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Where is the cosmic rest frame? : the local Universe and the Cosmological principle

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The dipole anisotropy of the CMB is believed to be due to our motion with respect to the ‘CMB rest frame’ at 369 km/s. This should also cause a dipolar modulation in the number counts of distant sources, through aberration & Doppler boosting. We test this with various all-sky catalogues: NVSS & SUMSS radio galaxies, WISE galaxies & quasars, as well as GAIA-unWISE AGNs, consistently finding a significantly larger dipole than expected (implying velocities >1000 km/s) with statistical significance upto 3.3 sigma. These observations indicate a bulk flow between the matter & radiation rest frames in the local Universe, extending out to scales larger than is expected in LCDM. An observational effect of such a bulk flow would be a scale-dependent dipolar modulation in the deceleration parameter. We look for this in the SDSS-II/SNLS-III Joint lightcurve Analysis catalogue of SN Ia and find such a dipole with 3.9 sigma significance, while the evidence for isotropic acceleration simultaneously drops to 1.4 sigma. This talk will conclude by reviewing the history of supernova data fitting, focussing on statistical methods & data quality issues. Both dark energy & the Hubble tension seem to be artefacts of fitting data to an idealized model of the universe.

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