

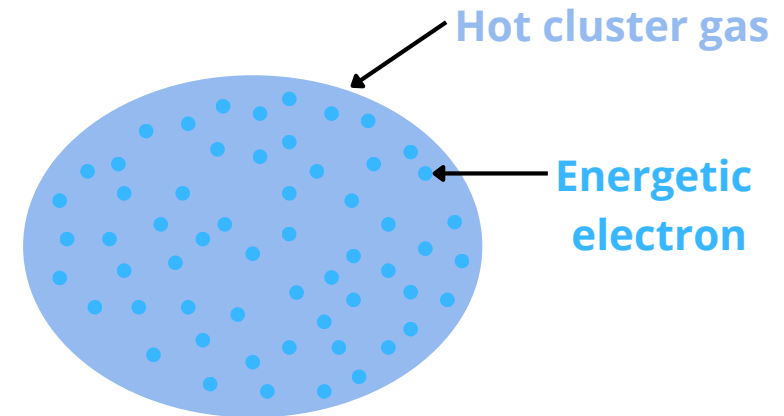
Impact of a w CDM cosmology on the tSZ power spectrum

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Work done in collaboration with Karim Benabed & Yohan Dubois

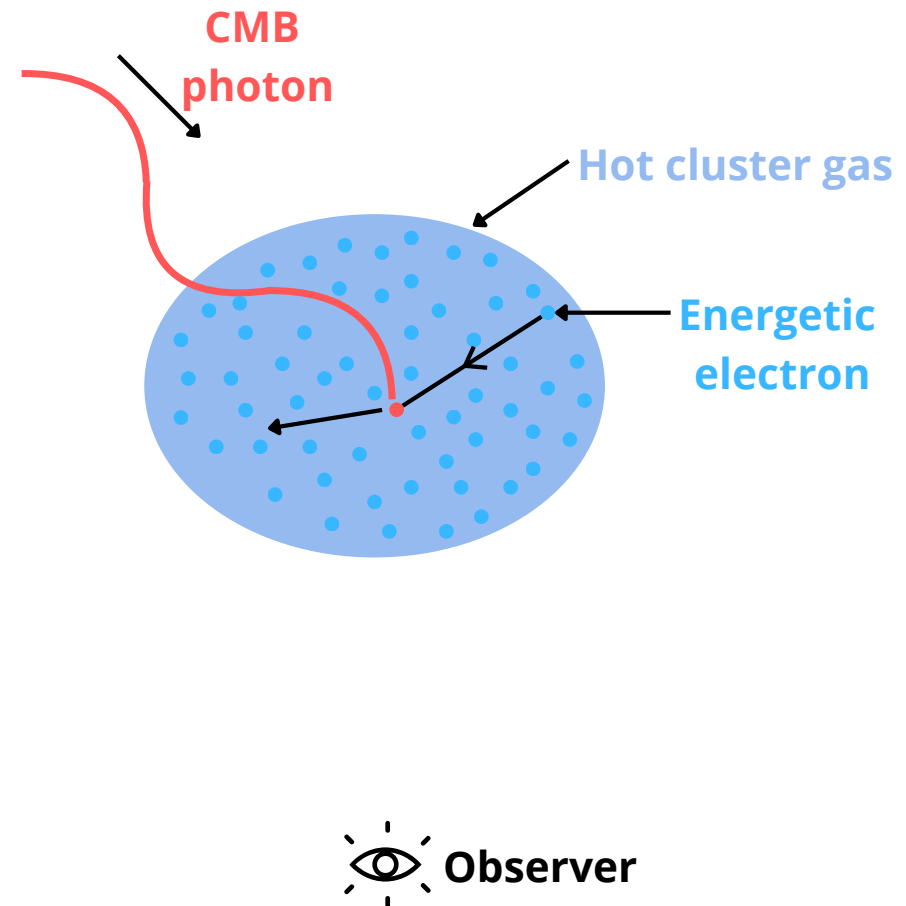
Effet Sunyaev-Zel'dovich thermique

- Comes from the **thermal electrons**, which reside mostly in **galaxy clusters**



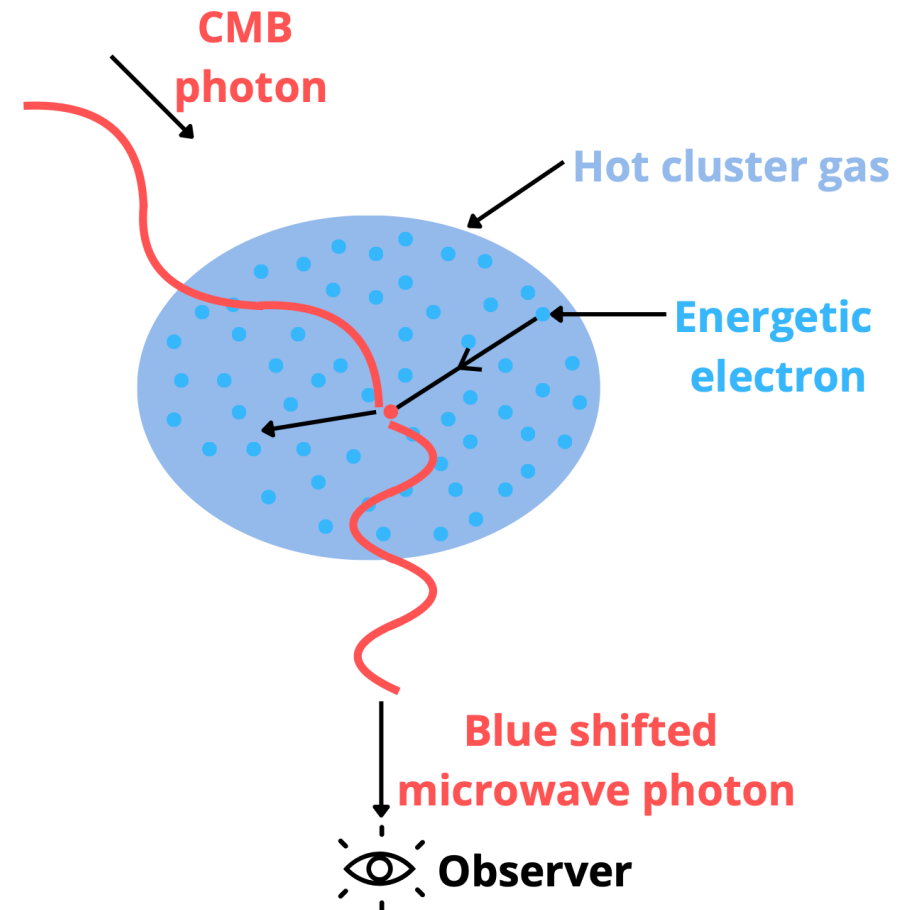
Effet Sunyaev-Zel'dovich thermique

- ▶ Comes from the **thermal electrons**, which reside mostly in **galaxy clusters**
- ▶ Energy is transferred from **hot electrons** to **CMB photons** through **inverse Compton scattering**

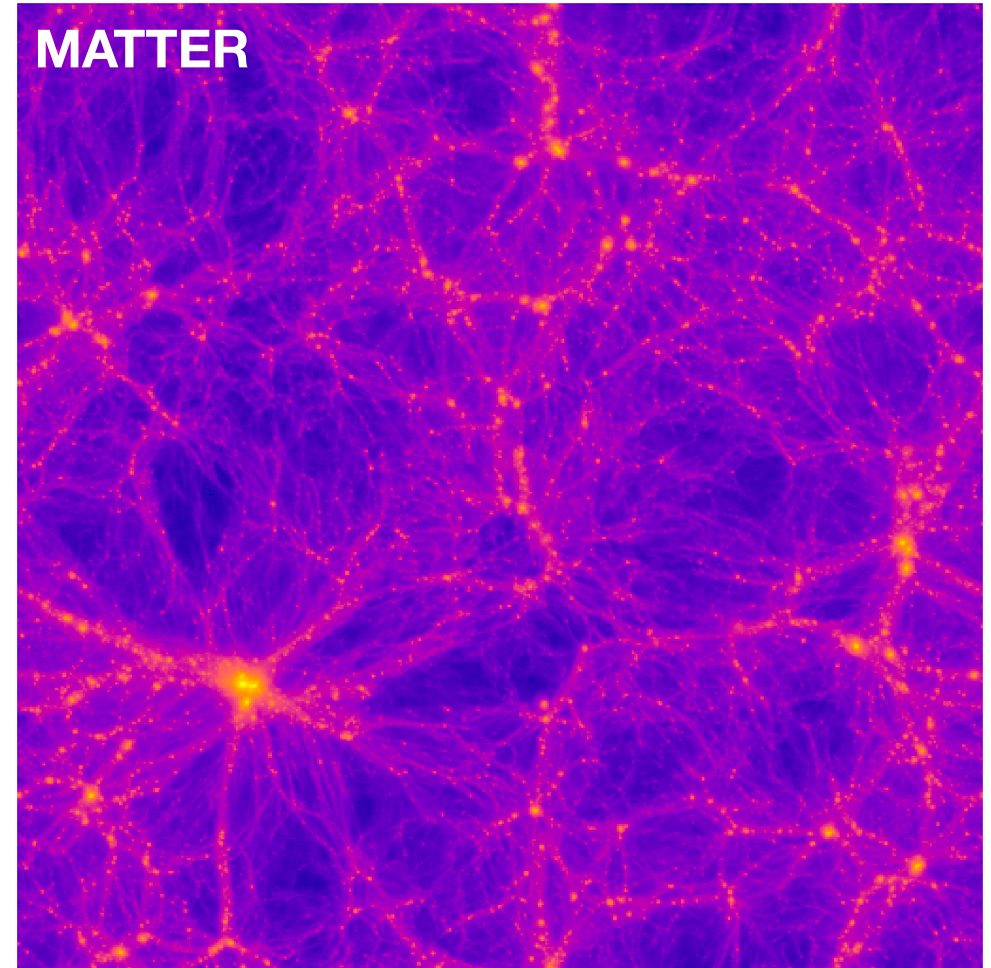
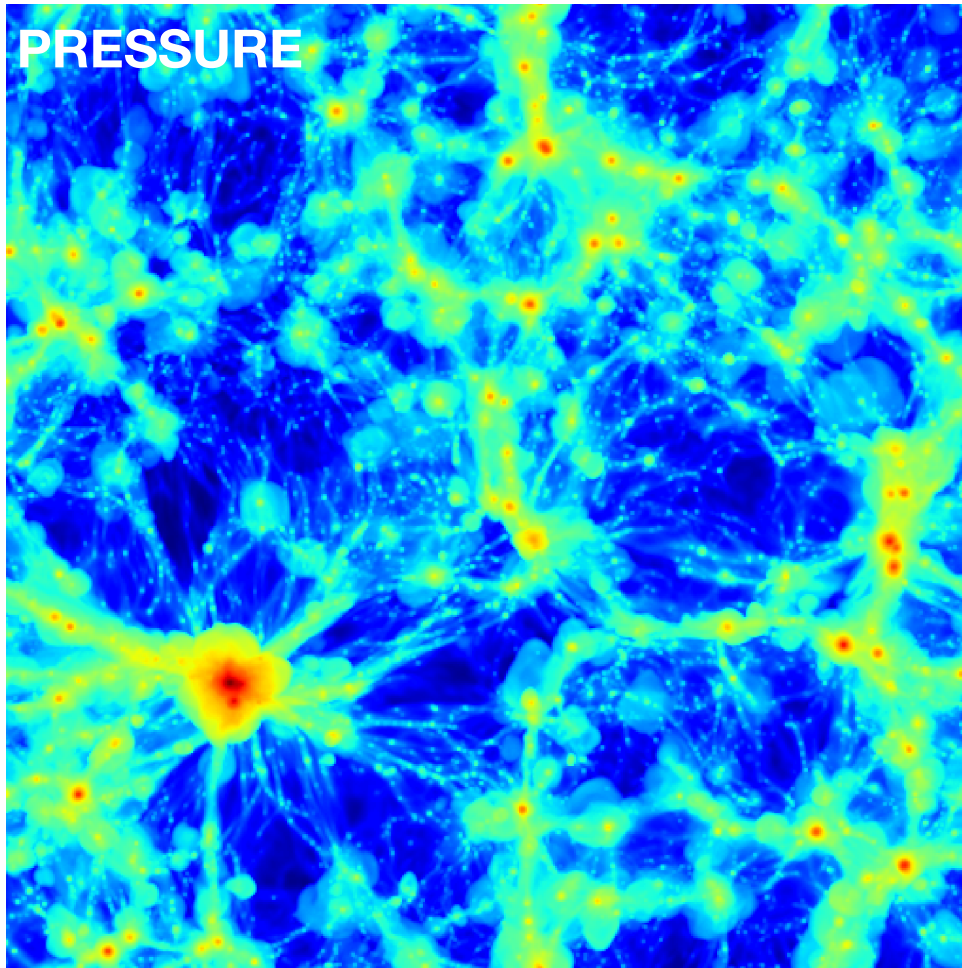


Effet Sunyaev-Zel'dovich thermique

- ▶ Shift in **energy**
- ▶ Information about the late time Universe
- ▶ Dependence: **gas density and temperature**
- ▶ Electron pressure along the line of sight



Horizon-AGN



L896_wCDM simulations

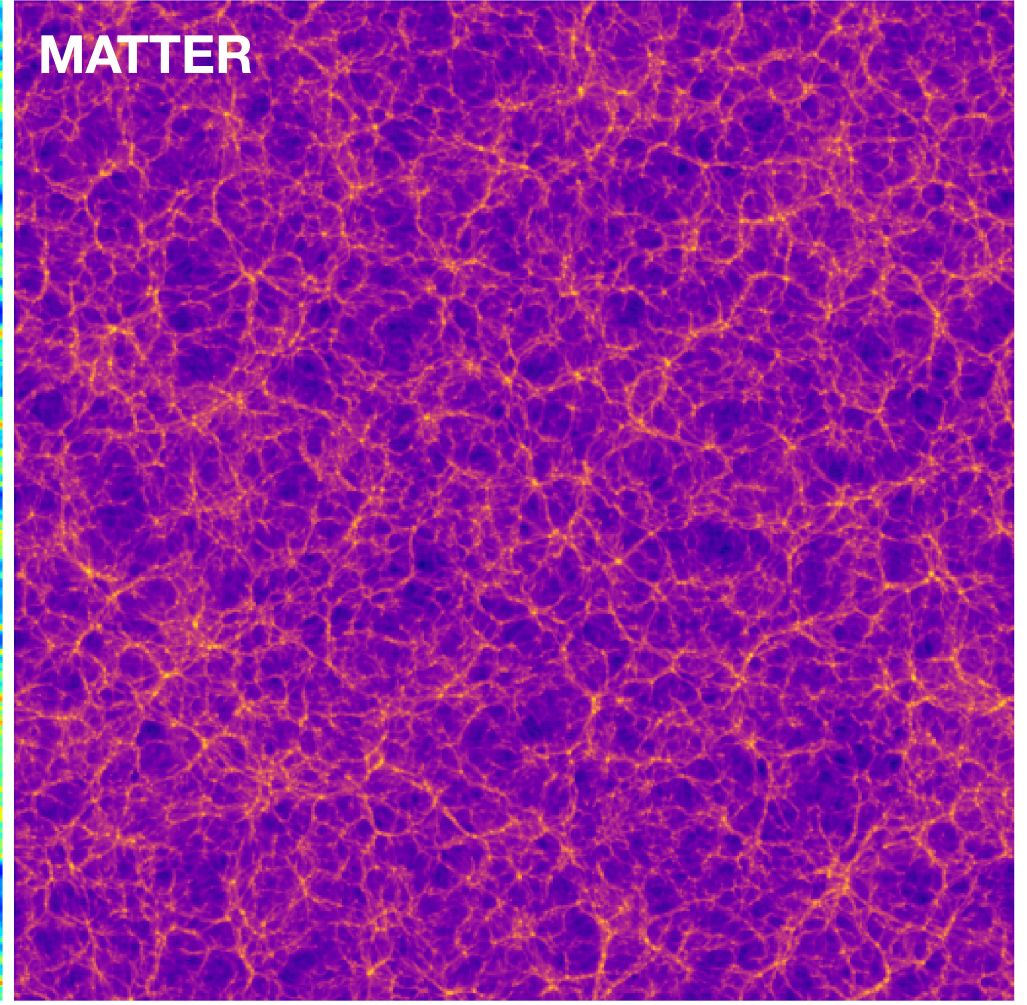
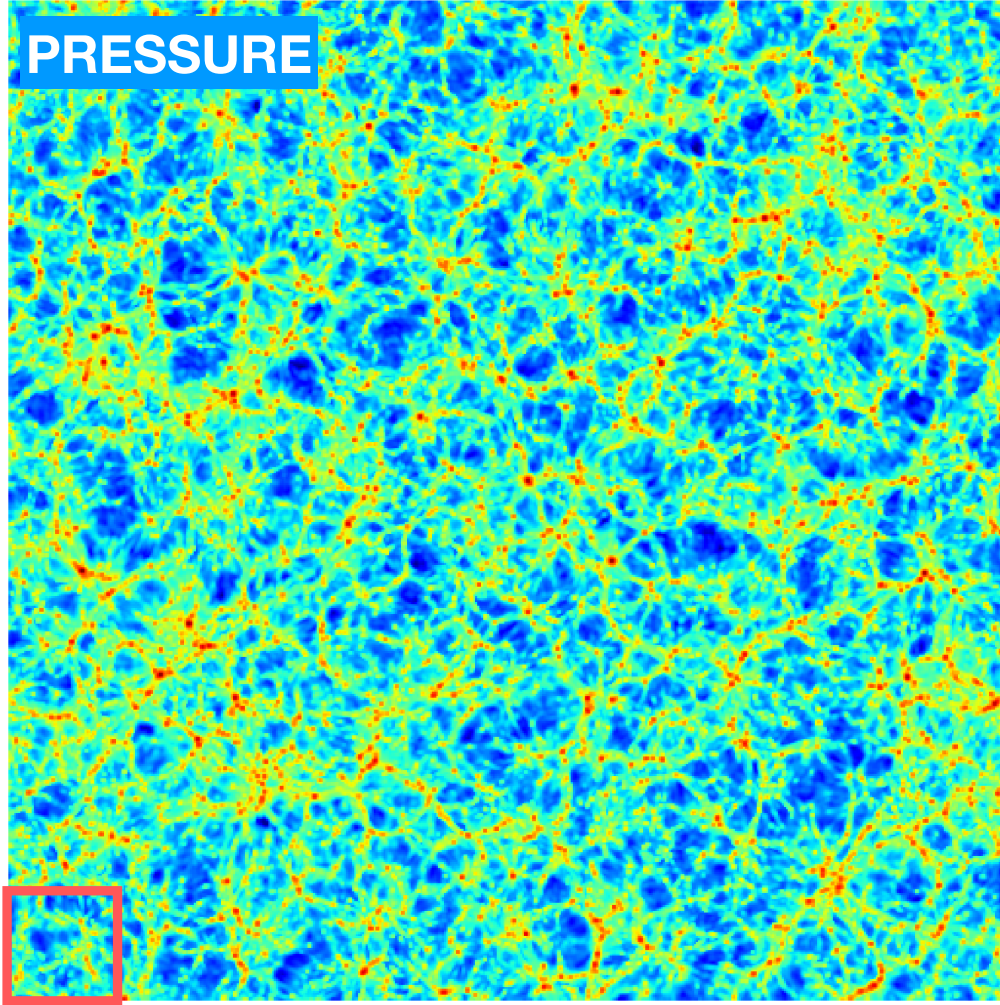
- ▶ Cosmological hydrodynamical simulations
 - ▶ $896 h^{-1}\text{Mpc}$ comoving volume, 1024^3 DM particle $\rightarrow M_{\text{DM,res}} = 6 \times 10^{10} M_{\odot}$
 - ▶ Gas cooling and heating, no galactic physics
 - ▶ Initial condition using 2LPT
 - ▶ **Cosmology $w\text{CDM}$:** $P = w\rho$ with different w
 - $w(a) = w_0 + w_a(1 - a)$
 - $w = -0.8, w = -1, w = -1.2$
- Equivalent to ΛCDM

L896_wCDM simulations

PRESSURE

MATTER

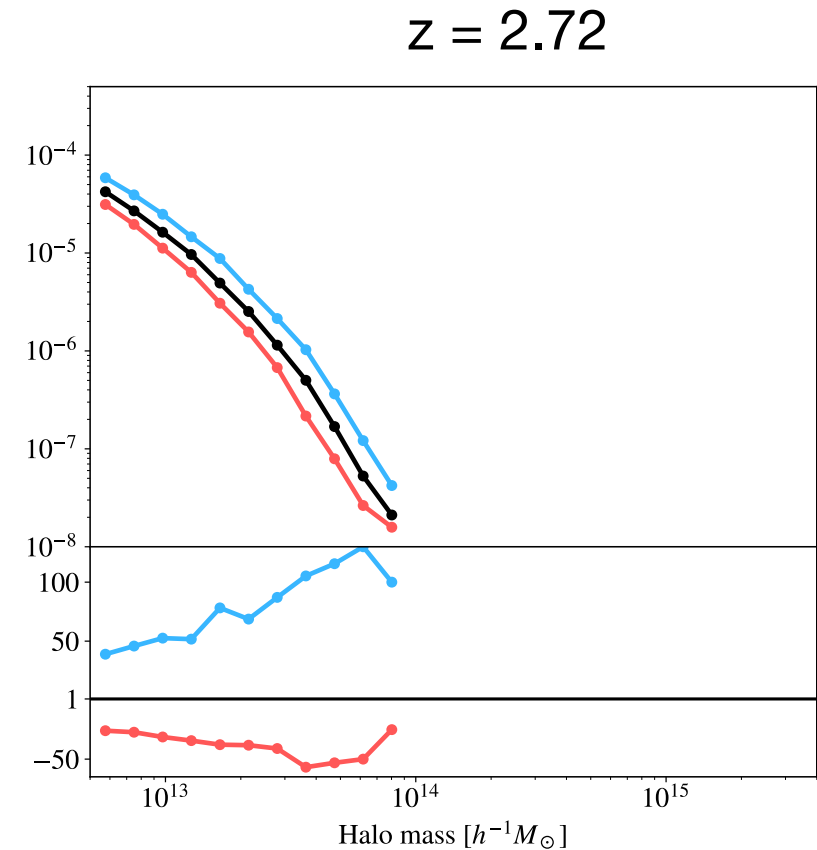
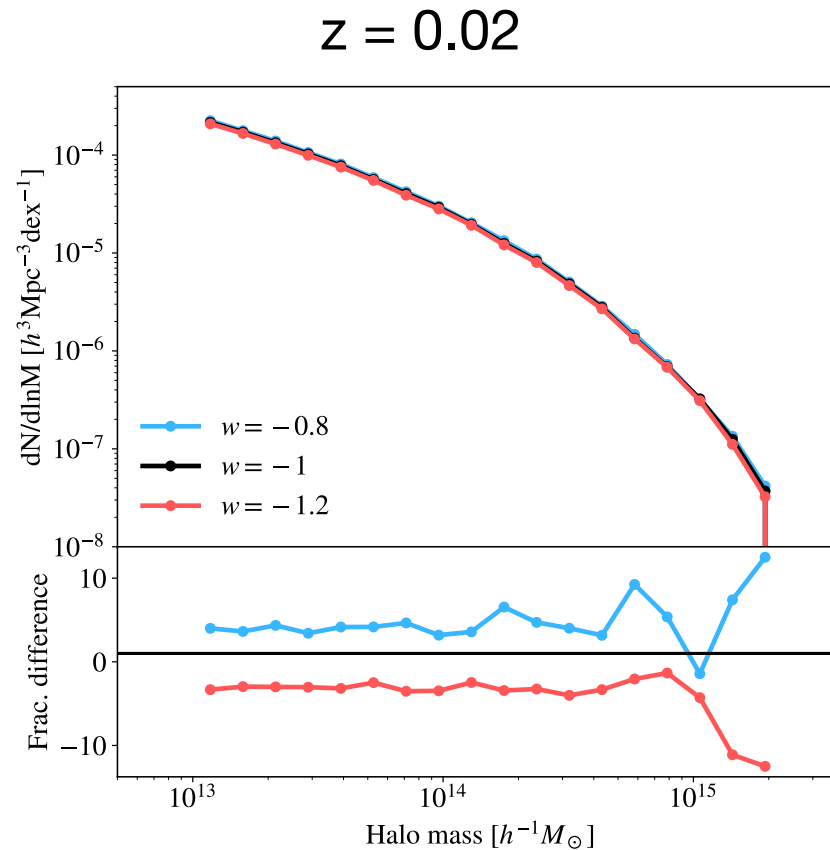
Size of Horizon-AGN



Halo mass function

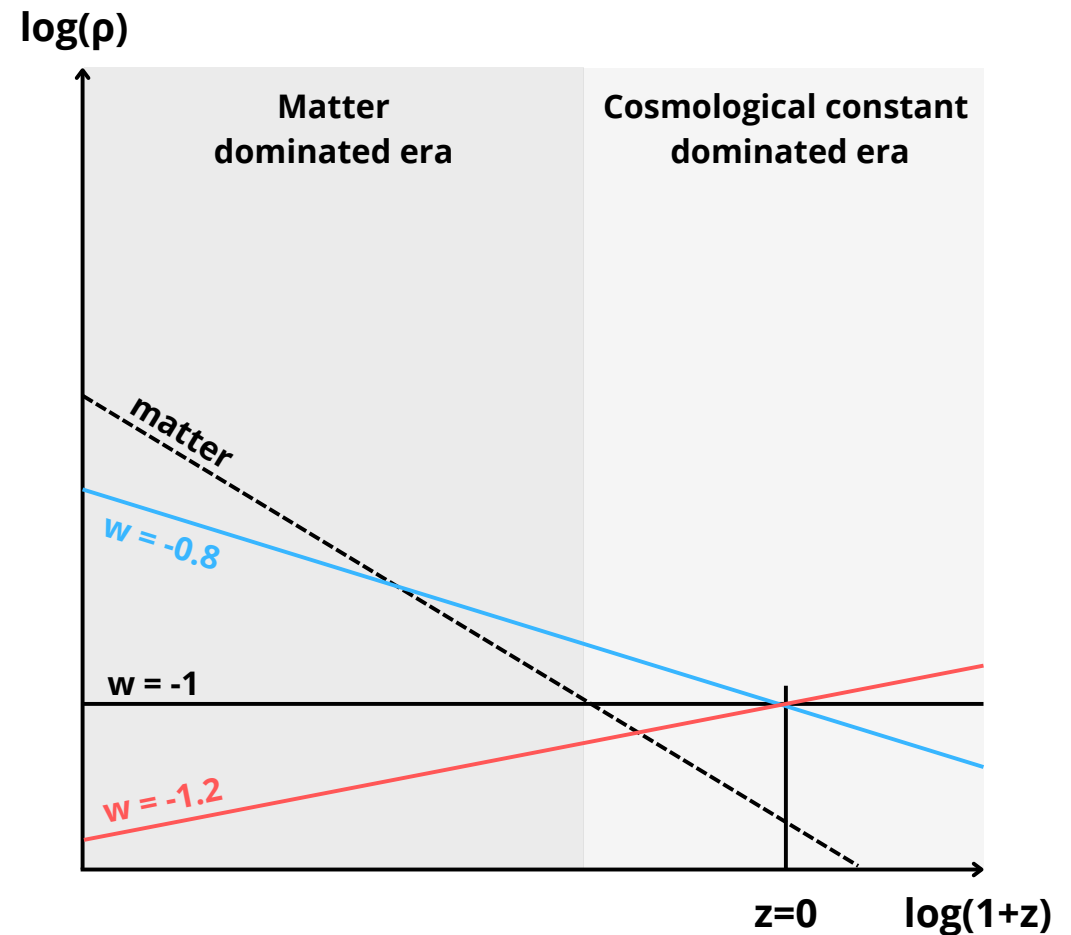
- Dark energy impacts the growth of structures

- $P = w\rho$



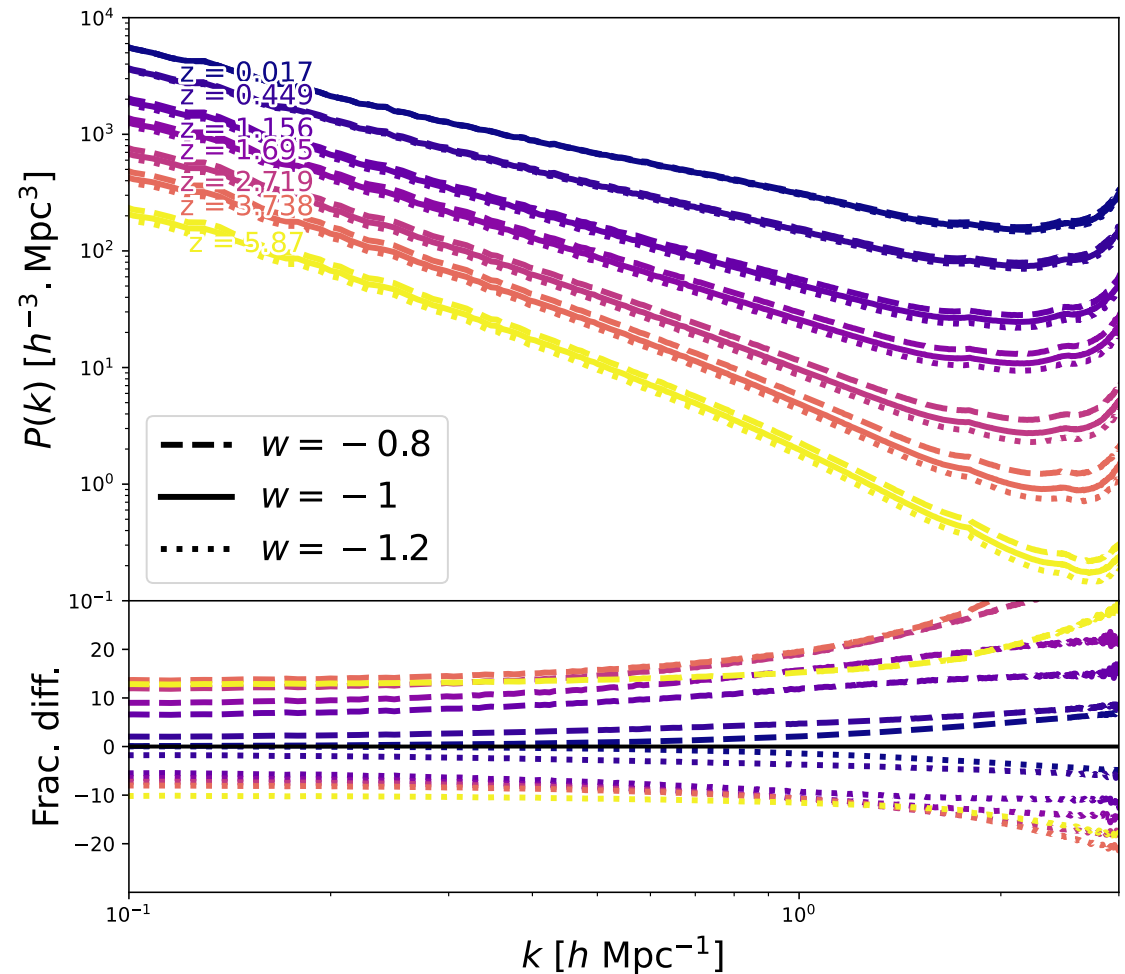
Growth of structures

- ▶ σ_8 imposed
- ▶ $w = -0.8$ accelerated expansion starts earlier
→ growth of structures is slower
→ **structure more developed earlier**
- ▶ Opposite trend for $w = -1.2$



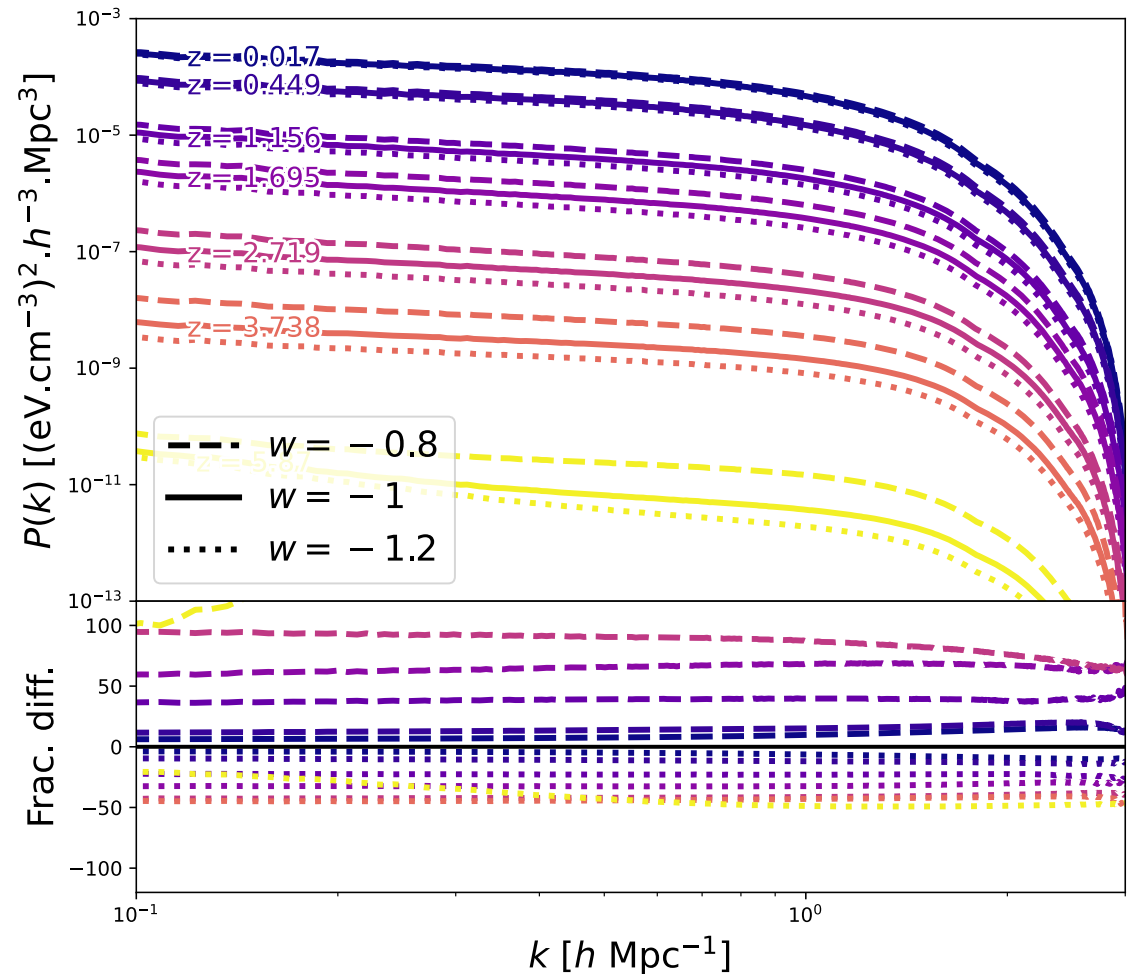
Matter power spectrum

- ▶ Power increases from $w = -0.8$ to $w = -1$ to $w = -1.2$
- ▶ These trends are expected



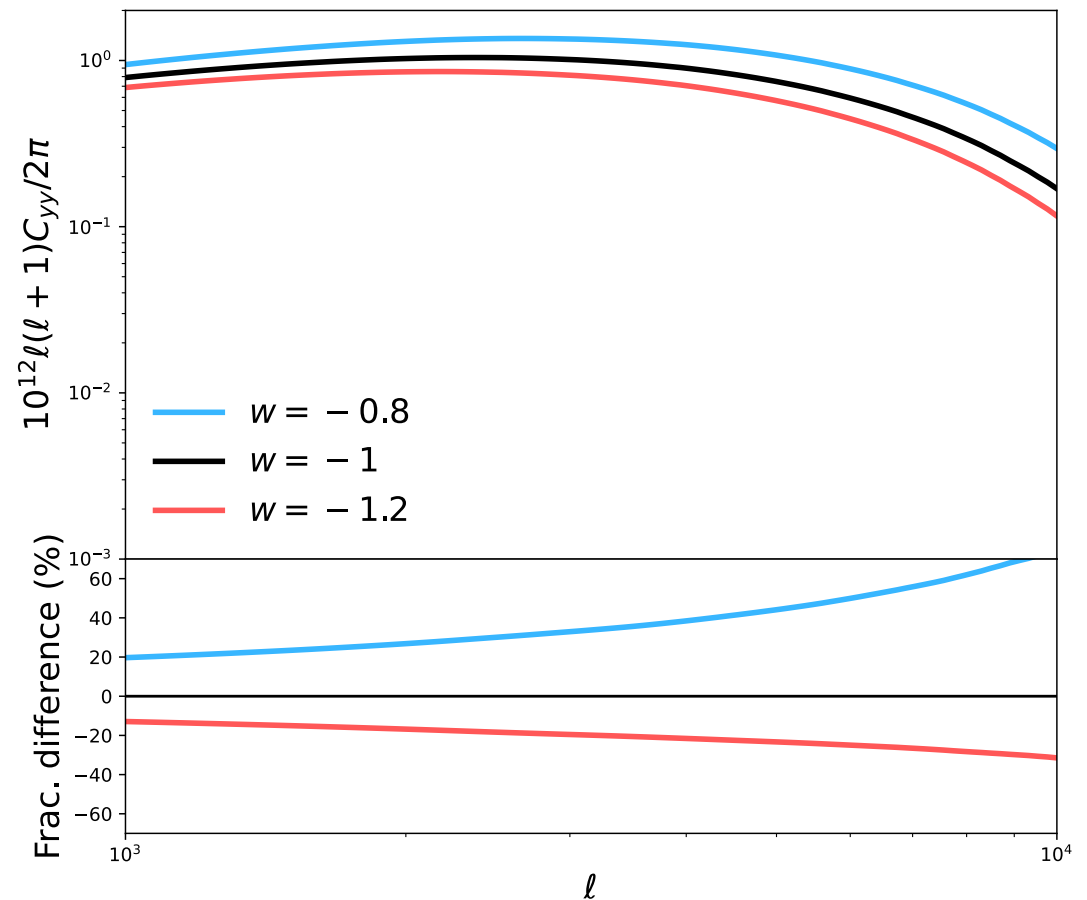
Pressure power spectrum

- ▶ Power increases from $w = -0.8$ to $w = -1$ to $w = -1.2$
- ▶ **These trends are expected**
- ▶ **Can it be predicted by simple quantity?**



Angular pressure power spectrum

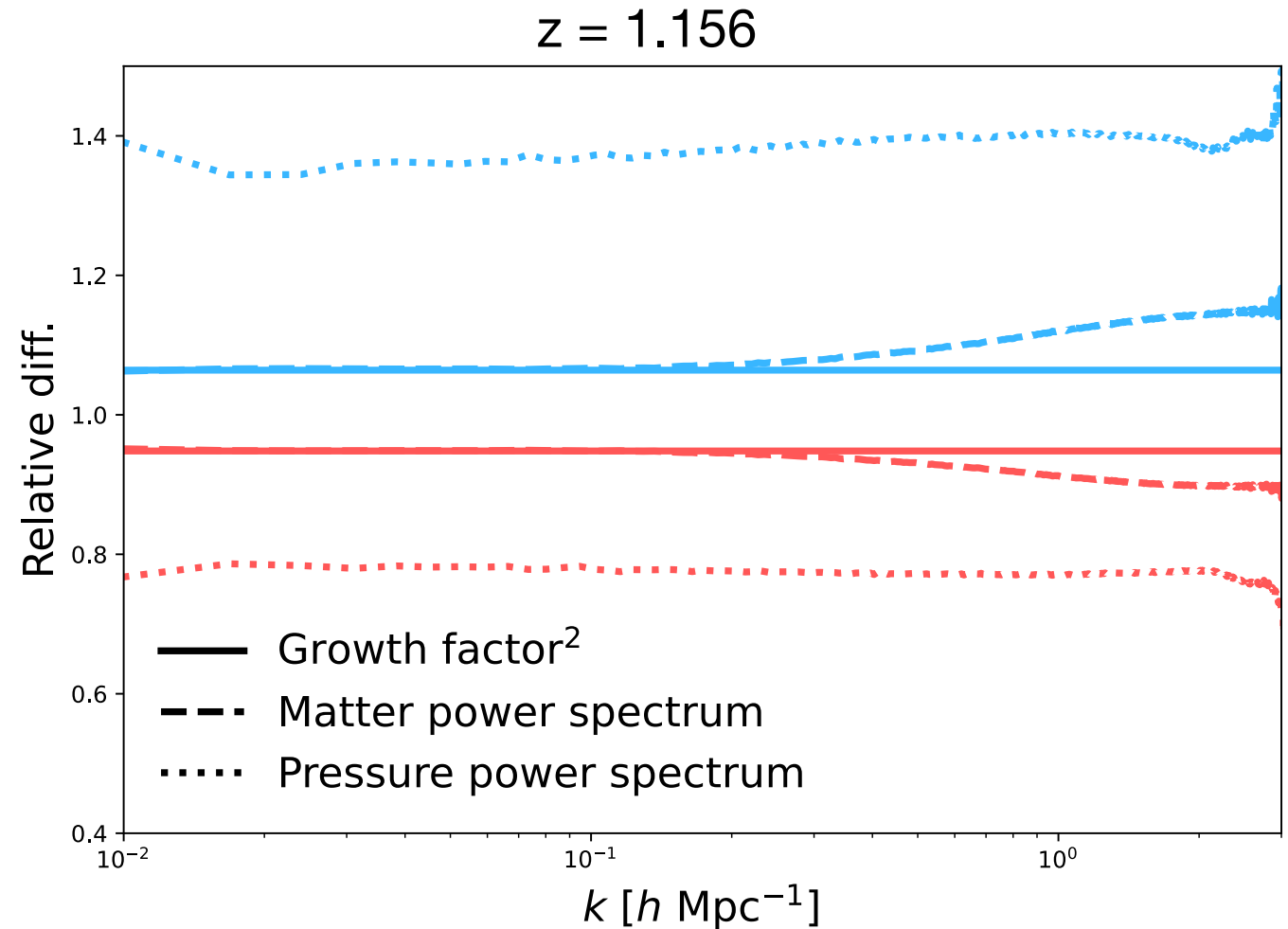
- ▶ $w = -0.8$: 20% to 80% more power
- ▶ $w = -1.2$: 15% to 40% less power



Predictability of the spectrum

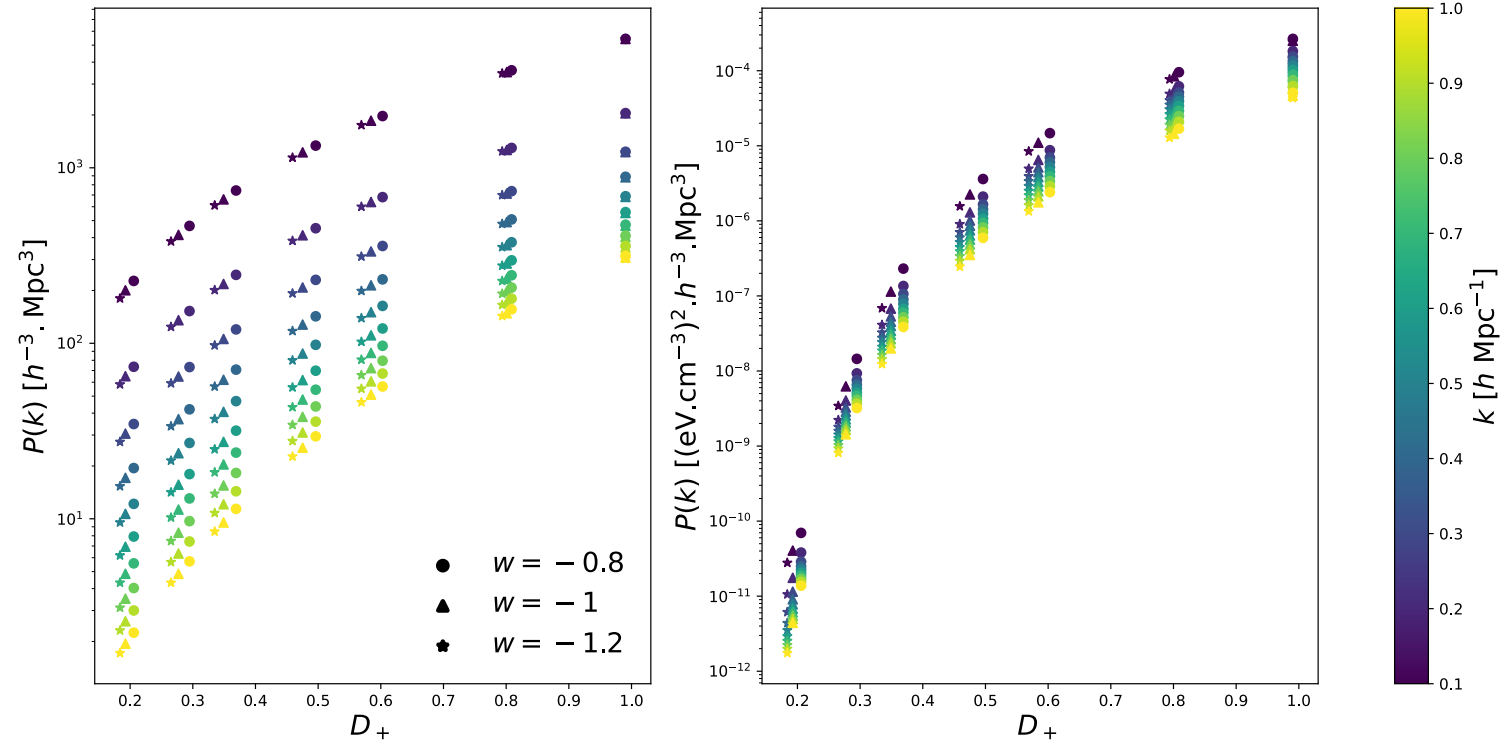
$$\frac{w = -0.8}{w = -1}$$

$$\frac{w = -1.2}{w = -1}$$



Predictability of the spectrum

- ▶ Is the scaling a function of D_+ ?
- ▶ Go to the ratios
- ▶ Find the fitting function



Conclusions

- ▶ Impact of w on the halo mass function, matter and pressure power spectrum
 - $w = -0.8 \rightarrow$ more halos, more massive halos, more power (matter & pressure)
 - Growth factor alone seems to be not enough to predict the trends
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Perspectives

- ▶ Try to predict the trends
- ▶ New suite of simulations with a $w_0 w_a$ CDM cosmology
- ▶ Impact on other properties: profile, concentration,...

Next steps

- ▶ Use more realistic baryonic physics → **Horizon-AGN-like setup**
 - What power are we loosing if we keep the simple physic?
- ▶ Go from w CDM to **$w_0 w_a$ CDM** cosmologies ($w(a) = w_0 + w_a(1 - a)$)
- ▶ Good balance between volume, resolution and physical processes included
 - → map the **$w_0 - w_a$ plane**
 - → **degeneracies between cosmological and astrophysical parameters** thanks to a few simulations that vary keys physical processes