

Progress report

Two-dimensional simulation of star formation in the early universe

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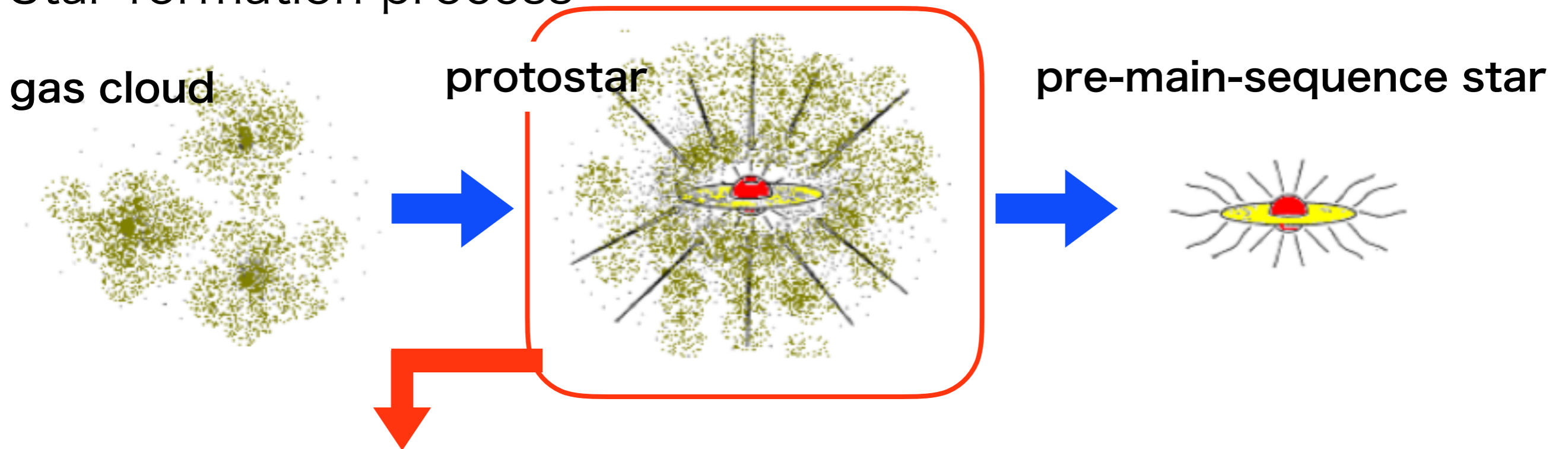


Theoretical Astrophysics
Tohoku University



Background of My Study

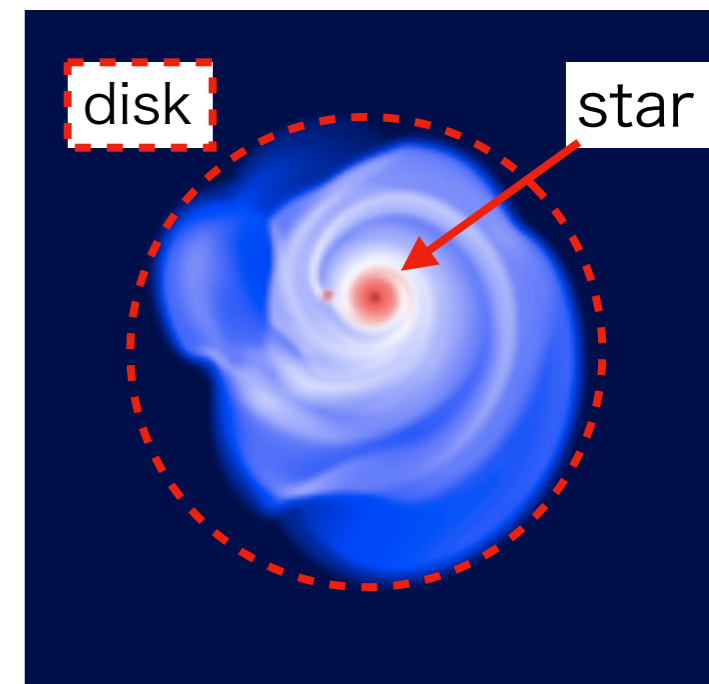
Star formation process



Formed star is characterized by gas accretion from disk.
high or low mass star?, single or multiple stellar system?

We follow the time evolution of circum-stellar disk using numerical simulation.

- ✓ origin of supermassive black holes
- ✓ initial mass of star
- ✓ multiple stellar system formation



Plan of my study

zero-metal
star formation

supermassive star formation

What is the origin of supermassive
black holes?

→ **currently writing**

low-metal
star formation

metallicity dependence of
gravitational instability of the disk

- stellar mass
- stellar multiplicity

→ **submitted**

solar-metal
star formation

thermal evolution of the disk
around sun-like star

→ **accepted**

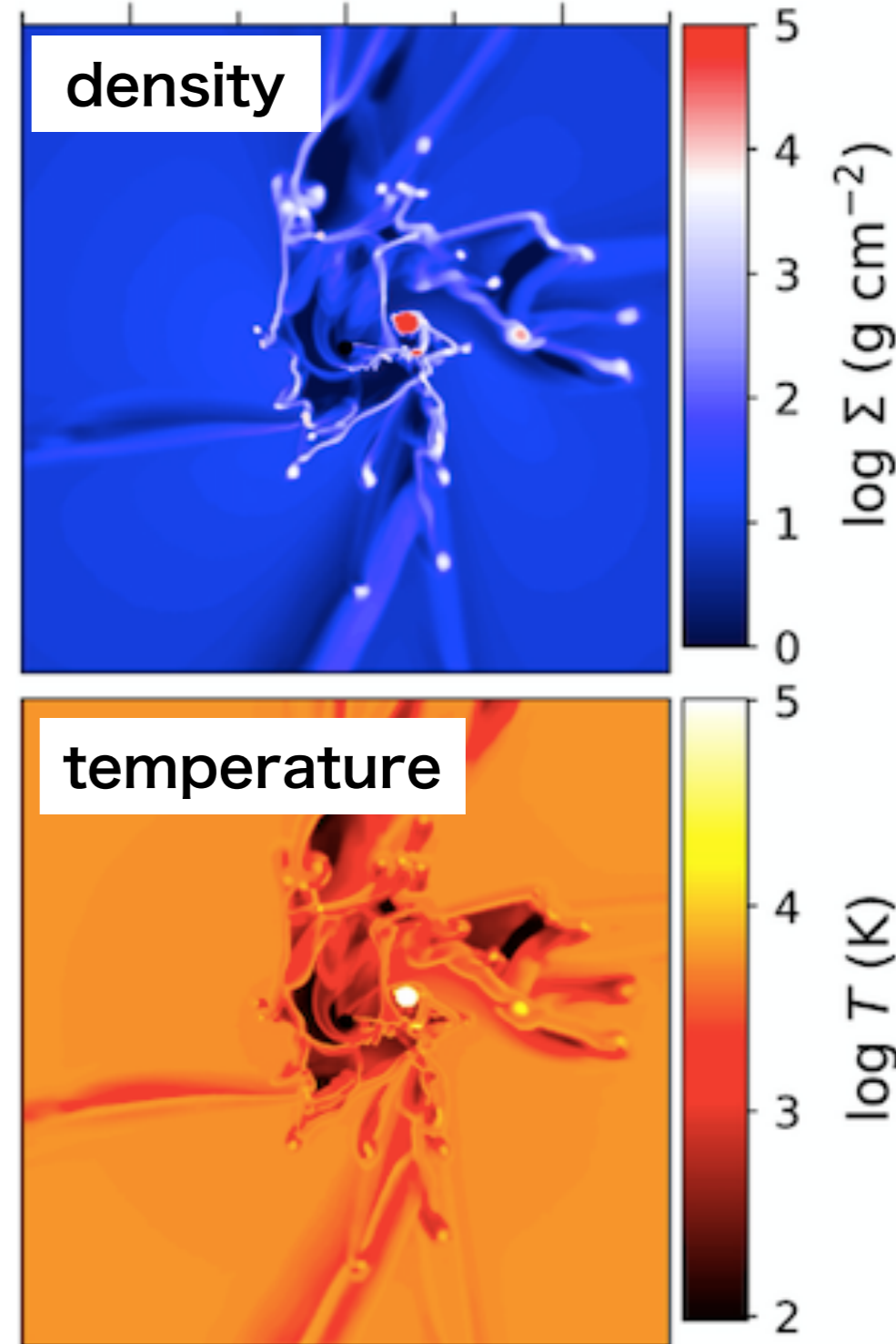
metallicity \approx cosmic time

Supermassive Star Formation

We follow the time evolution of
primordial gas cloud.

- ✓ Gravitationally unstable disk is formed.
spiral arms & gas clumps
- ✓ accretion rate : 0.1 Msun yr^{-1}
- ✓ Central stellar mass reaches $\sim 3 \times 10^4 \text{ Msun}$.

➔ Our calculation shows that supermassive stars can form in the early universe



Disk fragmentation and intermittent accretion onto supermassive stars

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Course status

- Advanced Lecture on Physics for the Universe I

GSP: 7p + GASP: 3p → total: 10p

- Advanced Experiments on Physics for the Universe

GEP 11P (remaining points: 2P)

N1: FPGA training course (3P)

N2: Scintillator hodoscope array read by MPPC (4P)

A1: Measurements on optical aberrations in an optical observation system (4P)

- Overseas training

Austria : visit a collaborator, 2 weeks

Chile : participate in the conference, 2 weeks

