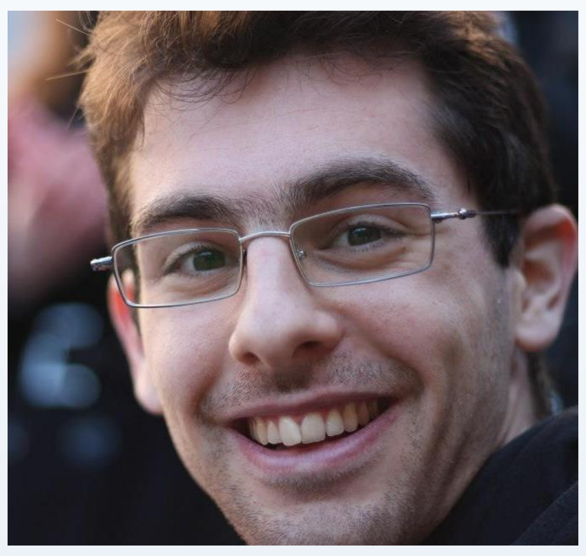

Simulating dwarf galaxies in the Fornax cluster environment

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Abstract

We investigate the evolution of late-type dwarf galaxies falling into the Fornax cluster starting from a selection of the MoRIA (Models of Realistic dwarfs In Action, Verbeke et al. 2015, 2017) suite of simulations. Our simulations include star formation, radiative cooling, supernova feedback, UV background effects, and ionization-aware internal energy and equation of state of the gas, coded in a heavily modified GADGET-2 version developed in our group. To simulate both the effect of tidal forces caused by the cluster potential and the effect of the intra-cluster medium (ICM), we use the **moving-box technique** described in Nichols et al. (2015). This allows to obtain a high resolution dwarf-ICM interaction while keeping an affordable simulation run-time.

We have carried out a representative set of simulations putting MoRIA dwarfs with stellar masses in the range of 4e6 - 1e9 Msol on infalling trajectories with different pericenter distances. We find that the **combined effect of tidal interactions** and **ram-pressure** for late-type dwarf galaxies can produce **strong star burst episodes** during pericenter passages followed by quenched star formation. Also, star forming galaxy tails (**jellyfish** galaxies) are observed. We find that dwarfs within this mass range that are on very radial orbits do not survive up to z=0. We also show the results of the analysis of the simulations following the dwarfs' journey into the Fornax cluster environment by tracking their **star formation activity**, their **structural parameters** and **stellar dynamics**. We relate these simulations to data from the existing, ongoing, and planned surveys of the Fornax cluster (such as the SAMI High Resolution Survey of Fornax Dwarf Galaxies, the Fornax Deep Survey, and the Fornax MeerKAT survey).

Movies of the simulations

References

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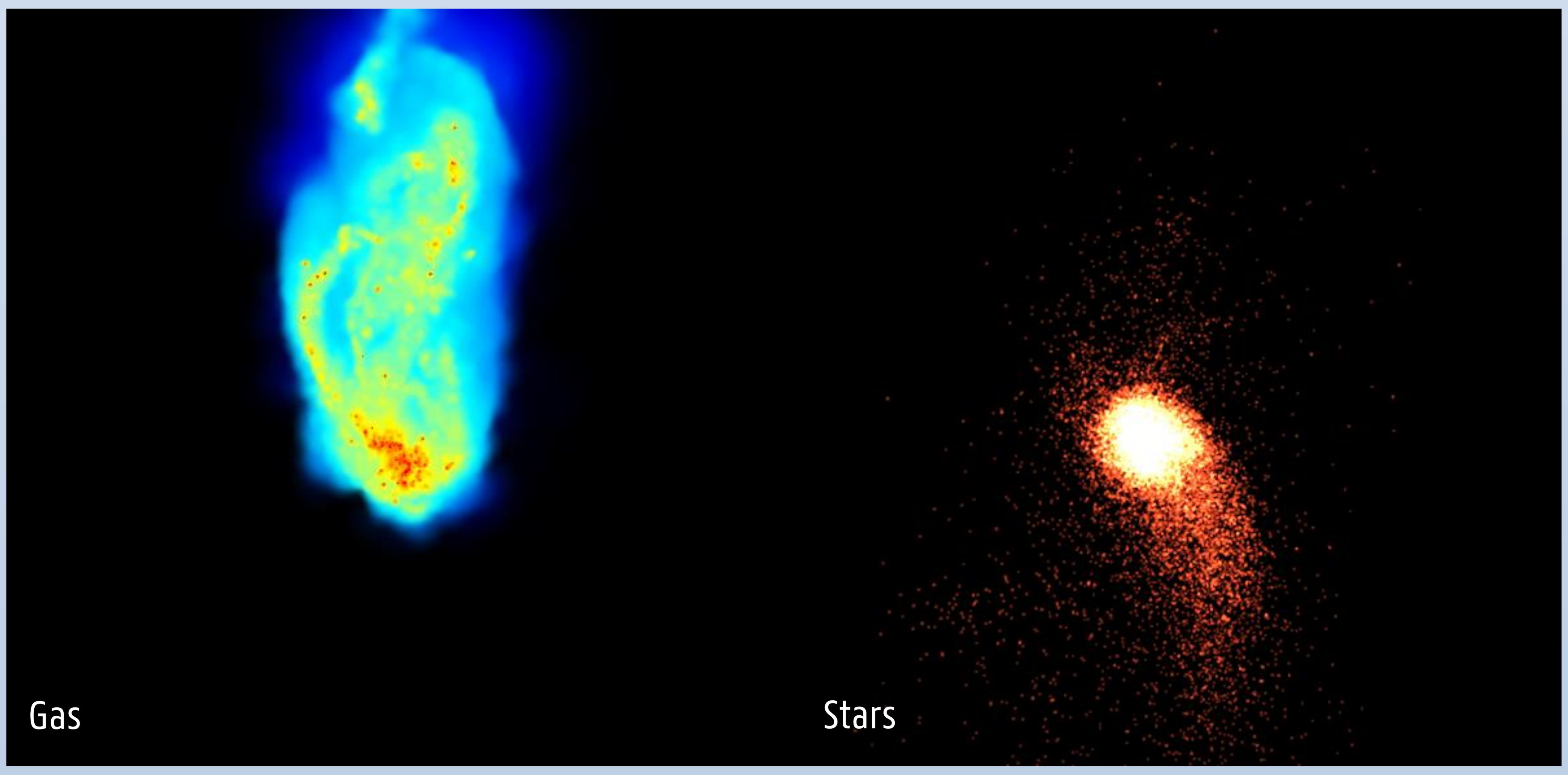
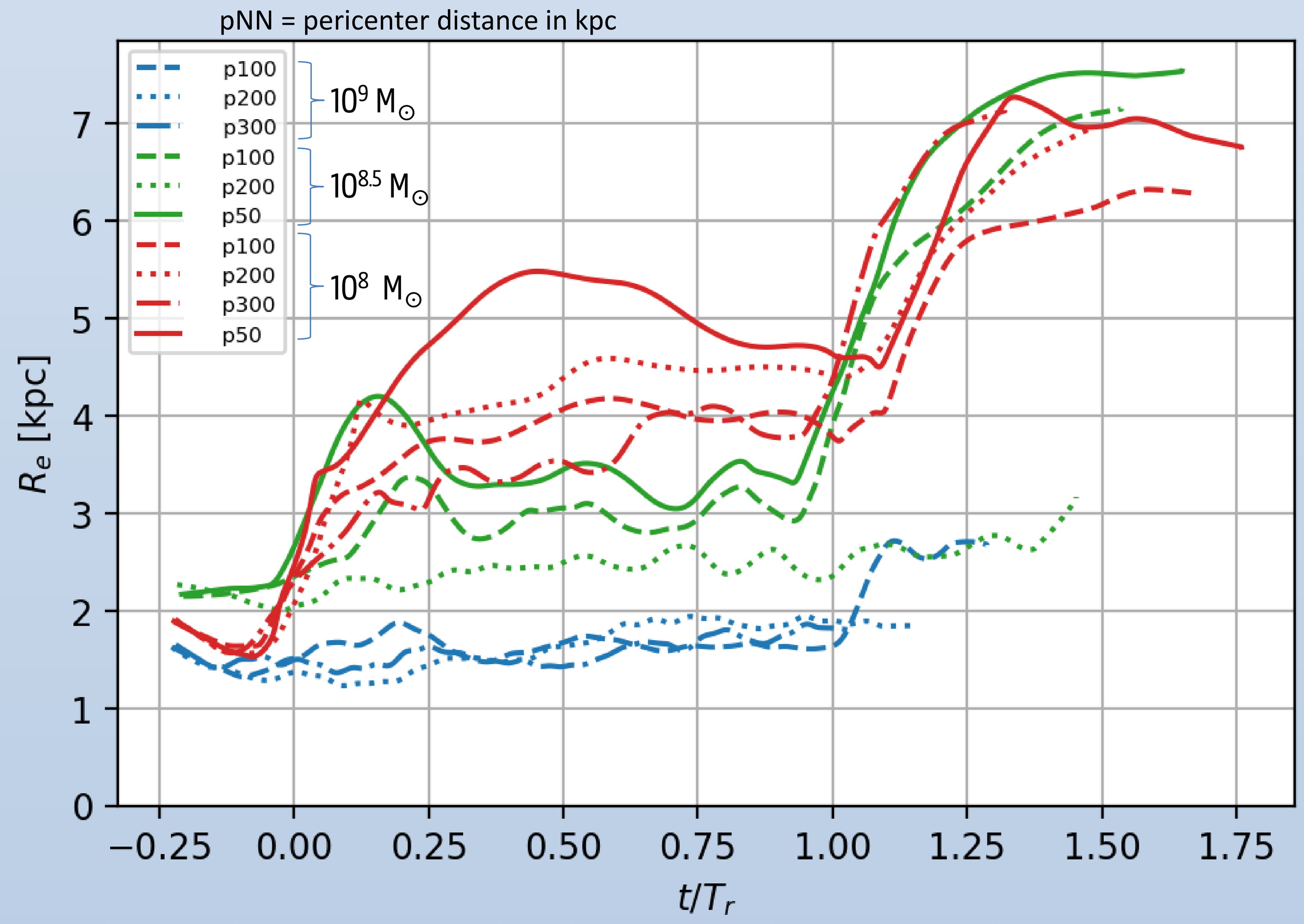
Ram pressure stripping + Tidal interactions

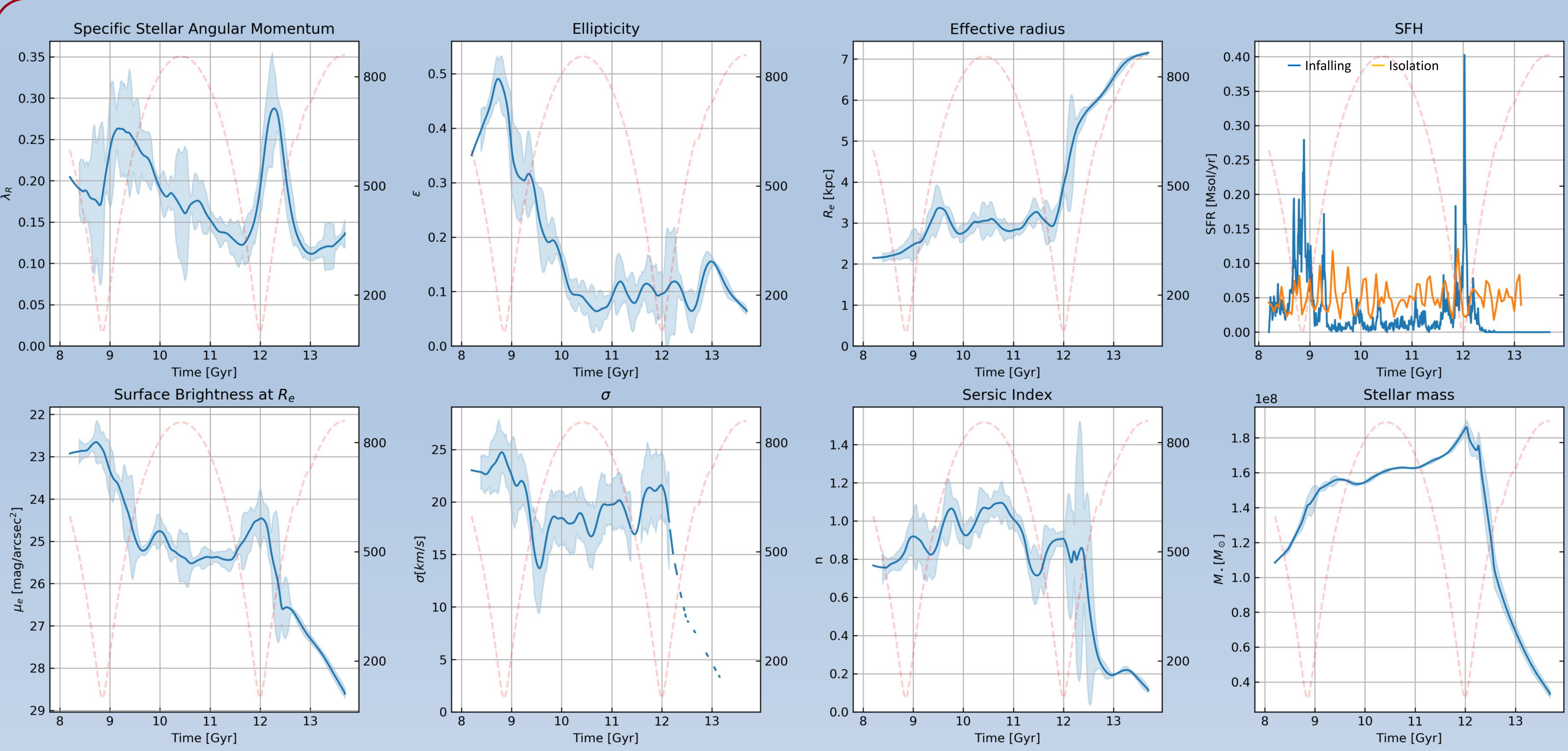


Galaxy on orbit with paricenter of 100 kpc, 500 Myr after the first pericenter passage. On the left projected gas density showing the result of the gas-stripping around pericenter. On the right the star particles distribution showing a tidal tail in front of the galaxy. Complex structures like these can be found in observed jellyfish galaxies in the Fornax cluster such as the NGC1427A.

Effective radius increase during infall



Effective radius evolution for different galaxies in different trajectories (z=0 stellar mass: 10^8 $M_\odot$ in red, $10^{8.5}$ $M_\odot$ in green, 10^9 $M_\odot$ in blue).
Time is normalized to radial period so that $t/T_r = 0$ and $t/T_r = 1$ correspond to pericenter passages in any orbit. Due to tidal stirring and feedback from supernovae after pericenter related starburst, galaxies increase their size.



Overview of various observables of a galaxy infalling into the cluster with an orbit with a pericenter of 100 kpc. Data points have been locally smoothed whereas the shaded region represents a sliding window standard deviation. The galaxy is viewed from the plane of the orbit. Dashed line is the distance of the galaxy from the center of the cluster. (Mastropietro et al. in prep.)

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