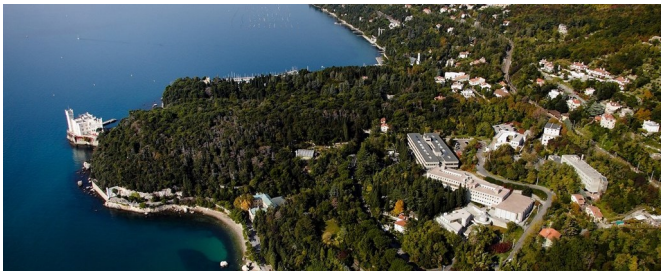

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Could enhanced structure formation ease large-scale cosmological tensions?

Thursday 31 August 2023 15:25 (25 minutes)

The "Standard Model of Cosmology"(ΛCDM) is increasingly in tension with new observations. High redshift galaxies observed by JWST and clusters such as El Gordo appear to be too massive too early, whilst supervoids are more frequent and underdense than expected. Local bulk flows also appear to be larger than predicted and the Hubble Tension casts doubt onto our understanding of dark energy. A particularly interesting idea here is that outflows of matter from a local supervoid, for which evidence in near-IR, X-ray and radio already exists, may systematically enhance the local determination of the Hubble constant and ease the Hubble Tension. To test this hypothesis, we performed new Gpc-scale N-body simulations of the νHDM model, where supervoids analogous to the inferred "Local Hole"are already known to form frequently (Angus+ 2013) due to the enhancement of gravity. Initial results suggest that the enhanced structure formation alone can generically enhance the locally determined Hubble constant, even for vantage points outside of a Local Hole analogue. We also find that most vantage points observe a dipole in the Hubble constant. Finally, we investigate bulk flows on a few 100 Mpc scales to test if recent observations can be reproduced (Watkins+ 2023). Comparative simulations are also performed for ΛCDM and two models we dub "ΛHDM"and "νCDM", so that the indivdual contributions of enhanced gravity and dark matter are understood.

Presenter: RUSSELL, Alfie

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