ID de la contribución : **37** Tipo : **Oral presentation**

Wising up to CatWISE: using simulation-based inference to measure the cosmic dipole

martes, 15 de septiembre de 2026 16:10 (25)

We apply Simulation-Based Inference ('SBI') to the cosmic dipole problem for the first time, measuring the distribution of quasar counts over the sky in the infrared CatWISE2020 sample. Our SBI-based approach alleviates systematic effects arising from the WISE instrument itself and enables direct inference of the sample's dipole. We find a dipole that is twice as large as the CMB expectation but more seriously misaligned with the CMB direction ($\approx 3\sigma$), adding further evidence to the persistent 'dipole tension'. This remains a serious challenge for ΛCDM. However, our result highlights the power of SBI at machine-inferring a likelihood function in the presence of difficult systematics, which will make it a natural choice for robust inference with new datasets. For example, in the radio regime, the Rapid ASKAP Continuum Survey contains a wealth of unexplored information but has possible systematics that must be understood before measuring the dipole. SBI will be a natural technique to disentangle the signal from the systematic, shedding new light on the dipole tension.

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Clasificación de la sesión : Afternoon Session (Tuesday)