CLASS Beyond ΛCDM

Cosmology with Computations Workshop (CosCOM)
12-17 December 2023

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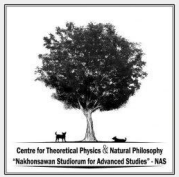
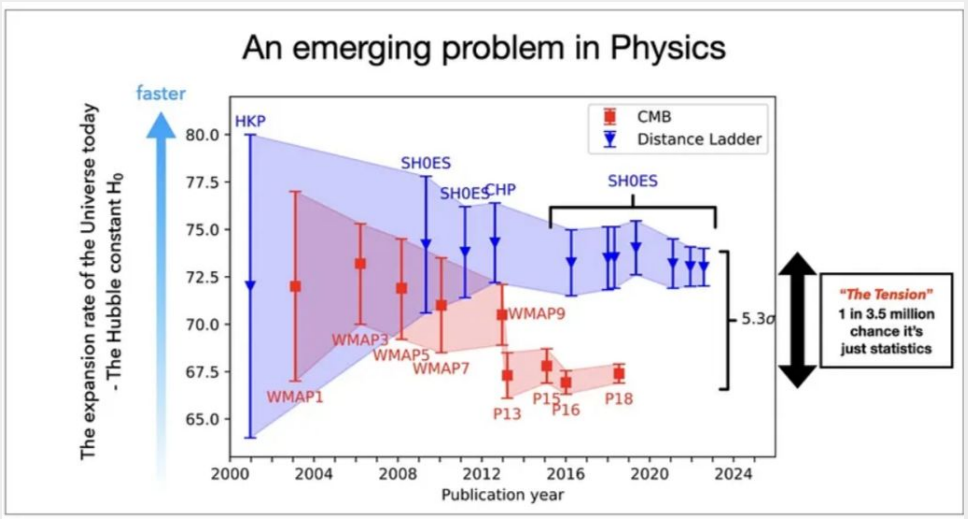


Mahidol University
Wisdom of the Land

State of the Art

- Our universe is not only expanding but it is also accelerating!!
- ΛCDM model has been constrained with unprecedented accuracy. But it suffers from the challenges coming from both the theoretical and observational sides.
- From theoretical side it suffers from the problems like Cosmological Constant Problem, Coincidence Problem, Fine tuning problem etc.
- With the improvement in our ability to constrain the cosmological parameters, a few statistically significant tensions has emerged.
- It seems that the late time cosmological data and early time cosmological data are in tension.
- We need to extent our imagination beyond standard ΛCDM.

Hubble Tension



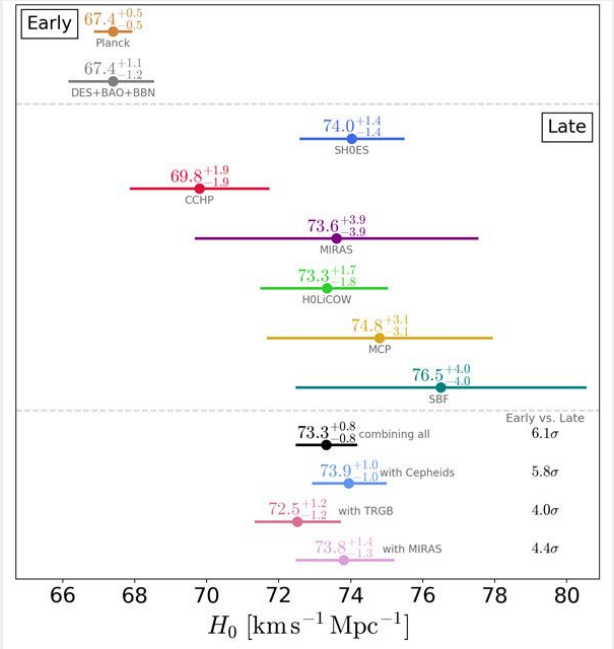
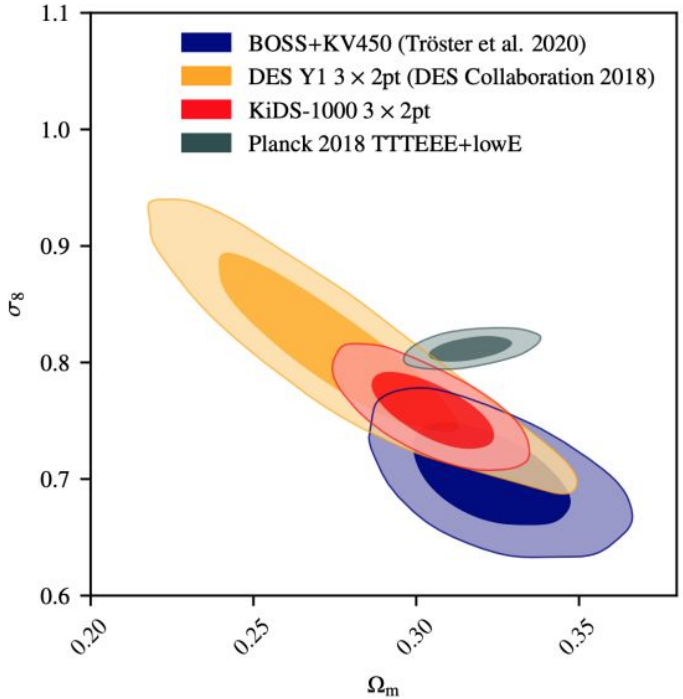


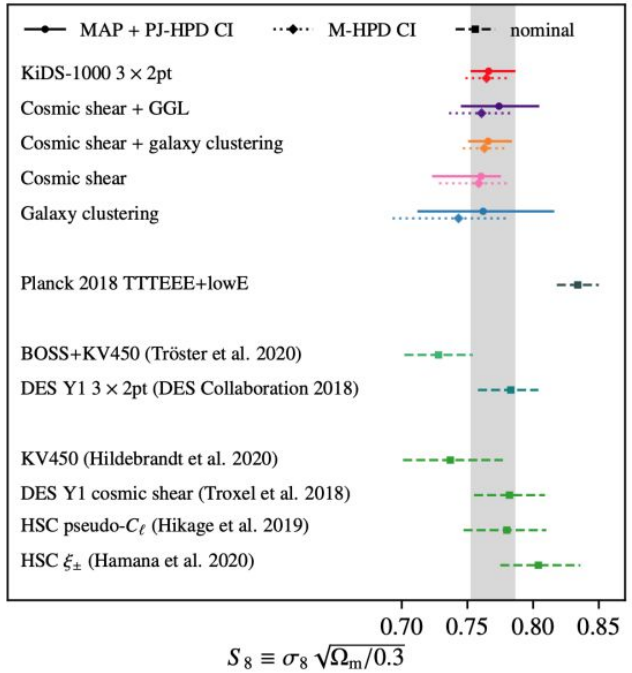
Fig 1(b)

CMB Planck data together with BAO, BBN, and DES have constraint the Hubble parameter to be H0 ~ (67.0 – 68.5)km/s/Mpc. On the other hand, cosmic distance ladder and time delay measurement like those reported by SH0ES and H0LiCOW collaborations have reported H0 = (74.03 ± 1.42) km/s/Mpc and H0 = (73.3 +1.7 −1.8) km/s/Mpc respectively by observing the local Universe.

arXiv: 2008.11284

σ_8 Tension





Apart from the Hubble tension, another tension between the Planck data with the weak lensing and the redshift surveys has been reported.

arXiv:2008.11285

Encouragement for Cosmologist to think beyond ΛCDM.