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## A test of the cosmological principle

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The standard model of cosmology assumes that the universe is statistically isotropic & homogeneous when averaged on scales exceeding  $\sim 100$  Mpc. That the CMB in fact exhibits a large dipole anisotropy is explained as due to our motion because of local inhomogeneity. This kinematic interpretation requires that there be a corresponding dipole in the sky distribution of high redshift objects. Using a new all-sky catalogue of 1.3 million quasars we find that this hypothesis is rejected at nearly  $4\sigma$  by the observed matter dipole. This calls into question the usual practice of boosting to the ‘CMB frame’ to analyse cosmological observations. In particular the acceleration of the Hubble expansion rate is also anisotropic in our heliocentric frame; it can no longer be convincingly argued that this can be made to look isotropic in the CMB frame and thus interpreted as due to  $\Lambda$ .

<https://arxiv.org/abs/2009.14826>

<https://arxiv.org/abs/1912.04257>

<https://arxiv.org/abs/1808.04597>

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