国立天文台天文シミュレーションプロジェクト 成果報告書

Can Baryon-Dark Matter Streaming Velocity Make Massive Blackholes in The Early Universe?

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利用カテゴリ XC-B ・ 計算サーバ

(1) I have finished developing an initial condition generator, BCCOMICS, that includes the smoothing effect of baryon-dark matter streaming velocity in the gas density field. I took the previously incomplete version from my collaborator and made it available for GADGET-2 type simulations. I also fixed a lot of bugs in the code that can affect the simulations. Sample density fields from the generator in shown in Figure 1.

(2) In order to emphasize the importance of rigorous calculation of streaming effect, I wrote a paper about systematics effects in previous studies that implemented the streaming velocity in approximate manners. The paper is posted on ArXiv[1] and under review by the Astrophysics Journal.

(3) About 50% of the planned blackhole formation simulations are complete and the rest is currently being run.

(4) As a related project, I have studied the effects of streaming motion and x-ray background from direct collapse blackholes in the small-scale gas structures at the late stage of reionization. I will submit a paper about those results soon.

[1] Park, H., Ahn, K., Yoshida, N., Hirano, S., 2020, ArXiv eprint, 2004.00863

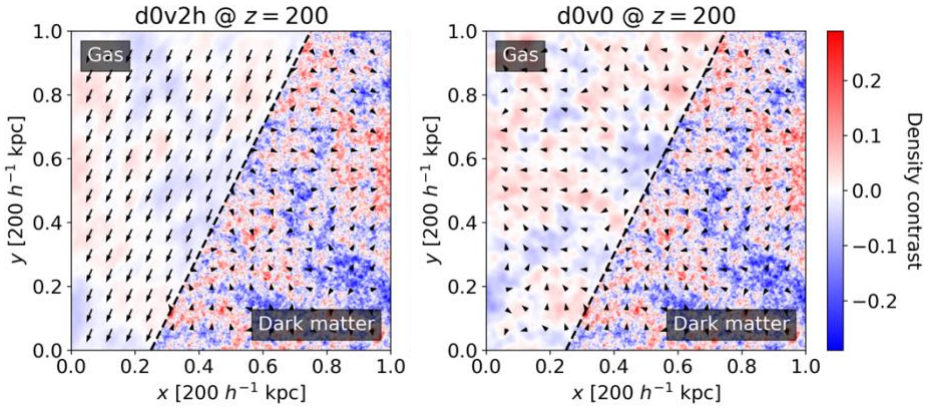

Figure 1) Gas and dark matter density field at z=200 generated using BCCOMICS. The left panel is a case with a strong streaming velocity of v=70 km/s while the right panel is the case with zero streaming velocity.