

Probing H_0 isotropy and bulk flows with eROSITA and galaxy cluster scaling relations

Sunday 10 September 2023 12:00 (30 minutes)

The expansion isotropy of the Universe and the dissipation of bulk flows at >200 Mpc scales is a crucial assumption of Λ CDM. Any significant, observational deviation from this consensus can strongly challenge the standard cosmological model. Multiwavelength scaling relations of galaxy clusters are an excellent and powerful tool to scrutinize both the Hubble constant (H_0) isotropy and the existence of bulk flows at large scales. This becomes feasible by studying the directionality of scaling relations between cluster properties that do or do not depend on cosmological assumptions. Using 540 X-ray clusters at $z < 0.4$, we robustly detected a 9% H_0 anisotropy at a 5.4 sigma level. Alternatively, this anomaly can be attributed to a 900 km/s cluster bulk flow extending up to 500 Mpc. Both scenarios are in strong tension with Λ CDM and have clear implications to the Hubble tension. Interestingly, the 1st eROSITA cluster catalog independently confirms this cosmic anisotropy within $z < 0.2$. Further confirmation comes from using new X-ray cluster measurements, forming much more precise scaling relations than before, boosting the detection of a large bulk flow out to ~ 600 Mpc to 6 sigma. Finally, the use of the hydrodynamical, Λ CDM FLAMINGO simulations confirms the rarity of our findings.

Presenter: Prof. MIGKAS, Konstantinos (Leiden University)