ID de Contribution: **63** Type: **Non spécifié**

Tomographic Coupled Dark Energy

jeudi 17 novembre 2022 12:10 (20 minutes)

We introduce a tomographic coupled dark energy model, an extension of the coupled quintessence model in which coupling strength between the scalar field, playing the role of dark energy, and dark matter particles, is allowed to vary with redshift. We bin the redshifts and let coupling vary within each tomographic bin, subsequently testing 3 different binning regimes where the choice of bin edges were largely motivated by the datasets we have chosen to use. We employ CMB data from *Planck*, the Atacama Cosmology Telescope (ACT) and South Pole Telescope (SPT), as well as a range of low redshifts probes such as measurements of the BAO peak, RSD, latest Type 1a supernovae measurements, cosmic chronometers, and the updated value for H_0 as reported by SH0ES. For the first time, we also utilise weak lensing data consisting of cosmic shear, galaxy clustering and their 3x2pt from the KiDS-1000 and BOSS surveys as late-time probes to constrain coupling strength at low redshifts. We see that in such a tomographic CDE framework, there can be much variation of coupling strength between different epochs, and that it is considerably unconstrained especially at low redshifts. Moreover, we find that favouring a non-null coupling can bring the value of S_8 measured from weak lensing data closer in agreement with *Planck* fiducial cosmology, making weak lensing a powerful probe to constrain such CDE models.

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Classification de Session: Review and contribution talks