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The outer haloes of massive, elliptical galaxies

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The outer haloes of massive elliptical galaxies are dark-matter dominated regions where stellar orbits have longer dynamical timescales than the central regions and therefore better preserve their formation history. Dynamical models out to large radii suffer from a degeneracy between mass and orbital structure, as the outer kinematics are unable to resolve higher moments of the line-of-sight velocity distribution. We mitigate this degeneracy for a sample of quiescent, massive, nearby ellipticals by determining their mass distributions independently using a non-parametric method on X-ray observations of the surrounding hot interstellar medium. We then create dynamical models using photometric and kinematic constraints consisting of integral-eld, long-slit and planetary nebulae (PNe) data extending to ∼50 kpc. The rst two galaxies of our sample, NGC 5846 and NGC 1399, were found to have very shallow pro jected light distributions with a power law index of ∼1.5 and a dark matter content of 70–80% at 50 kpc. Spherical Jeans models of the data show that, in the outer haloes of both galaxies, the pro jected velocity dispersions are almost inde- pendent of the anisotropy and that the PNe prefer the lower end of the range of mass distributions consistent with the X-ray data. Using the N-body code NMAGIC, we cre- ated axisymmetric models of NGC 5846 using the individual PNe radial velocities in a likelihood method and found them to be more constraining than the binned velocity dispersions. Characterising the orbital structure in terms of spherically averaged proles of the velocity dispersions we nd $\sigma_\psi > \sigma_r > \sigma_\theta$.

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