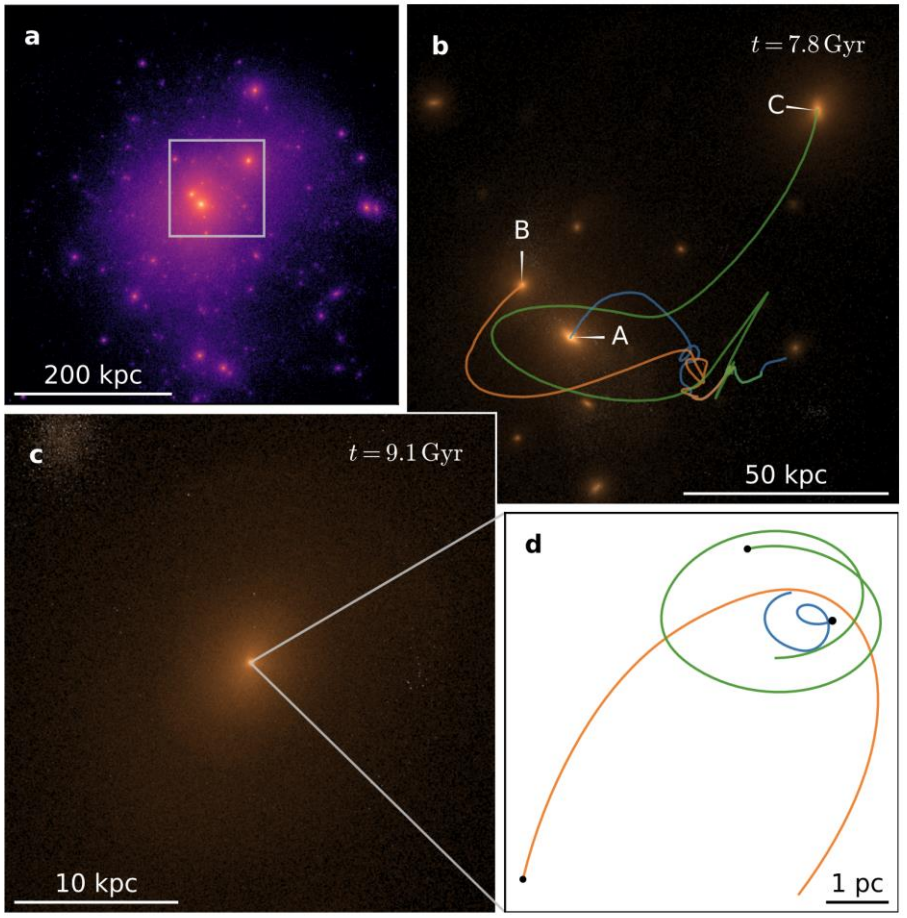
hy5562: Galaxy formation and evolution

- **Members:**
  Prof. Peter Johansson (PI)
  Dr. Till Sawala (Academy of Finland res. fellow)
  Dr. Stuart McAlpine (postdoc)
  Dr. Shihong Liao (postdoc)
  Dr. Dimitrios Irodotou (postdoc)
  Dr. Francesco Rizzuto (postdoc)
  Mr. Matias Mannerkoski (PhD student)
  Mr. Alexander Rawlings (PhD student)

- **Abstract:**
We use large-scale numerical simulations to study the formation and evolution of galaxies from the very early Universe until the present-day. The simulations calculate the gravitational interactions between dark matter, gas, stars and supermassive black holes and include models for gas cooling, star formation, stellar evolution and black hole physics.

Recently we have focussed on studying the mergers of supermassive black holes in massive galaxies using the Helsinki developed KETJU code (ERC funded project). The key goal is to calculate the gravitational wave signal from merging supermassive black holes in gas-rich galaxies and provide model predictions for the future ESA LISA (Laser Interferometer Space Antenna) mission, which will directly detect such gravitational waves from space, when launched in the mid 2030s.

Mannerkoski et al. 2021, Astrophysical Journal Letters, 912, 20



Caption: Overview of a KETJU simulation showing a) the large-scale projected mass-density of three merging galaxies, b) the complex trajectories of the central black holes, c) and d) zoom-in on the final black hole trajectories before the mergers.
1 pc=1 parsec = 3.26 light-years, 1 Gyr=10^9 years