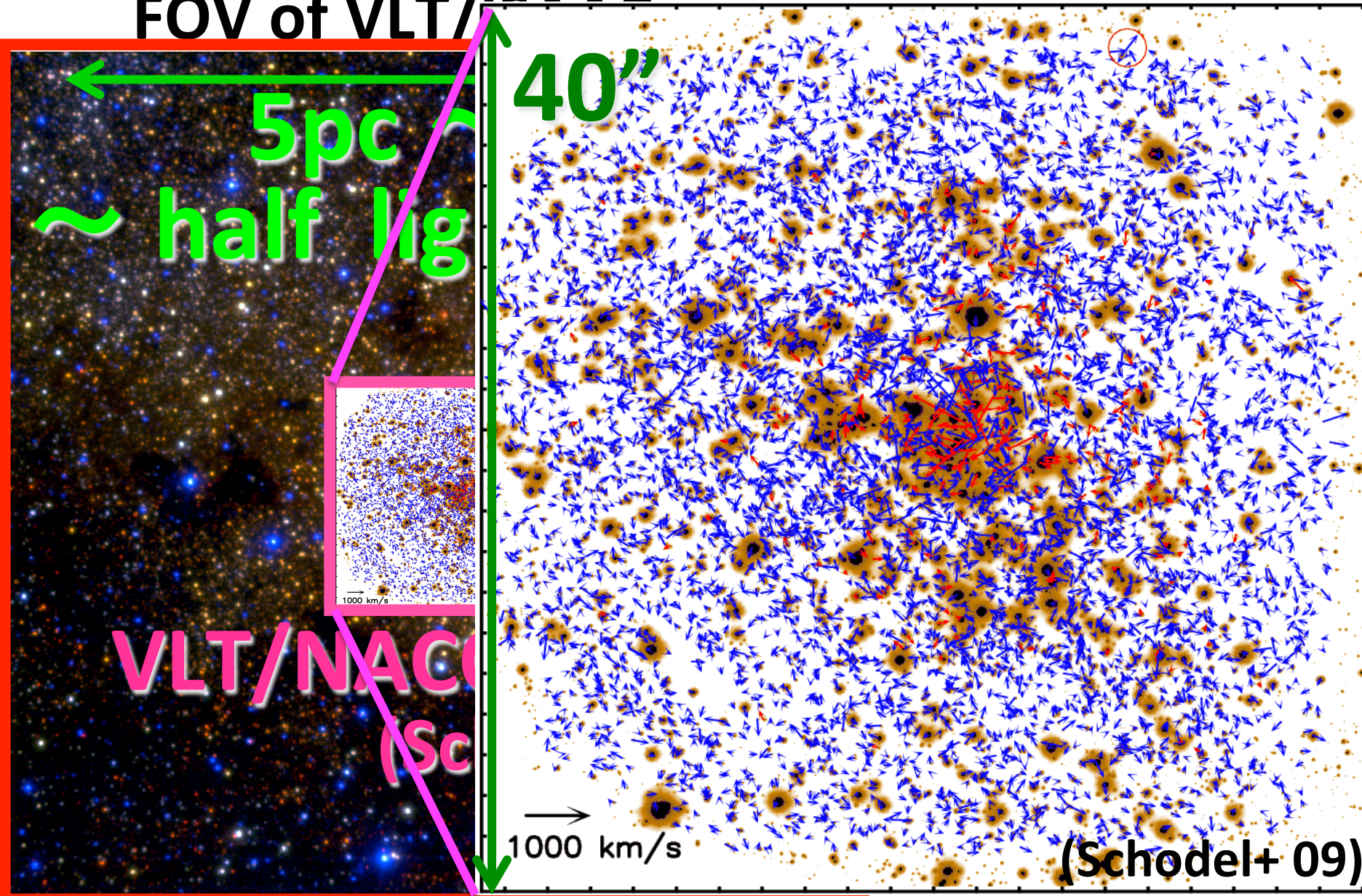
NSC $\leftrightarrow$ (whole) Galaxy



Nuclear Star Cluster

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FOV of VLT/NACO

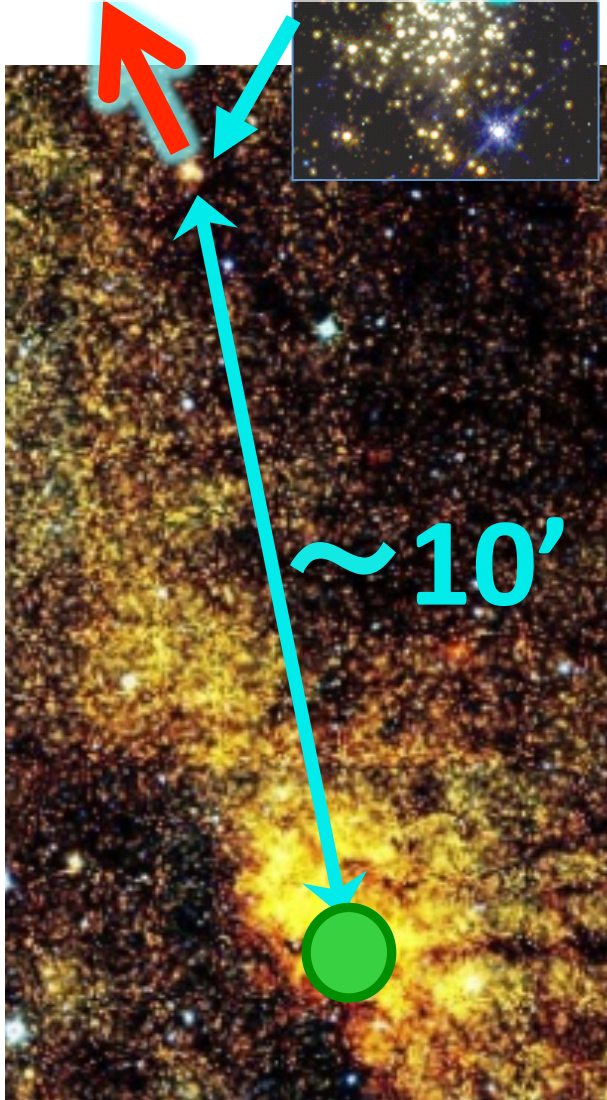


Hidden Clusters

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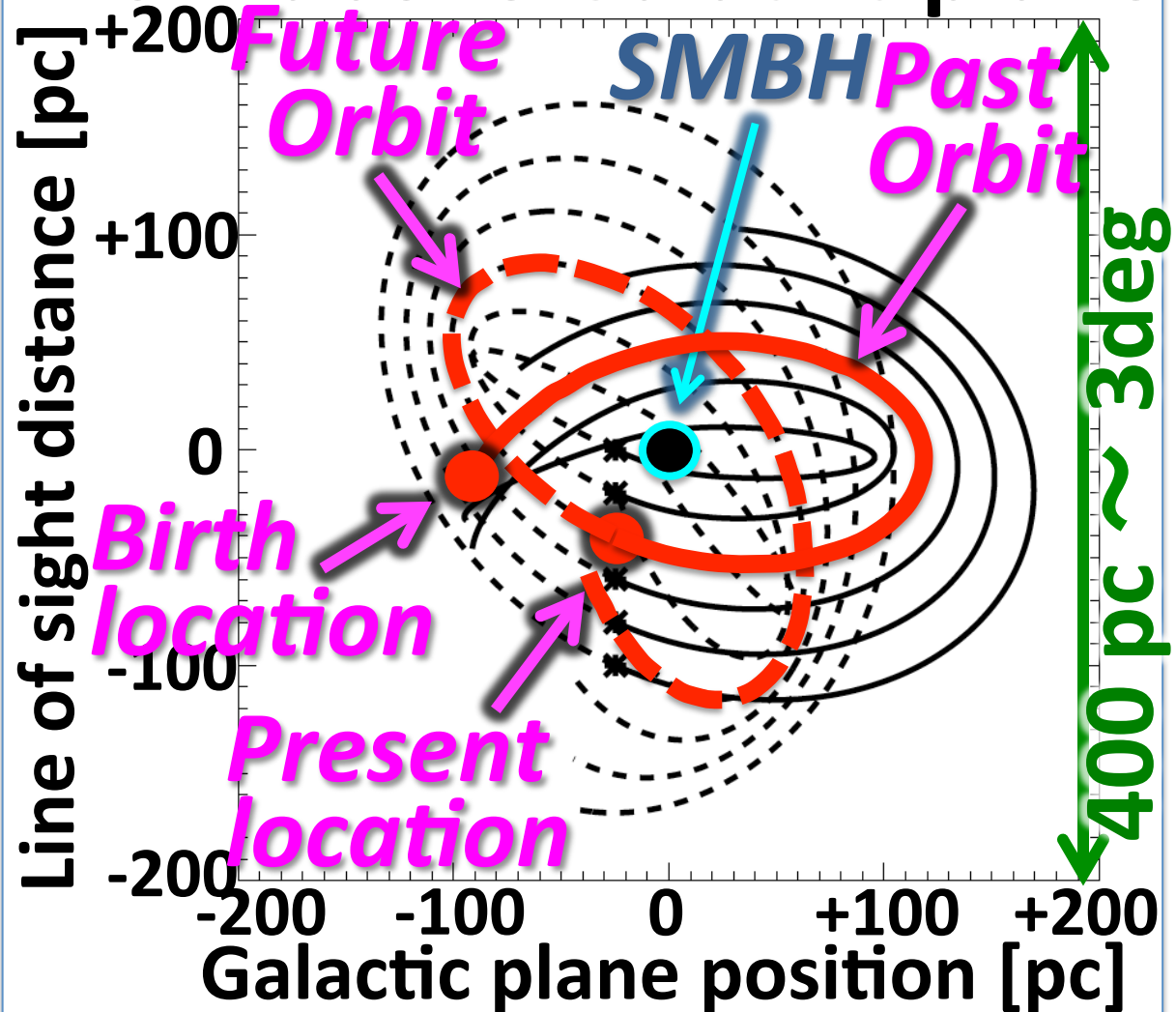
Arches Cluster

$\sim 5 \text{ mas/yr}$



$\sim 10'$

Cluster orbits viewed from above Galactic plane



Position uncertainty $< \text{FWHM}/50$

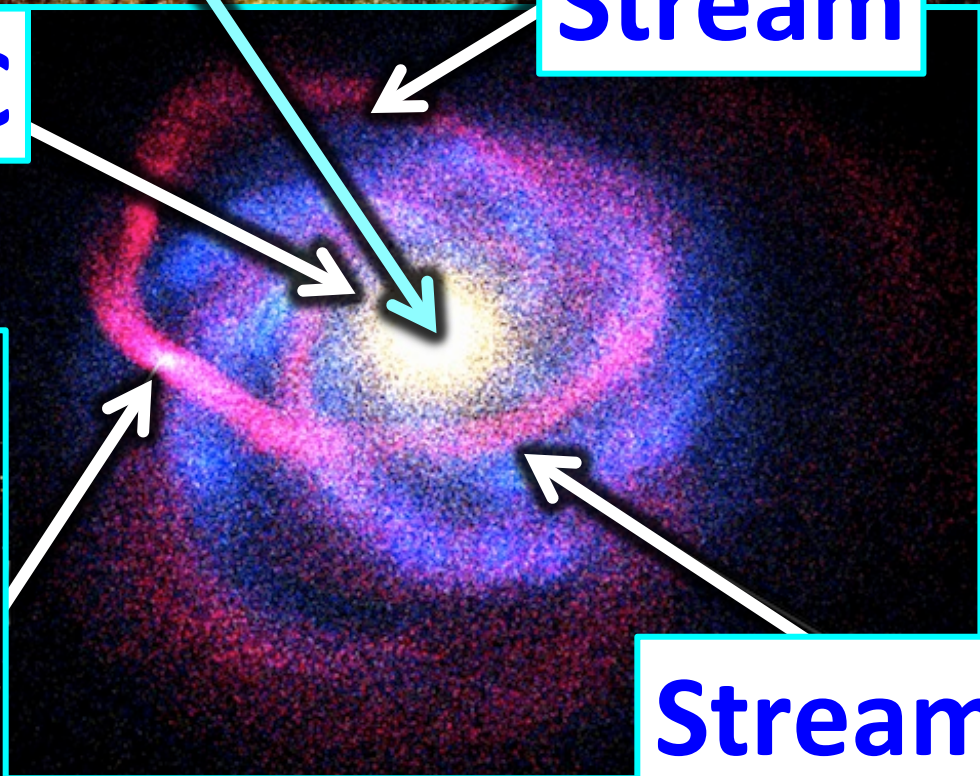
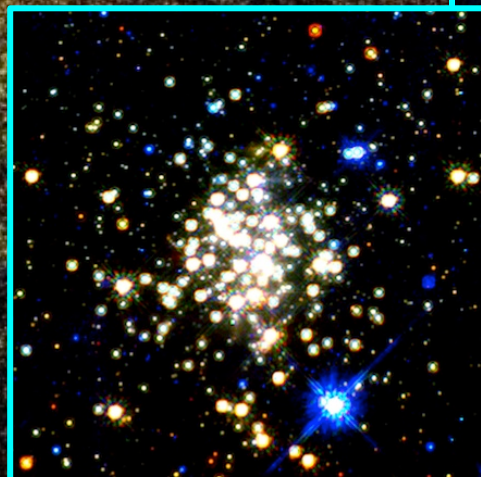
**Proper motion detection
with $> 3\sigma$ in 5 year observations**

Objects	Proper motion [mas/yr]	GLOA Good (120 mas)	GLAO Moderate (190 mas)	GLAO Bad (320 mas)
HVS	a few$\times 10$	○	○	○
Clusters	~ 5	○	○	○
NSC	a few	○	△	×



NSC

Stream



Stream