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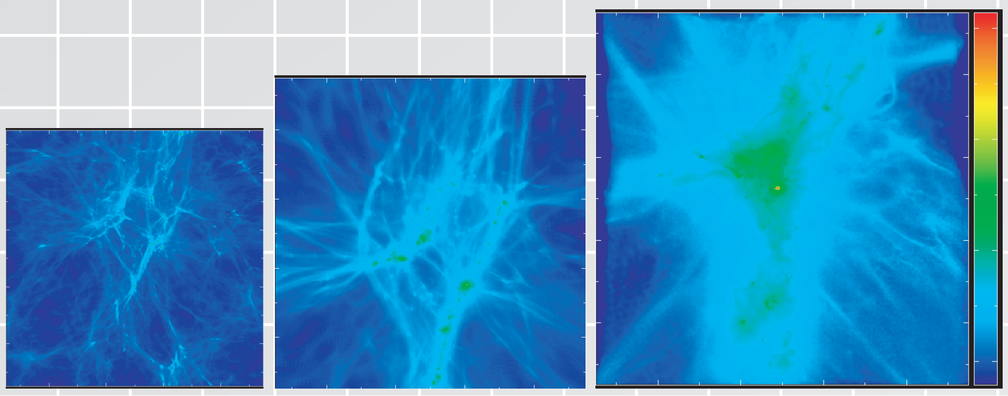
FIRST
The Origin of FIRST Generation Objects

Simulations with FIRST (1)

The FIRST simulator allows us to perform large-scale simulations on the formation of first stars as well as first galaxies and the development of structure in the universe.

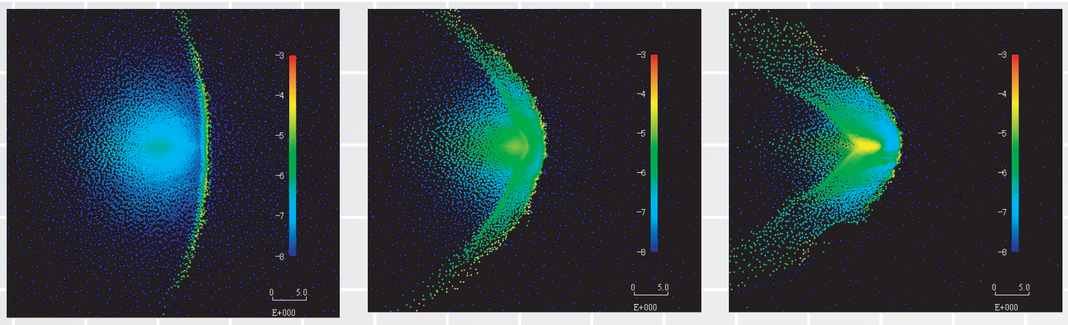
First star formation

In order to investigate mass of first stars, we perform cosmological N-body/hydrodynamic simulations including radiative heating/cooling and chemical reactions. Using 64-node parallel computation on the FIRST simulator, we employ about 30 million of dark matter and gas particles, respectively. This is an example of simulation which shows that evolution of gravitational instability and formation of a star at center of the simulation box.



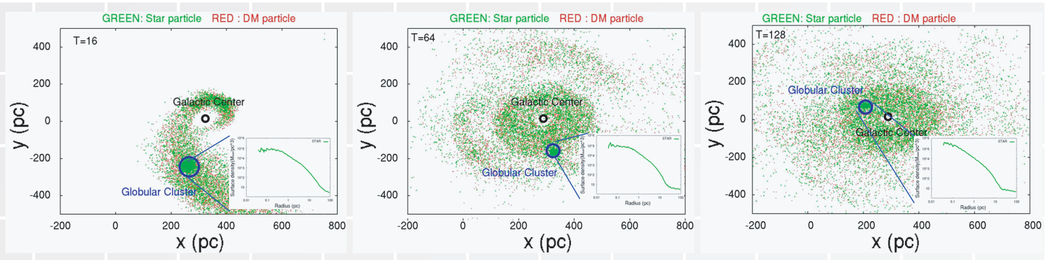
First star feedback

The star formation in first generation objects is regulated by ionizing and photodissociating radiation emitted from previously formed stars. Such regulation should be explored by radiation hydrodynamics (RHD) with careful treatment of radiation transfer. A RHD simulation with the FIRST simulator has revealed that subsequent star formation is possible after the formation of a very first star.



Formation of globular

FIRST simulator allows us to simulate the dynamical evolution of a globular cluster. Using the FIRST simulator, N-body simulations are performed to solve the dynamical evolution of a globular cluster in a galactic tidal field. The simulations must be done with high accuracy to trace orbits of each star, because the two-body gravitational encounter plays an important role in its dynamics.



Radiative magnetohydrodynamic accretion flows in the galactic center

Radiation in magnetohydrodynamic (MHD) accretion flows plunging into a supermassive black hole in our galactic center are investigated by using 3-D radiation transfer (RT) simulations. 3-D RT simulations with the FIRST simulator have revealed rapid variation in the spatial distribution of the emergent photons that can account for variable emissions in recent observations.