

# Constraining a DDE Model with AdS-to-dS and Similar Late-Time Transitions

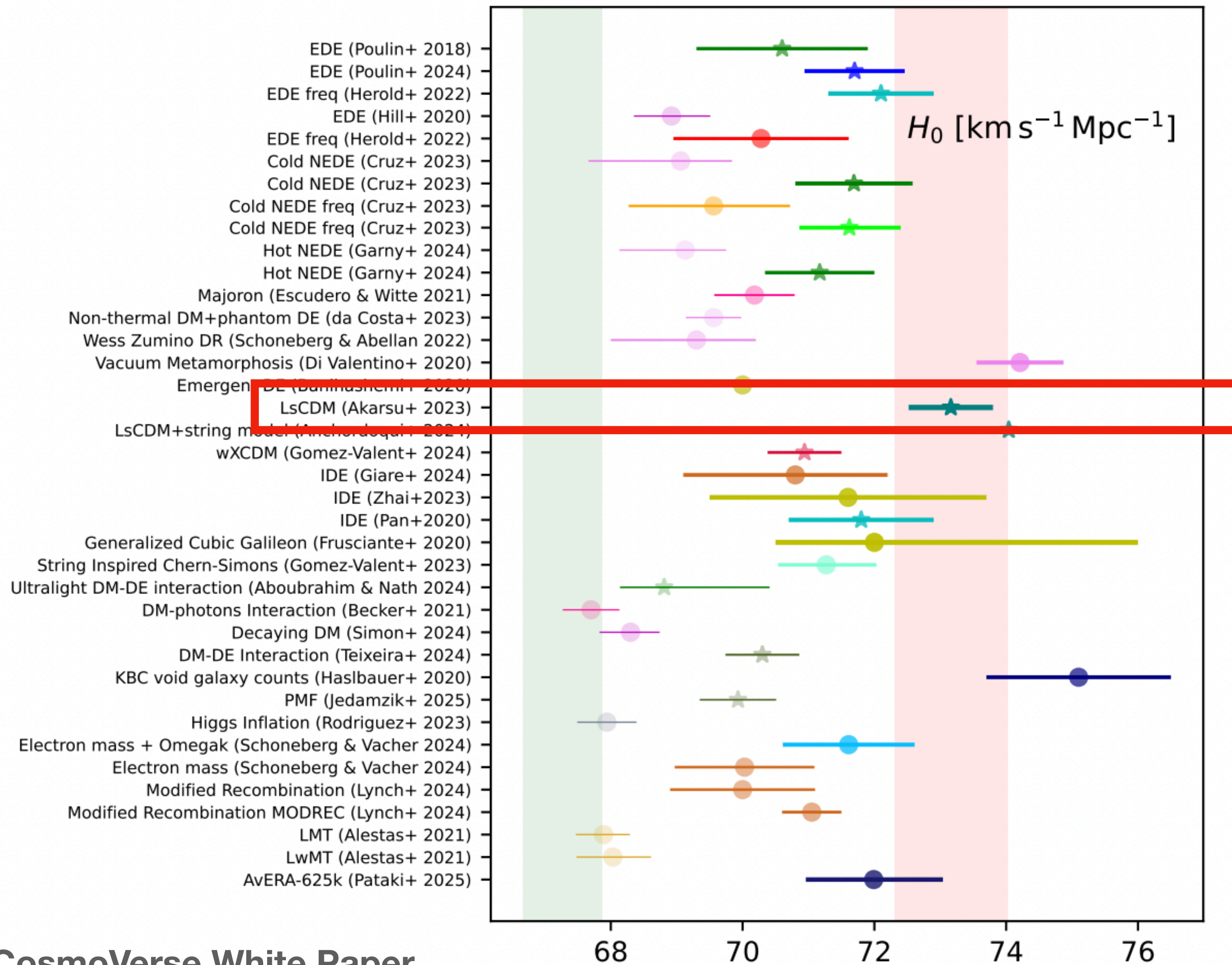
CosmoVerseSchool@Sofia  
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İTÜ





- $\Lambda\text{CDM} \rightarrow \Lambda + \text{CDM}$
- $\Lambda_s\text{CDM} \rightarrow \Lambda_s + \text{CDM}$

$$\Lambda_s = \Lambda \text{sgn}(z_{\dagger} - z)$$

Phenomenological model constraints are promising. Let us constrain a phantom scalar field theory that can produce this phenomenology.

CosmoVerse White Paper  
25 Aug 2025

FIG. 3: Summary of models proposed to solve the  $H_0$  tension in this White Paper following the order of the different sections.

# Ph- $\Lambda_s$ CDM

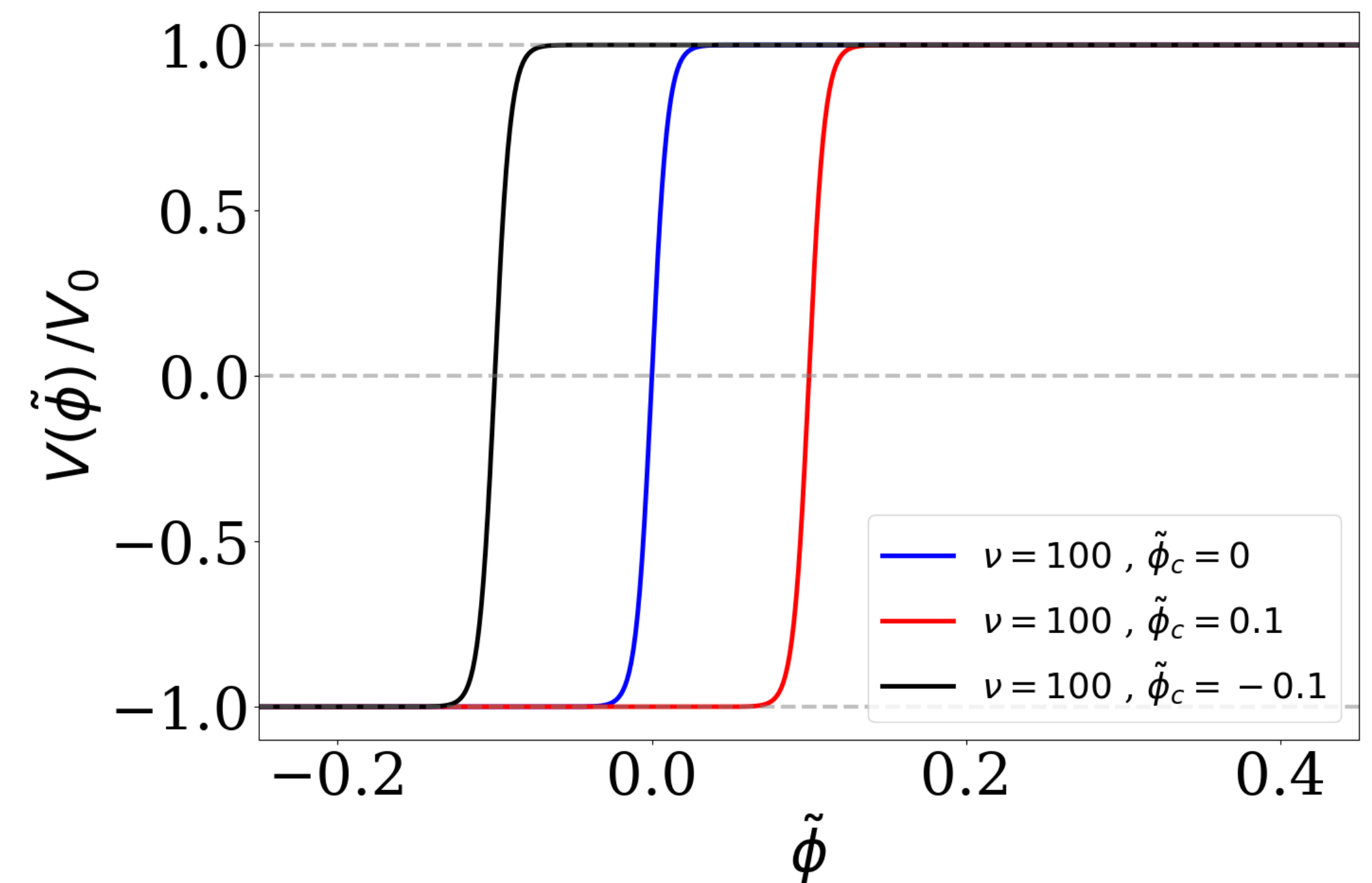
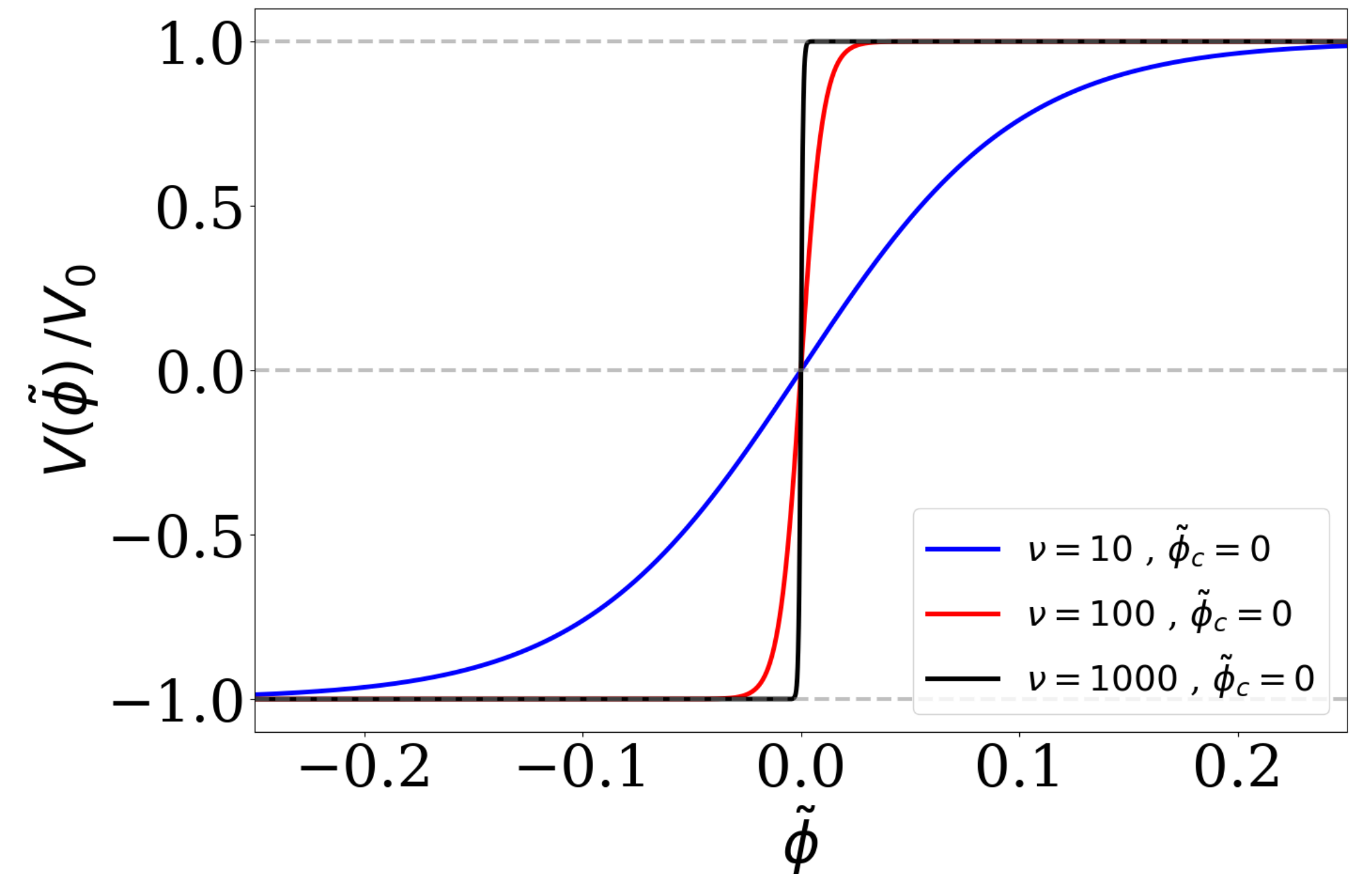
- <https://arxiv.org/abs/2502.14667>

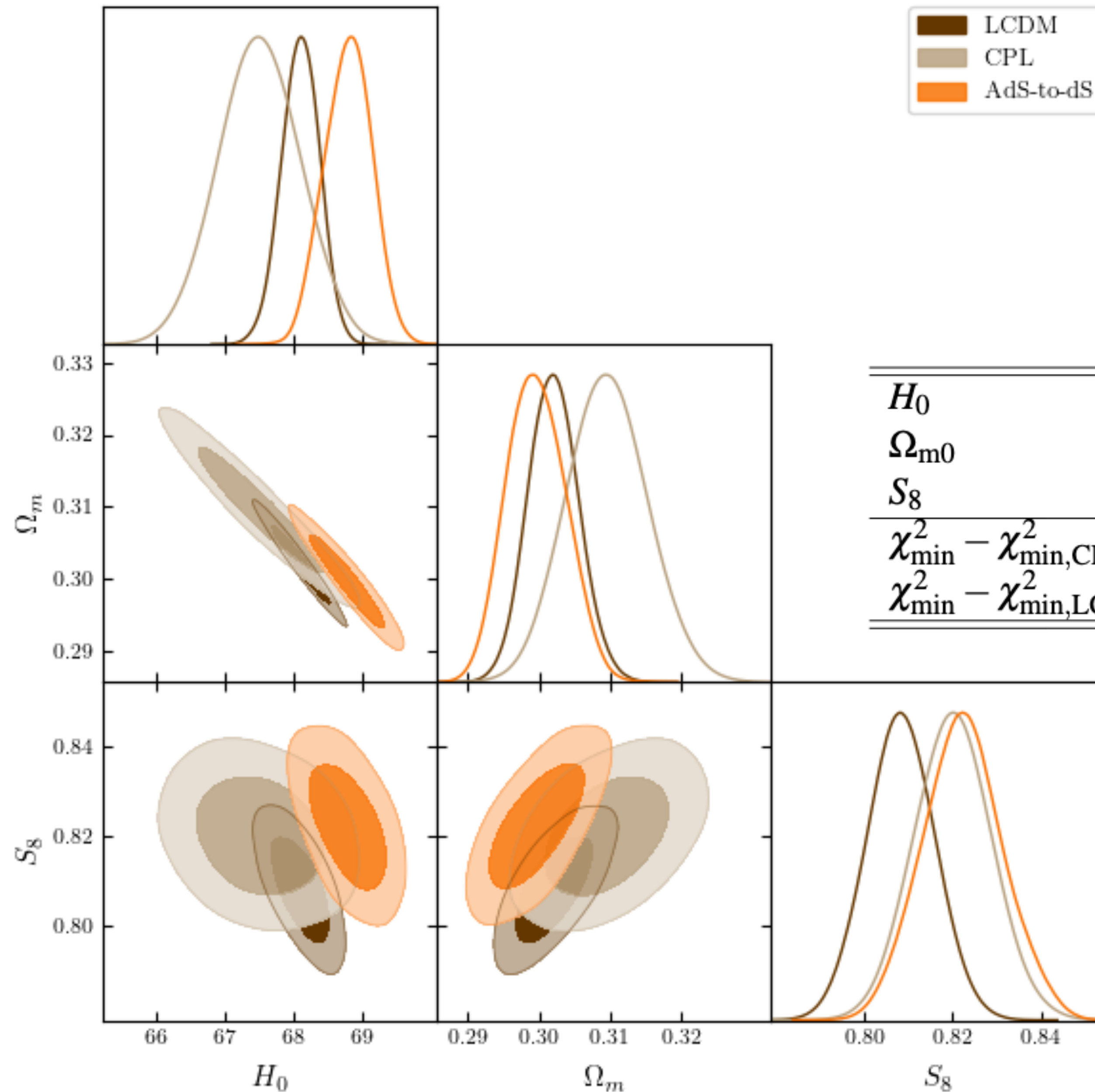
$$S_\phi = \int d^4x \sqrt{-g} \left[ \frac{\xi}{2} g^{ik} \partial_i \phi \partial_k \phi - V(\phi) \right]$$

$$\ddot{\phi} + 3H\dot{\phi} + \xi c^2 \frac{dV}{d\phi} = 0$$

$$V(\tilde{\phi}) = \Lambda \tanh \left[ \nu(\tilde{\phi} - \tilde{\phi}_c) \right], \quad \Lambda > 0$$

extra two free parameters compared to LCDM





■ LCDM  
■ CPL  
■ AdS-to-dS

- Planck 2018 + DESI DR2 + PantheonPlus
- For fixed  $\nu = 1000$  (rapid transition limit)

	Ph- $\Lambda_s$ CDM	CPL	LCDM
$H_0$	$68.80 \pm 0.34$	$67.51 \pm 0.60$	$68.11 \pm 0.28$
$\Omega_{m0}$	$0.2997^{+0.0040}_{-0.0044}$	$0.3096 \pm 0.0057$	$0.3021 \pm 0.0036$
$S_8$	$0.8223 \pm 0.0091$	$0.8201 \pm 0.0088$	$0.8083 \pm 0.0077$
$\chi^2_{\min} - \chi^2_{\min, \text{CPL}}$	-4.11	0	3.25
$\chi^2_{\min} - \chi^2_{\min, \text{LCDM}}$	-7.35	-3.25	0

**Ph- $\Lambda_s$ CDM performs significantly better than CPL as a DDE model !!**

and

**$H_0$  tension is reduced to  $5.4\sigma$  from  $6.3\sigma$  for LCDM, compared to the consensus report value of  $73.50 \pm 0.81 \text{ km/s/Mpc}$ .**