

Hubble Parameter Estimation With CORN

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With no assumptions on cosmology...

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$$H(z) = \frac{\dot{a}}{a} = - \frac{1}{1+z} \frac{dz}{dt}$$

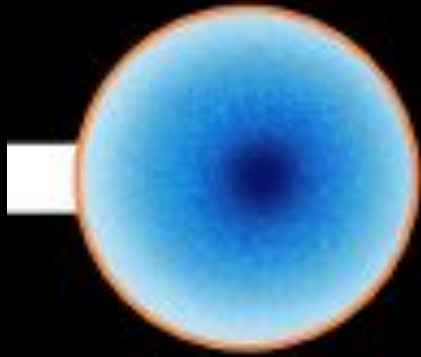
With no assumptions on cosmology...

$$H(z) = \frac{\dot{a}}{a} = - \frac{1}{1+z} \frac{dz}{dt}$$

**We need a population
of synchronised
tracers**

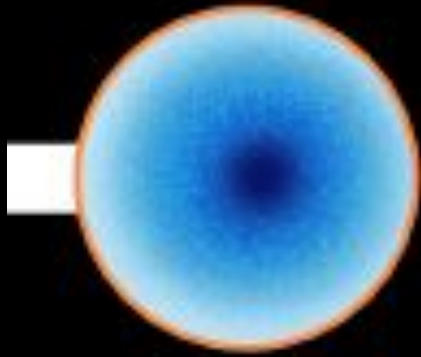
**We need a population
of synchronised
tracers**

**Massive & Passive
galaxies**



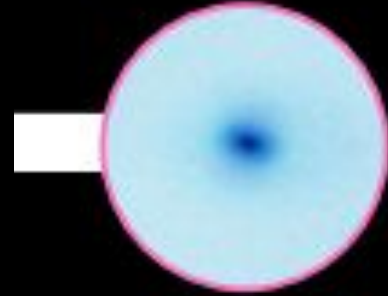
VS

Local giant
early-type
galaxy



Local giant
early-type
galaxy

VS



RELICS!!

$$\begin{aligned} \text{Cov}_{ij}^{\text{tot}} = & \text{Cov}_{ij}^{\text{stat}} + 10\% \sigma \\ & + \text{Cov}_{ij}^{\text{met}} + \text{Cov}_{ij}^{\text{young}} + 2\% \sigma \\ & + \text{Cov}_{ij}^{\text{SFH}} + \text{Cov}_{ij}^{\text{IMF}} + \text{Cov}_{ij}^{\text{st.lib.}} + \text{Cov}_{ij}^{\text{SPS}} \\ & + 3\% \sigma + 1\% \sigma + 7\% \sigma + 5\% \sigma \end{aligned}$$

$$\begin{aligned} \text{Cov}_{ij}^{\text{tot}} = & \text{Cov}_{ij}^{\text{stat}} + 10\% \sigma + \text{Cov}_{ij}^{\text{young}} + \text{Cov}_{ij}^{\text{met}} + \text{Cov}_{ij}^{\text{SFH}} + \text{Cov}_{ij}^{\text{IMF}} + \text{Cov}_{ij}^{\text{st.lib.}} + \text{Cov}_{ij}^{\text{SPS}} \\ & + \text{Cov}_{ij}^{\text{young}} + \text{Cov}_{ij}^{\text{SFH}} + \text{Cov}_{ij}^{\text{IMF}} + \text{Cov}_{ij}^{\text{st.lib.}} + \text{Cov}_{ij}^{\text{SPS}} \\ & + \text{Cov}_{ij}^{\text{SFH}} + \text{Cov}_{ij}^{\text{IMF}} + \text{Cov}_{ij}^{\text{st.lib.}} + \text{Cov}_{ij}^{\text{SPS}} \\ & + \text{Cov}_{ij}^{\text{IMF}} + \text{Cov}_{ij}^{\text{st.lib.}} + \text{Cov}_{ij}^{\text{SPS}} \\ & + \text{Cov}_{ij}^{\text{st.lib.}} + \text{Cov}_{ij}^{\text{SPS}} \\ & + \text{Cov}_{ij}^{\text{SPS}} \end{aligned}$$

Diagram illustrating the decomposition of total covariance ($\text{Cov}_{ij}^{\text{tot}}$) into various components. The components are represented by terms in the equation, with their relative contributions indicated by percentages and standard deviation (σ) values. Red 'X' marks indicate components that are not included or are zero.

- $\text{Cov}_{ij}^{\text{stat}}$ (Statistical)
- $\text{Cov}_{ij}^{\text{young}}$ (Young population)
- $\text{Cov}_{ij}^{\text{met}}$ (Metallicity)
- $\text{Cov}_{ij}^{\text{SFH}}$ (Star Formation History)
- $\text{Cov}_{ij}^{\text{IMF}}$ (Initial Mass Function)
- $\text{Cov}_{ij}^{\text{st.lib.}}$ (Stellar Library)
- $\text{Cov}_{ij}^{\text{SPS}}$ (Stellar Population Synthesis)

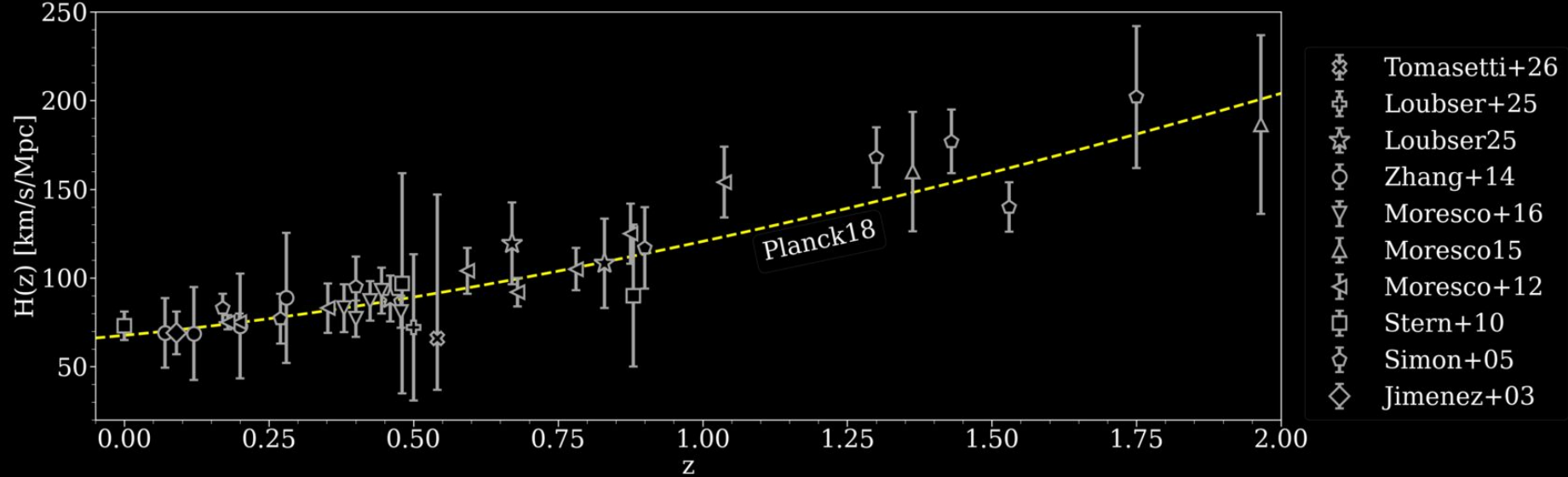
Contributions shown:

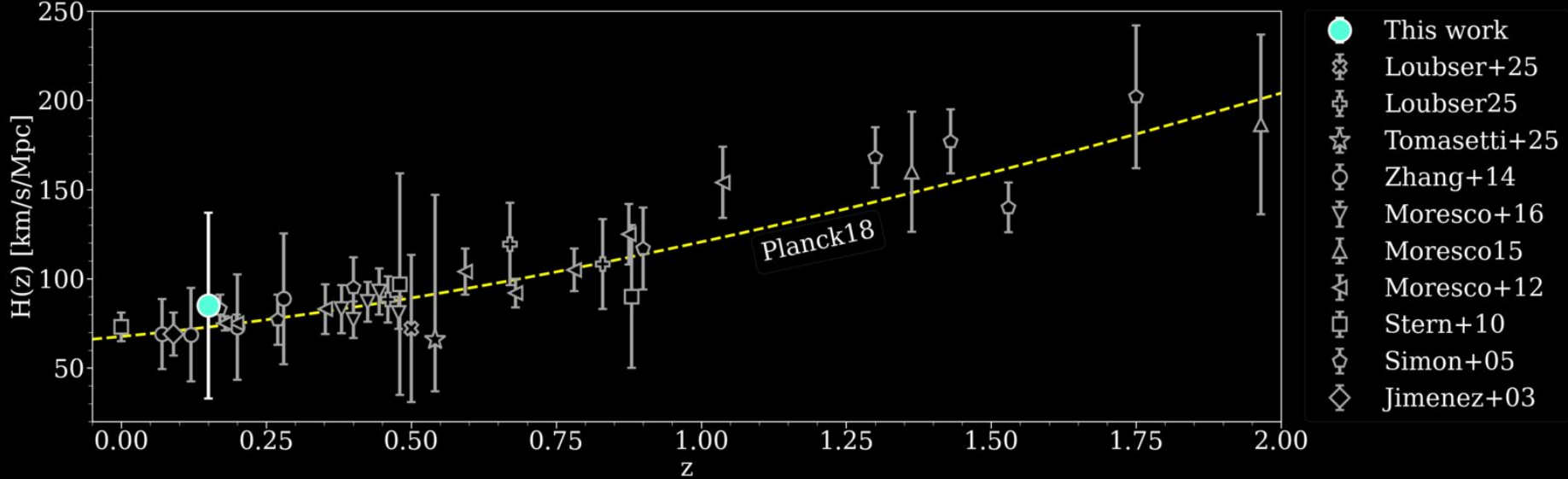
- $\text{Cov}_{ij}^{\text{stat}}$: 10% σ
- $\text{Cov}_{ij}^{\text{young}}$: 1% σ
- $\text{Cov}_{ij}^{\text{st.lib.}}$: 7% σ
- $\text{Cov}_{ij}^{\text{SPS}}$: 5% σ

Components marked with a red 'X' are excluded or zero.

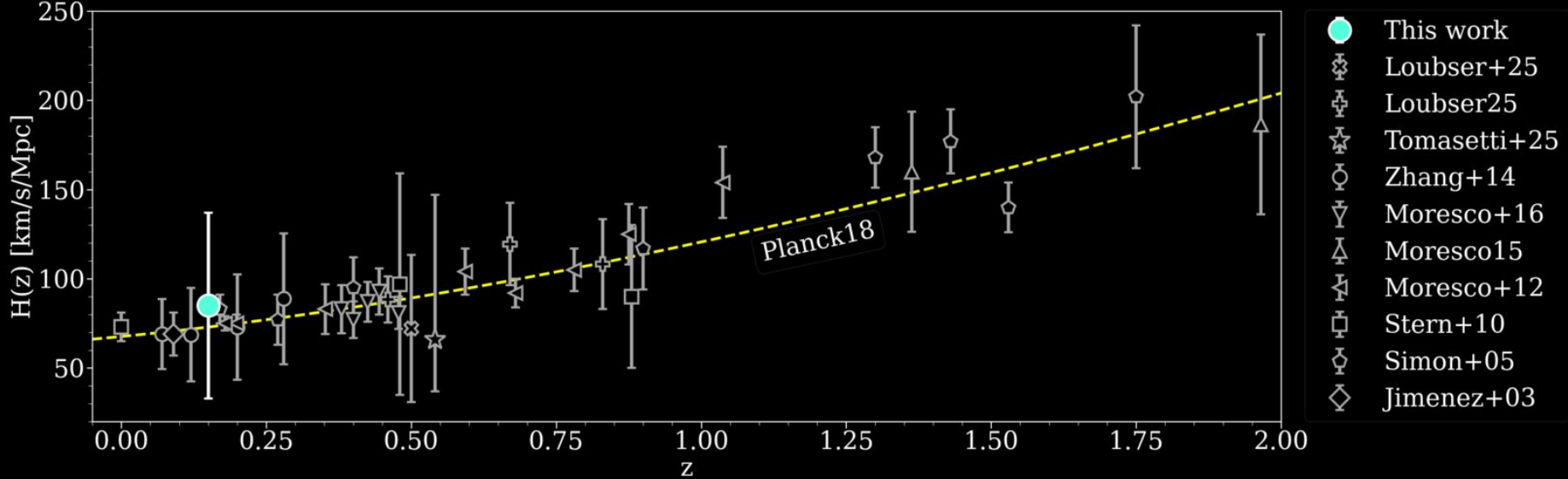
$$\begin{aligned} \text{Cov}_{ij}^{\text{tot}} = & \text{Cov}_{ij}^{\text{stat}} + \text{Cov}_{ij}^{\text{met}} + \text{Cov}_{ij}^{\text{young}} + \text{Cov}_{ij}^{\text{SFH}} + \text{Cov}_{ij}^{\text{IMF}} + \text{Cov}_{ij}^{\text{st.lib.}} + \text{Cov}_{ij}^{\text{SPS}} \\ & \text{1}\% \sigma \quad \text{7}\% \sigma \quad \text{5}\% \sigma \end{aligned}$$

The equation shows the decomposition of total covariance into several components. The components are: $\text{Cov}_{ij}^{\text{stat}}$, $\text{Cov}_{ij}^{\text{met}}$, $\text{Cov}_{ij}^{\text{young}}$, $\text{Cov}_{ij}^{\text{SFH}}$, $\text{Cov}_{ij}^{\text{IMF}}$, $\text{Cov}_{ij}^{\text{st.lib.}}$, and $\text{Cov}_{ij}^{\text{SPS}}$. The contributions are: $\text{Cov}_{ij}^{\text{stat}}$ (1% σ), $\text{Cov}_{ij}^{\text{met}}$ (7% σ), $\text{Cov}_{ij}^{\text{young}}$ (5% σ), $\text{Cov}_{ij}^{\text{SFH}}$ (crossed out), $\text{Cov}_{ij}^{\text{IMF}}$ (1% σ), $\text{Cov}_{ij}^{\text{st.lib.}}$ (7% σ), and $\text{Cov}_{ij}^{\text{SPS}}$ (5% σ).



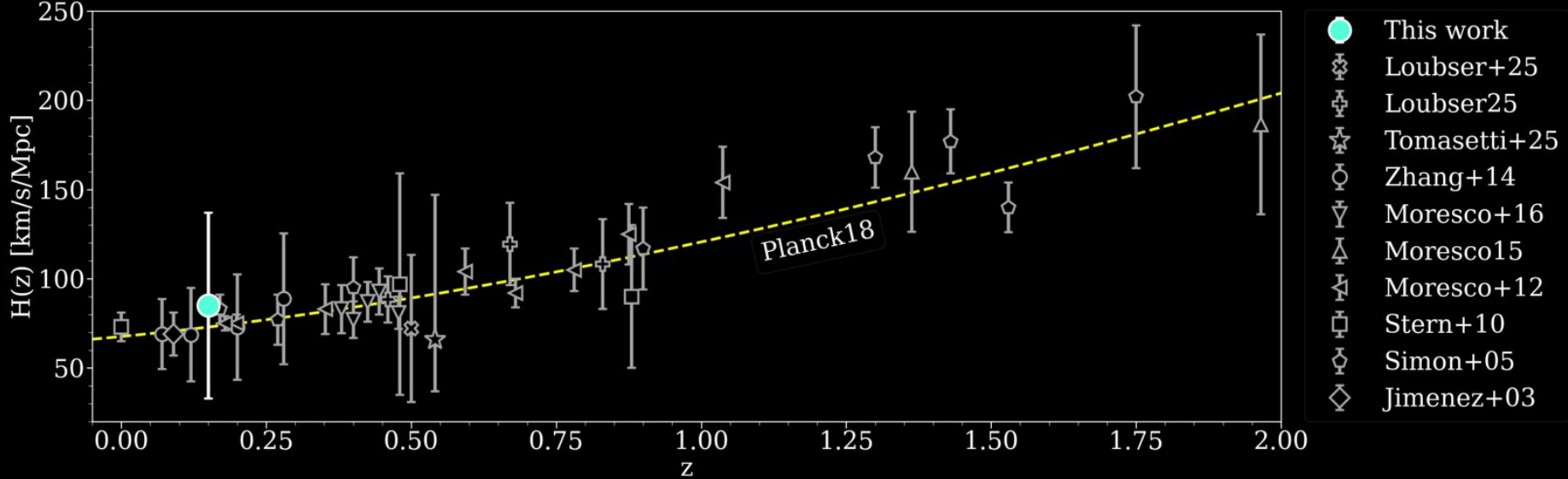


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(submitted)



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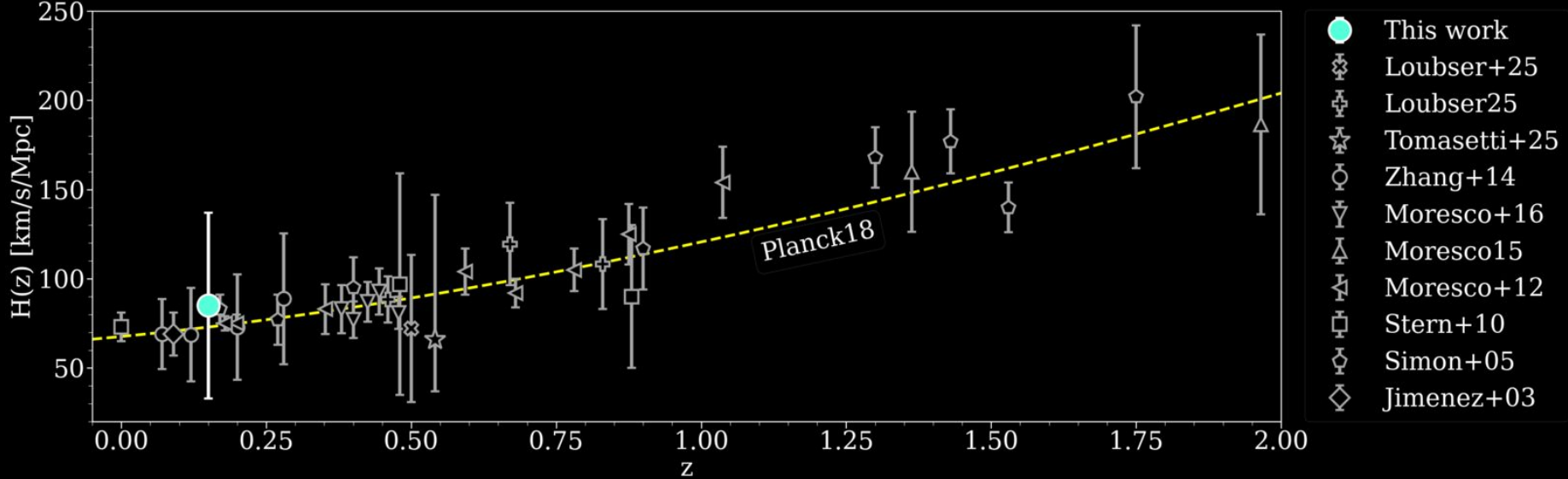
**RELICS ARE
PROMISING!**



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**SOON BIGGER
DATASETS**



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