Black Holes in Star Clusters

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My Research Work

- Acquiring kinematics for star clusters or dwarf galaxies

- Analysing IFU spectra or individual stellar spectra, dynamical modeling, analysing gas dynamics

- Recent research has been focused on finding IMBHs

- Past research involved analysis of NSCs, BHs and their dynamics

Omega Centauri's black hole

Lower limit - 8200 Msun
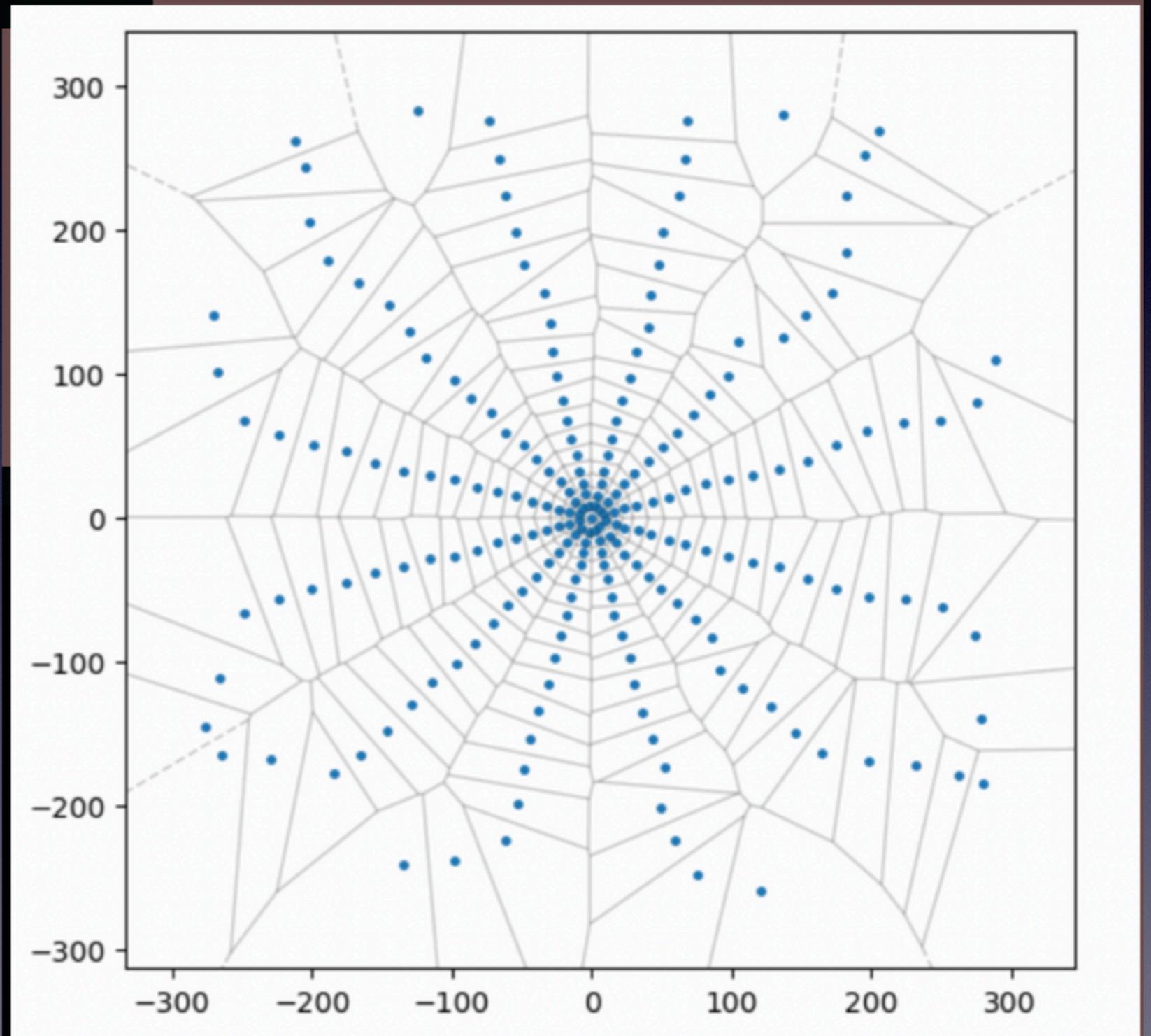HÄBERLE et al. 2024 (Nature)
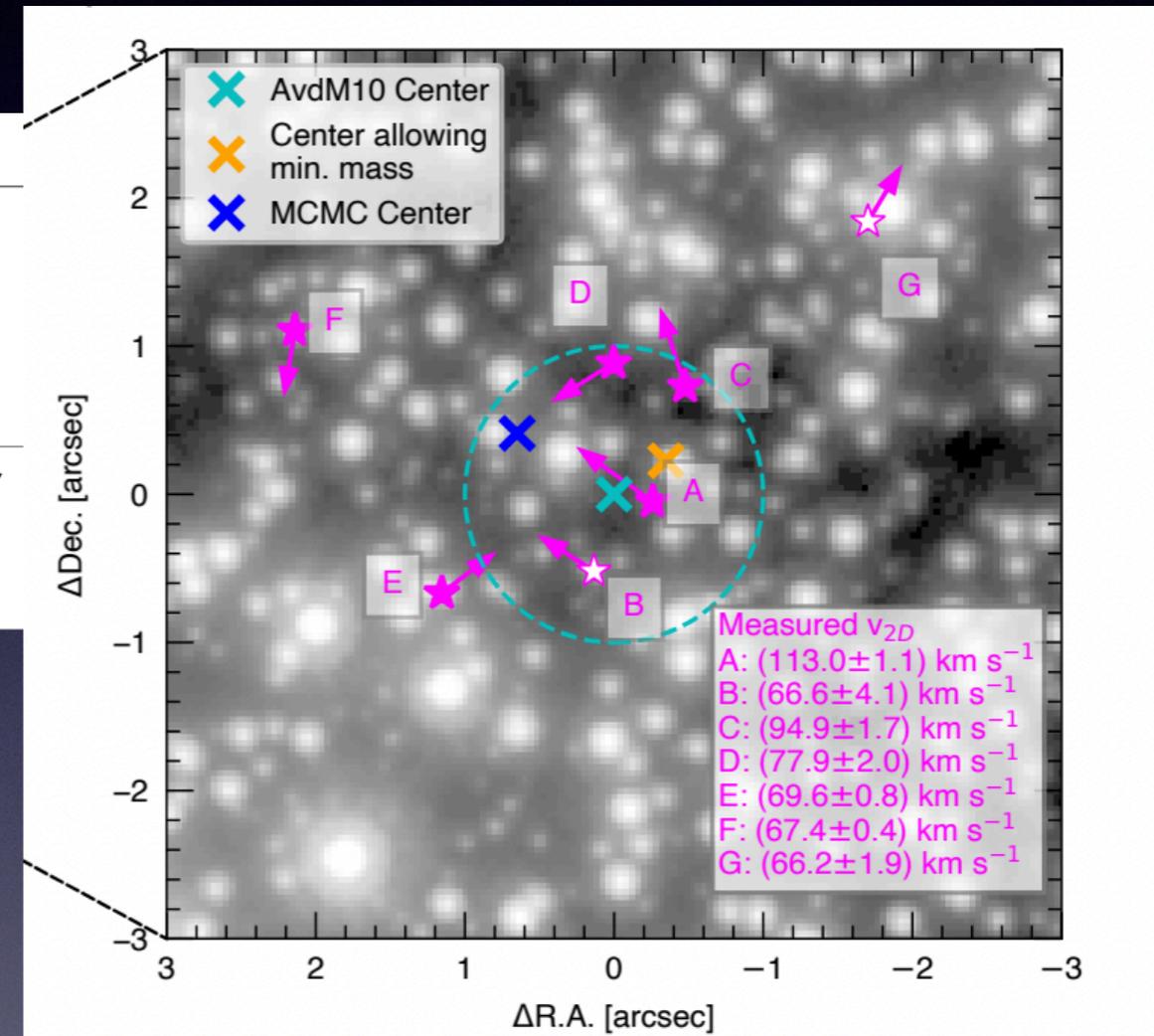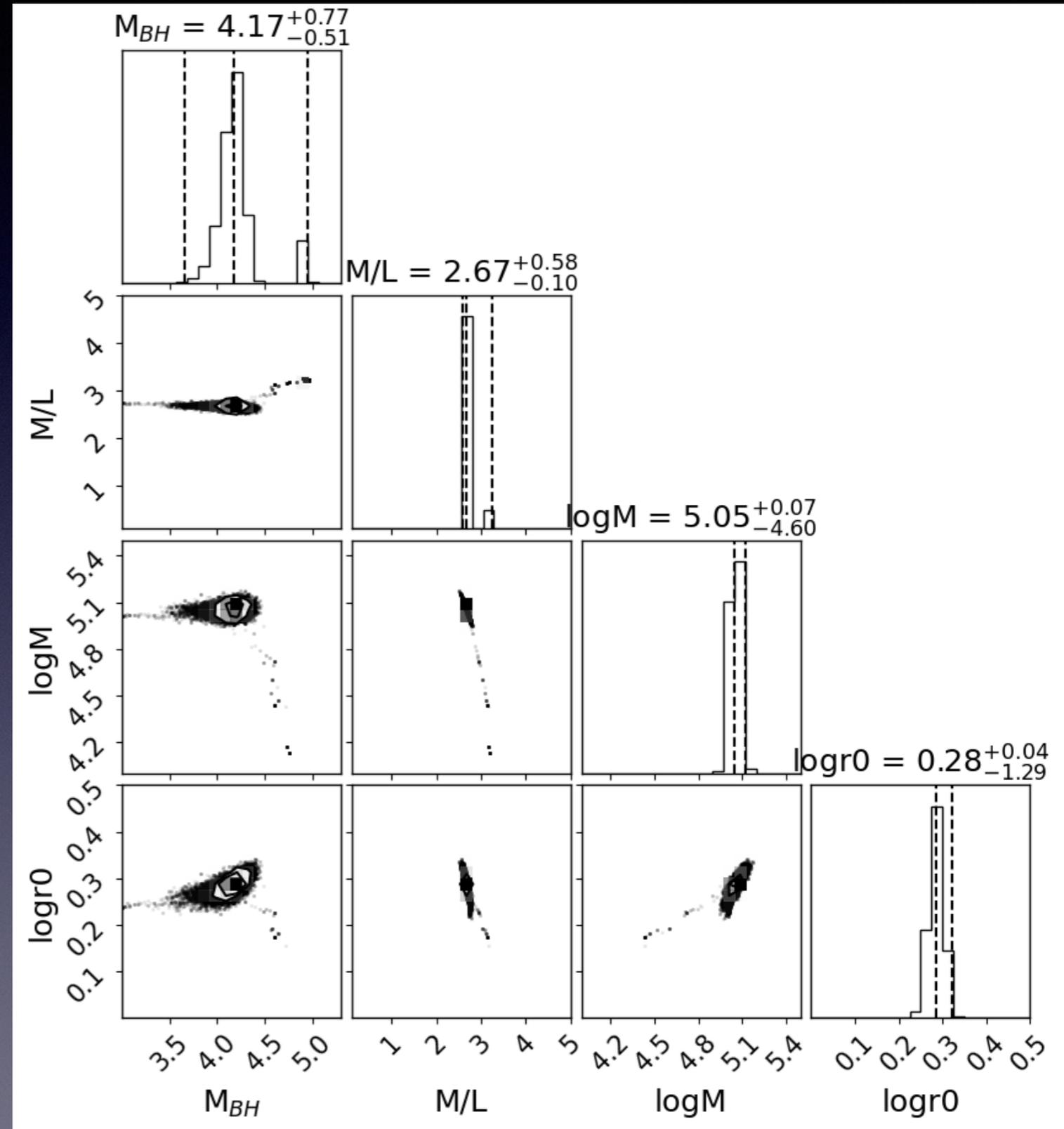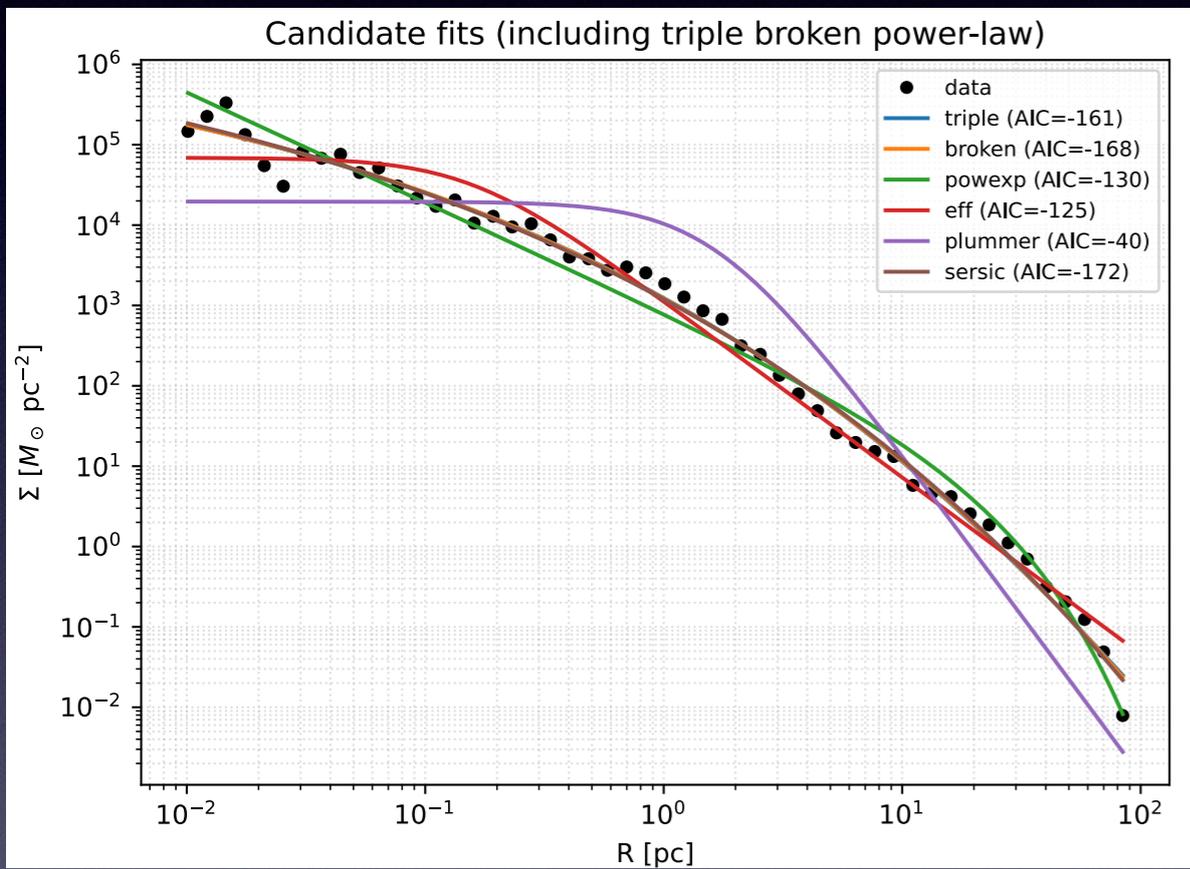
OMEGACAT - 3-D Velocities

Combining the proper motions from HST catalogue with the line of sight velocities from MUSE GTO/ GO data
(Häberle +2024)

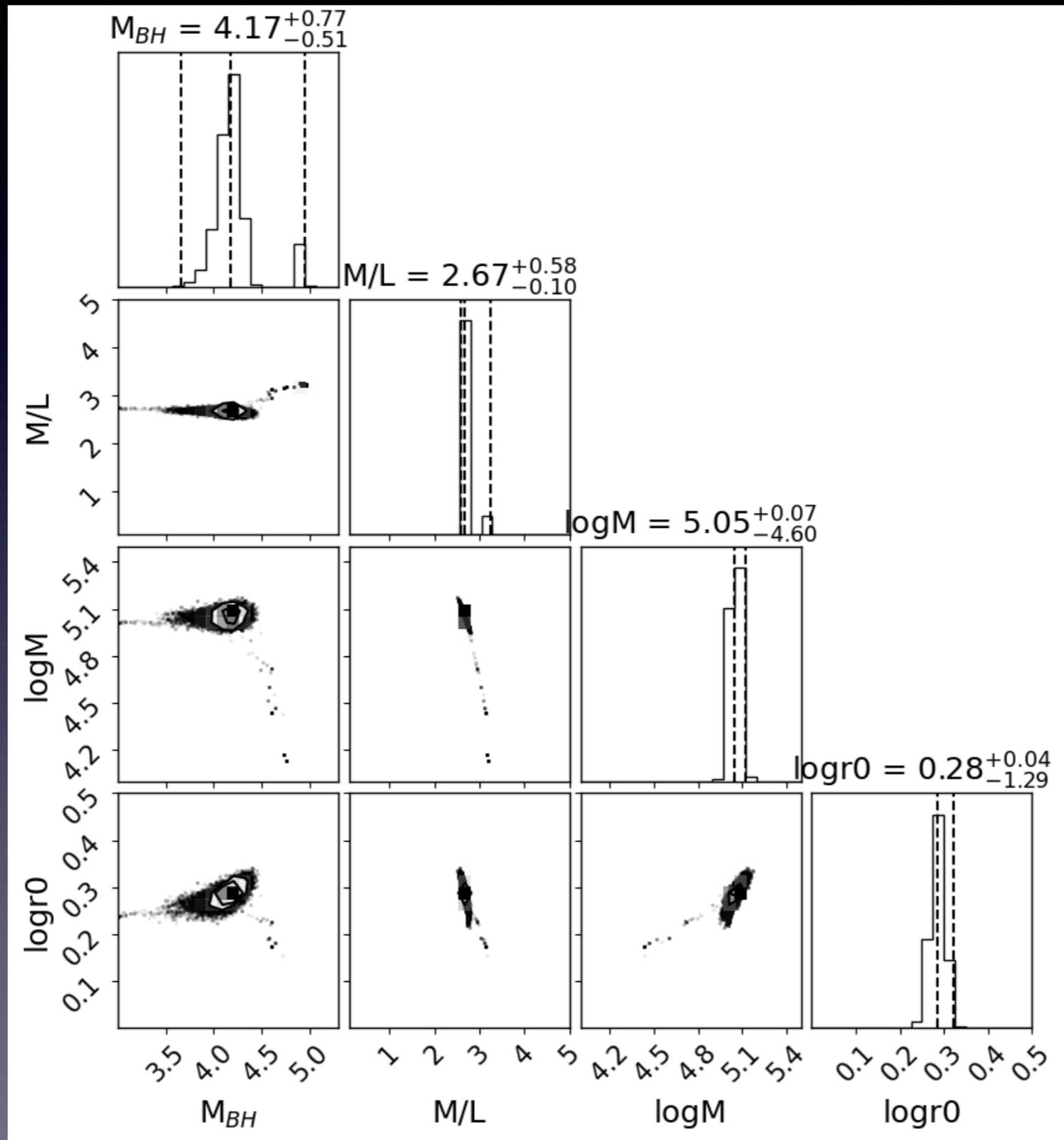> 1 Million stars containing the velocities

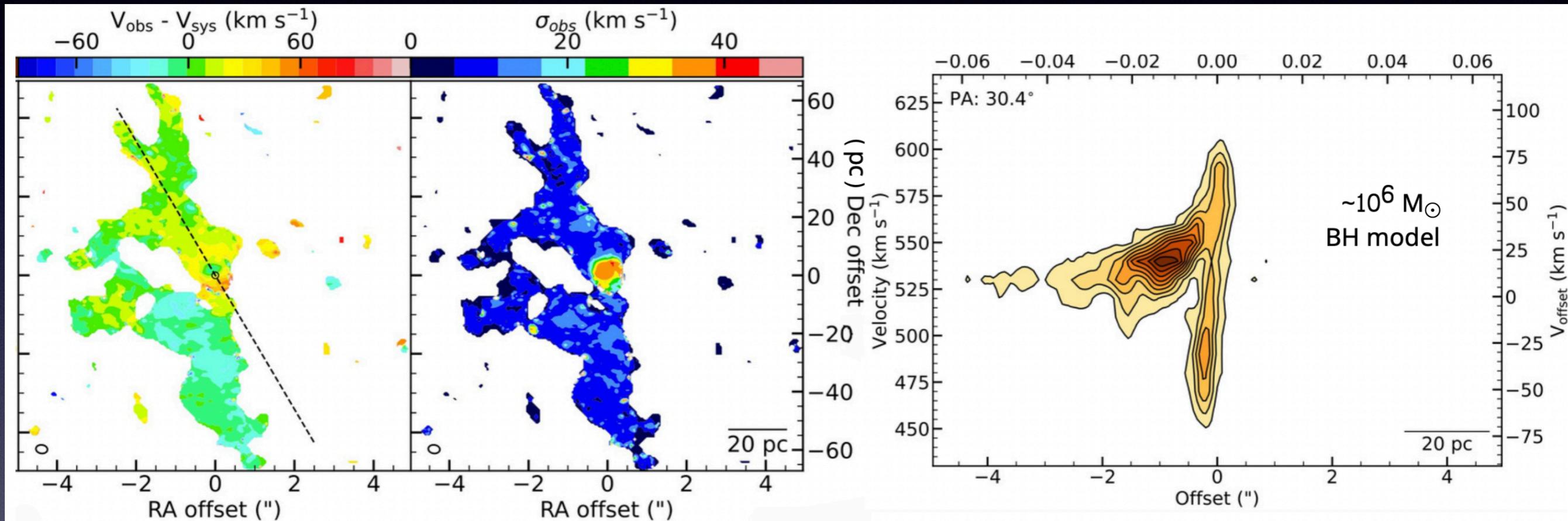We use a high selection quality criteria for proper motions ~ 640,000 stars

DARK-MASS PROFILE FROM SIMULATIONS

JEAN'S IMBH & DARK-MASS MODELS

Modelling the kinematics in a low-mass galaxy

ESO274-1 galaxy mas ~ 3x10⁸ M☉

Future Research Plans - Bridging Observations and Simulations

- Synthetic Spectroscopy - Building IFU datacubes for direct comparisons, generating mock line of sight velocities and dispersion profiles

- Finding more of the clusters that can have hidden IMBHs in them based on the kinematic signatures

- Use synthetic observations to test whether cluster scale dynamics explain nuclear star cluster or SMBH seeds