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Early Dark Energy meets massive neutrinos

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Early dark energy (EDE) alleviates the H_0 tension at the cost of increasing the clustering amplitude and worsening the S_8 discrepancy. Motivated by massive neutrinos' ability to suppress structure, we study their impact on EDE combining Planck and BOSS full-shape clustering data. A Bayesian analysis returns no evidence for a non-zero neutrino mass sum M_ν ($< 0.15, \mathrm{eV}$ at 95%˜C.L.), with limits driven primarily by shifts in the BAO scale. A frequentist profile likelihood analysis reveals a correlation between M_ν and the EDE fraction $f_{\rm EDE}$, which keeps H_0 fixed as M_ν increases. Compared to the best-fit baseline EDE model ($M_\nu = 0.06, \mathrm{eV}$), a model with $M_\nu = 0.15, \mathrm{eV}$ maintains the same H_0(km/s/Mpc)=(70.08, 70.12, respectively) whilst decreasing S_8=(0.837, 0.831 respectively), whilst still representing a better fit ($\Delta\chi^2 = -3.1$) relative to ΛCDM. Our results indicate that an EDE+M_ν model can keep the H_0 tension at the same level as baseline EDE while mitigating the enhanced clustering issue.

Presenter: Mr REEVES, Alexander (ETHZ)