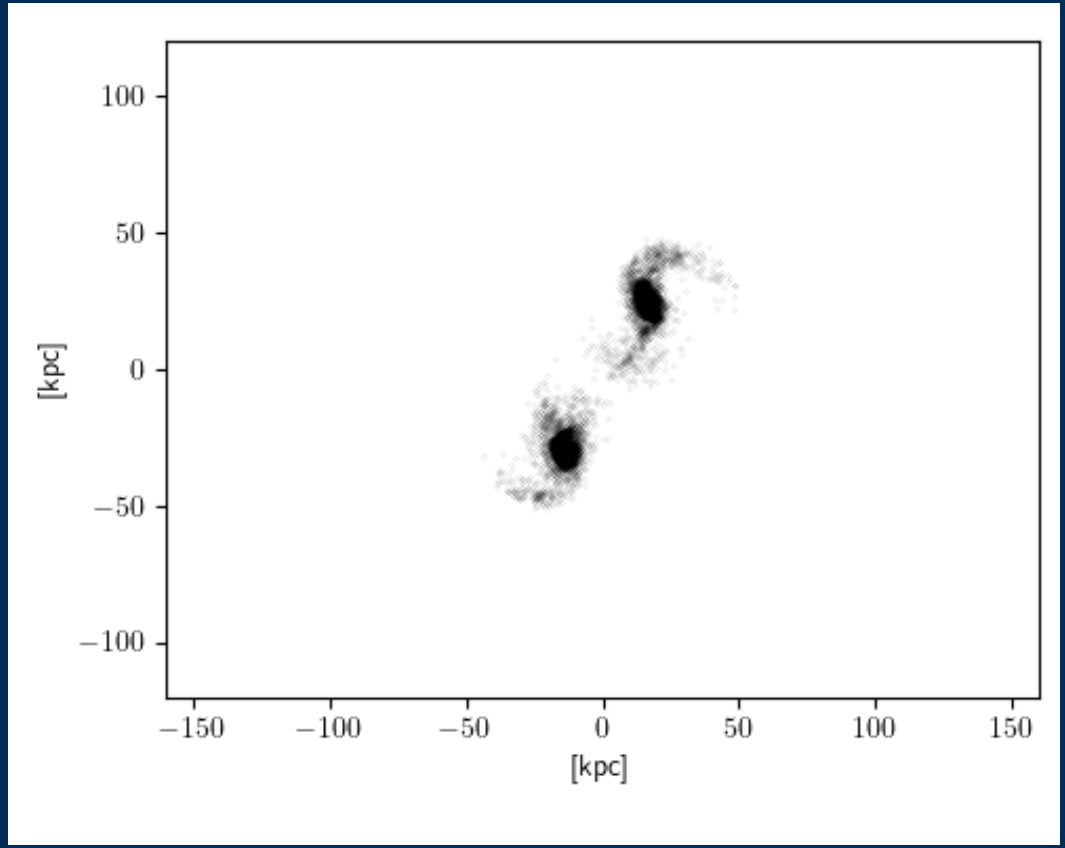
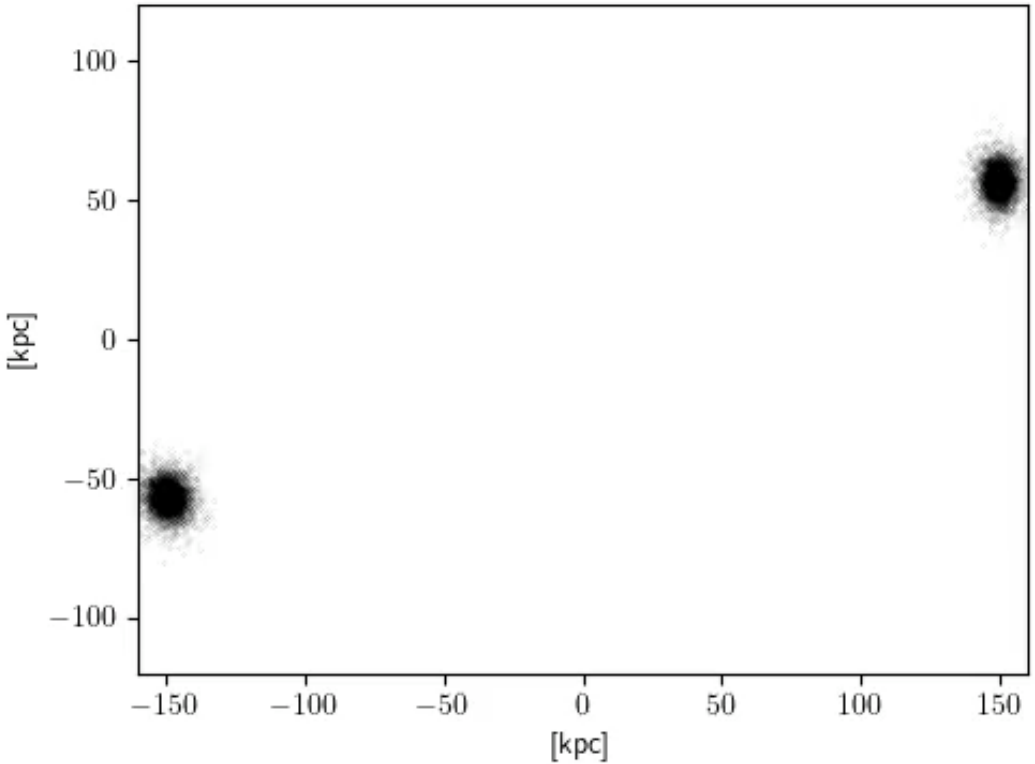
Leibniz-Institut für
Astrophysik Potsdam

N-body simulation of a galaxy merger



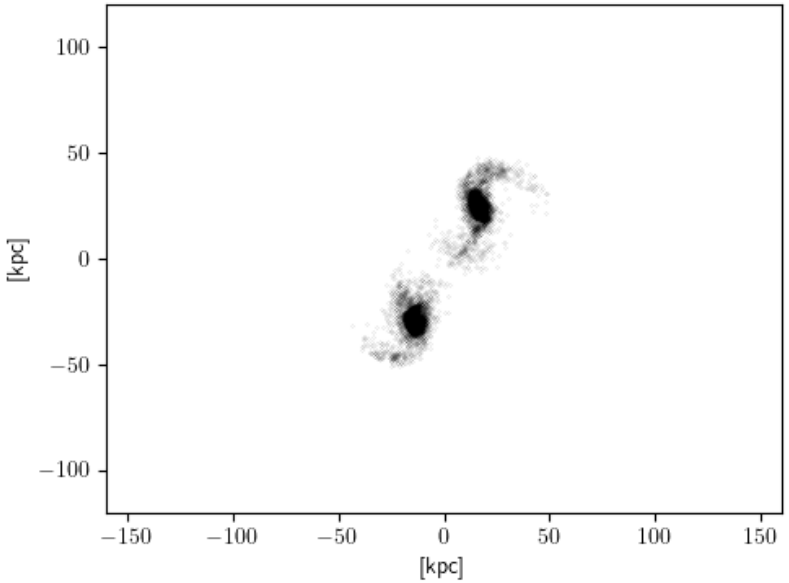
Rainer Weinberger / EXCOSM computing school / 19. March 2025

The simulation: the position of stars



About the simulation

- Initial conditions of two equal galaxies
  - Contain a stellar disk and a dark matter halo
  - Represented via particles of different “type”
- On a merger trajectory
  - Since these are not point particles, we get dissipation
  - of the orbital energy via tides and dynamical friction
  - Ultimately, a merger into a single galaxy
- N-body simulation done with the GADGET-4 code
  - Springel et al. (2021)
  - https://wwwmpa.mpa-garching.mpg.de/gadget4/
  - Code also capable of cosmological n-body simulations



Steps for running the simulation

1. Log in to Newton cluster
   - ssh [username]@141.33.4.144
   - [type in password]
2. Go to directory on parallel file system
   - cd /lustre/[username]/
3. Clone git repository with examples
   - git clone https://github.com/rainerweinberger/CosmoComputingSchool.git
4. Open/display instructions in subdirectory galaxymerger
   - cat ./CosmoComputingSchool/galaxymerger/instructions.sh
   - Follow the steps there line by line (e.g. open a second terminal to do this)
5. Download movie
   - rsync [username]@141.33.4.144:/lustre/[username]/galaxy_merger_sim/output/movie_galaxymerger.mp4 ./