Inhomogeneous Cosmology Whitepaper

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- 17 Sep — discussion by IC III participants (added 18 Sep)

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Question 1

Are these two interpretations — weak field on a flat background versus a fully non-linear GR approach of differential expansion — physically equivalent in the sense of being observationally indistinguishable, provided that the conditions for the weak field limit to be valid are matched by the actual space-time?

Question 2

What are the quantitative conditions required for these two interpretations to be indistinguishable?

Question 3

Does the weak-field approximation allow for non-zero rotation? Or is $w_{ab} = 0$ an implicit assumption of this scheme?

Question 4

What is the physical meaning of the scalar spatial curvature?

Question 5

What is the physical meaning of the Poisson gauge? Does it make sense to talk about a set of observers in this gauge?

Question 6

What is an element of fluid in the real universe? What kind of limitations do we meet while using the fluid approach in cosmology?

Question 7

Can the small scales (few comoving Mpc) be handled accurately by existing numerical approaches that do not take into account virialisation?

Question 8

Why is backreaction and spatial curvature small in GEVOLUTION *results? What is the role of assumptions on the topology of the spatial section?*

Question 9

Are gevolution simulations mathematically self-consistent — which terms are set to zero? Could the ignored terms accumulate to significantly high values over a Hubble time?

Question 10

Is the difference between results by Adamek, Macpherson etc and Bruni, Bentivegna etc only due to the gauge choices? Do they agree at the level of observables?

Question 11

What are the observables from the Buchert approach, exact solutions, gevolution, ET, simsilun, VQZA that can be tested by model independent methods (CBL test, most massive objects in the universe)?

Conclusion: few months from now?

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