BEYOND ΛCDM WITH HALO MODEL RESPONSES

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LSS CHALLENGE

Observations goal:

Measure LSS with per-cent level precision

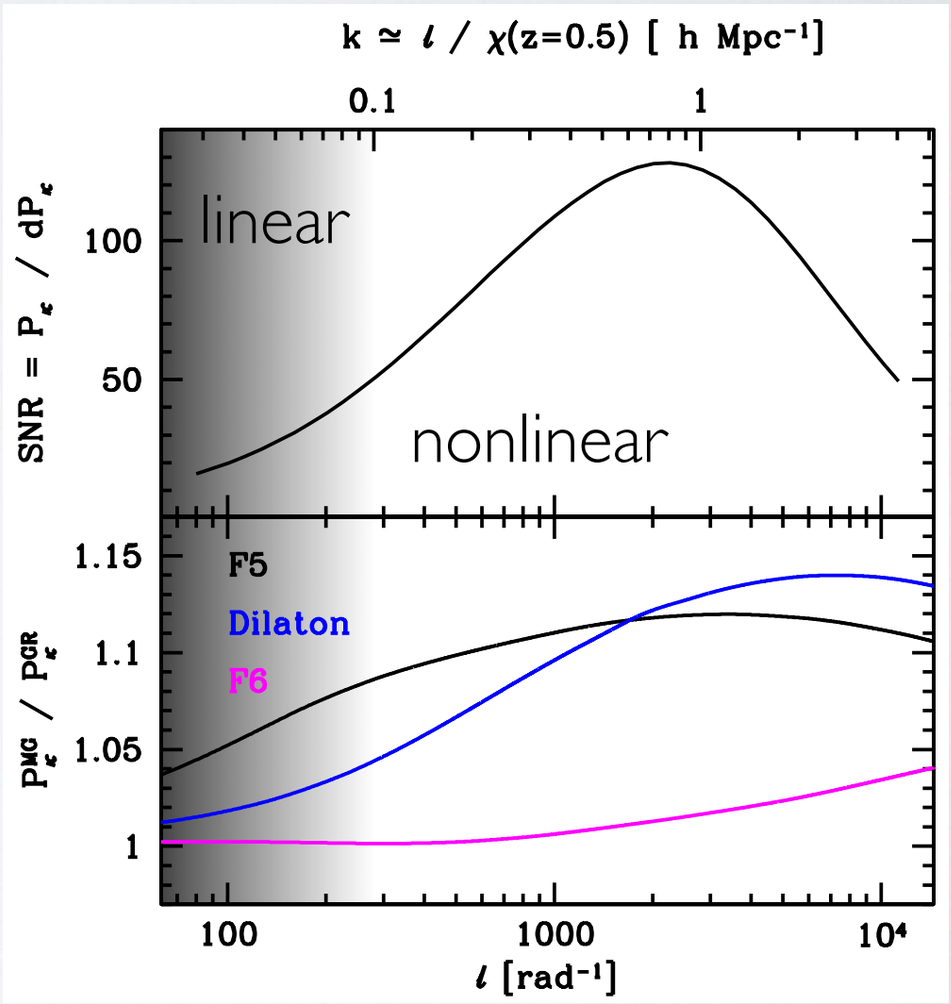
Large Synoptic Survey Telescope

Theory goal:

Keep up with observations!

Framework for fast, accurate and general calculations

euclid



HALO MODEL RESPONSES

Reference cosmology

GR+ΛCDM cosmology with ICs adjusted to match target cosmology $P_{\rm lin}(k,z_0)$

Response: $$\mathcal{R}(k,z) \equiv \frac{P_{\rm HM}^{\rm target}(k,z)}{P_{\rm HM}^{\rm ref}(k,z)}$$

large scales $\Rightarrow \mathcal{R} = 1$

small scales $\Rightarrow \mathcal{R} \approx \dfrac{P_{\rm 1h}^{\rm target}(k,z)}{P_{\rm 1h}^{\rm ref}(k,z)}$

intermediate scales ⟶ SPT + $n_{\ln M}^{\rm target}/n_{\ln M}^{\rm ref}$

Power spectrum: $$P_{\rm NL}^{\rm target}(k,z) = \mathcal{R}(k,z) \times P_{\rm NL}^{\rm ref}(k,z)$$

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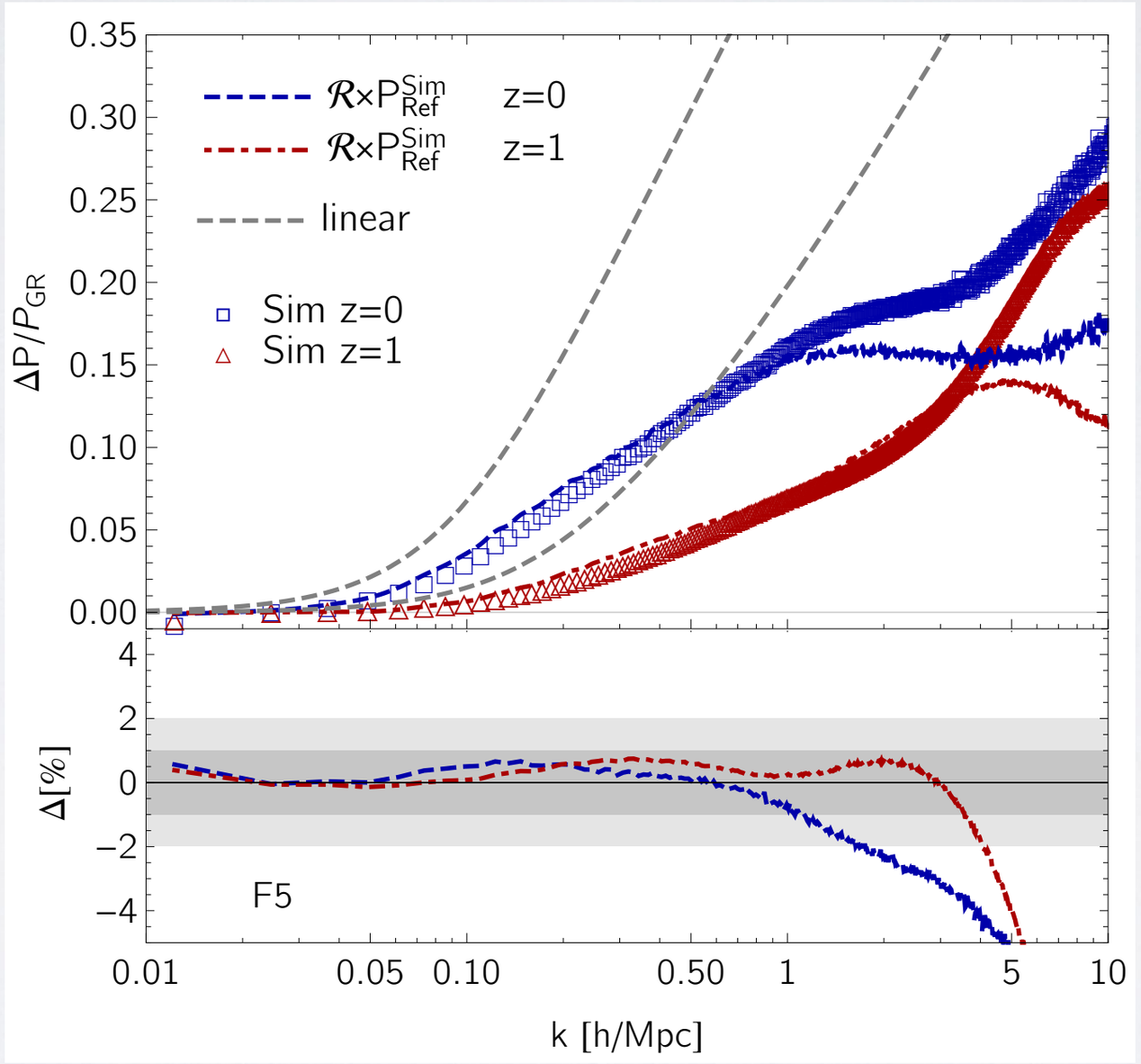
f(R) gravity



Cataneo et al. in prep.

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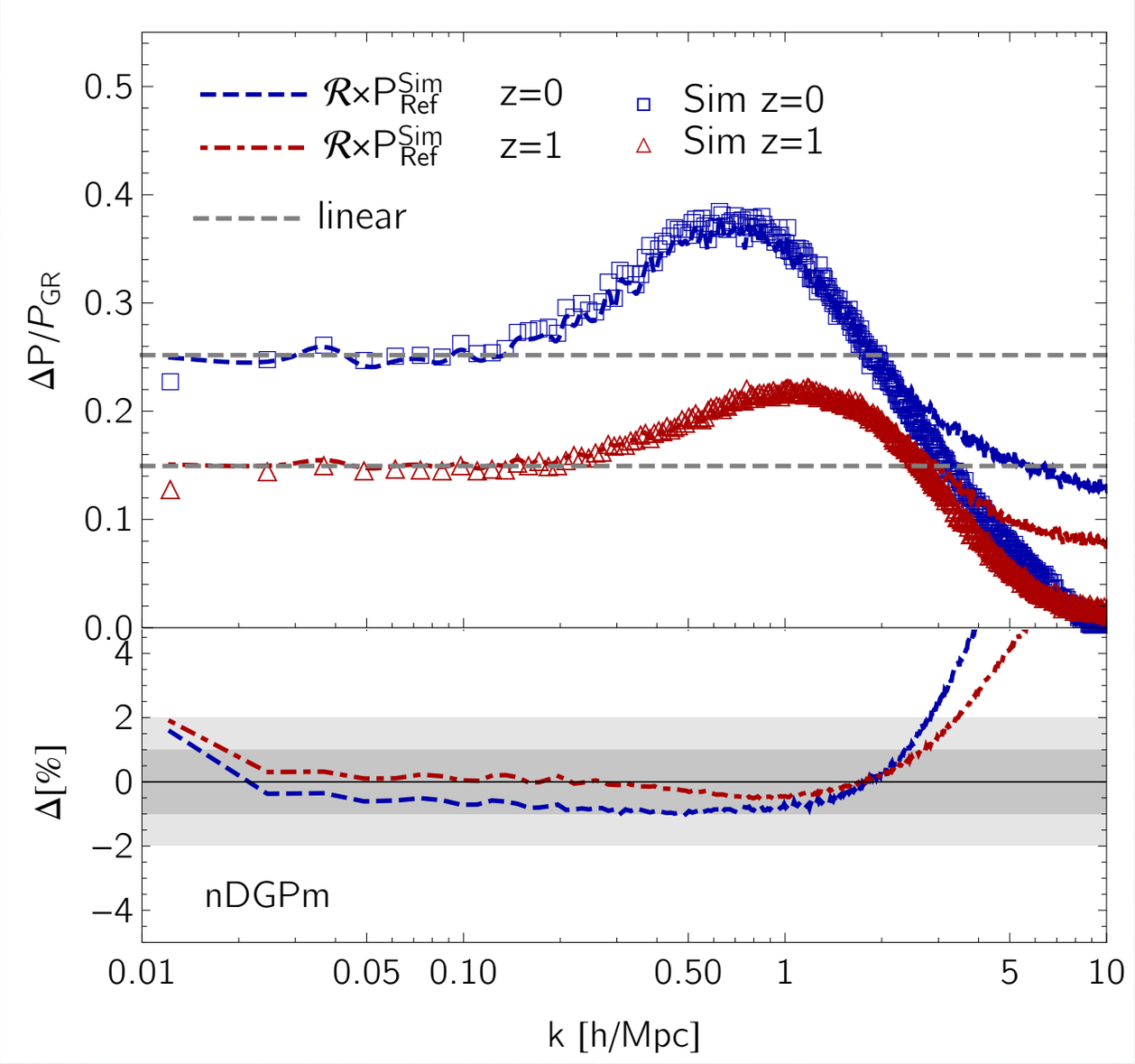
nDGP



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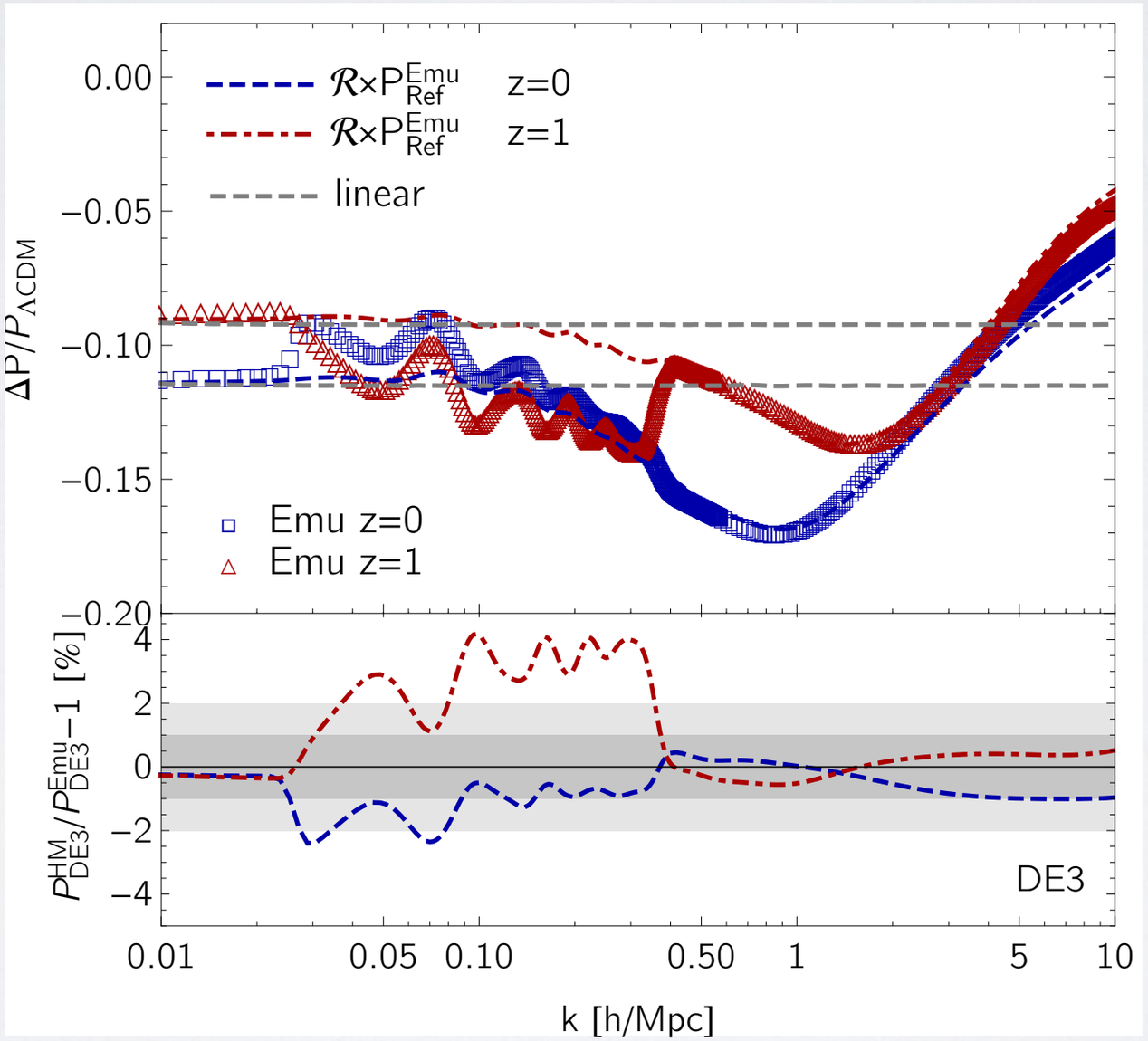
Evolving DE
(w_0=-1 w_a=0.5)



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OUTLOOK

- Clustering dark energy (w/ D Rapetti)
- K-mouflage (w/ P Brax & C Llinares)
- Generalisation to Horndeski theory
- Massive neutrinos (w/ J Harnois-Déraps, D Inman, JD Emberson)
- Improve highly nonlinear regime ($1 < k\,\mathrm{Mpc}/h < 10$)
- Include baryonic physics
- *Reference*-cosmology emulator (DM-only GR+ΛCDM)