Contribution ID: **71** Type: **Talk**

k-evolution and the trace of a new instability in the EFT framework.

Wednesday 4 September 2019 14:55 (25 minutes)

The physical reason for the observed acceleration of the Universe is one of the most important mysteries in cosmology. This is also one motivation for the next generation of large galaxy surveys like Euclid, LSST or SKA that will observe billions of galaxies to provide galaxy number counts and weak lensing measurements. In the first part of my talk, I'm going to show a systematic extension of the Effective Field Theory of Dark Energy framework to non-linear clustering. As a first step, we have studied the k-essence model and have developed a relativistic N-body code, k-evolution. I'm going to talk about the k-evolution results, including the effect of k-essence perturbations on the matter and gravitational potential power spectra and the k-essence structures formed around the dark matter halos.
In the second part of my talk, I'm going to show for some choice of parameters the k-essence non-linearities suffer from a new instability and blow up in finite time.

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Session Classification: Parallel Sessions: Modified Gravity and Dark Energy (C.A.R.L., H03)

Track Classification: Modified Gravity and Dark Energy