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Tightening dynamical dark energy constraints with galaxy alignments

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Recent 2σ–4σ deviations from the cosmological constant Λ suggest that dark energy (DE) may be dynamical, based on baryon acoustic oscillations and full-shape galaxy clustering analyses. This calls for even tighter DE constraints to narrow down its true nature. In this talk, I present how galaxy intrinsic alignments (IA) can enhance the full-shape galaxy clustering–based DE constraints, using Fisher forecasts on various extensions of dynamical DE models, including scenarios with curvature, massive neutrinos, and modified gravity. Incorporating IA improves the DE figure of merit by 42%–57% and tightens the primordial power spectrum amplitude constraints by 17%–19%. Our findings highlight IA's potential as a valuable cosmological probe complementary to galaxy clustering.

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