Contribution ID: **109** Type: **Plenary/Parallel talk**

Early dark energy meets neutrinos

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_{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. Further analysis of this model and neutrino mass measurements in general require the careful addition of extra datasets. I will also present preliminary work on the extension of a multi-probe combination analysis at map-level of a broad combination of cosmological data sets. This approach provides strong constraints on the LCDM model, its extensions and systematics, through the combination of both auto- and cross-correlations of the different probes.

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Session Classification: Poster session