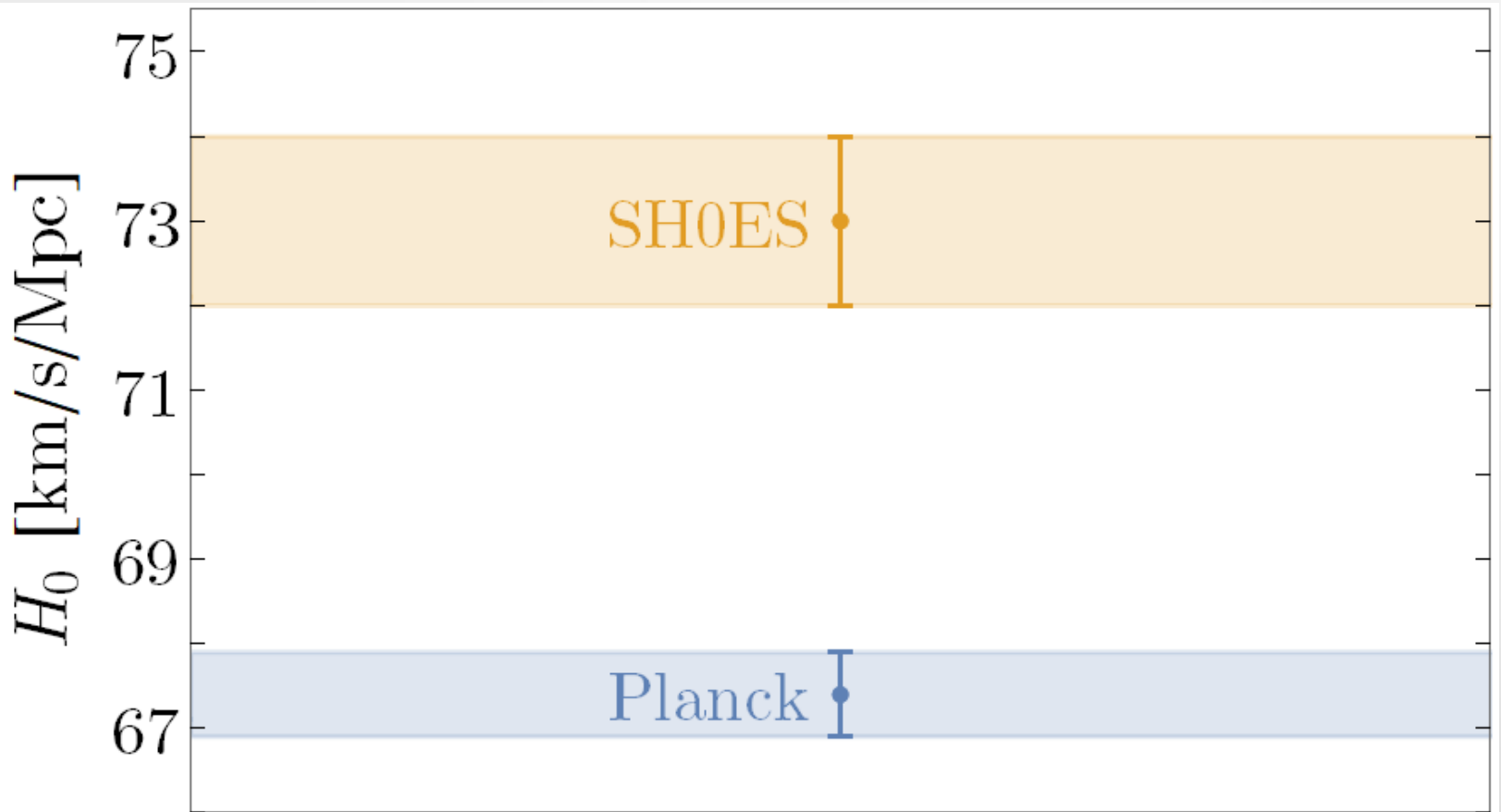




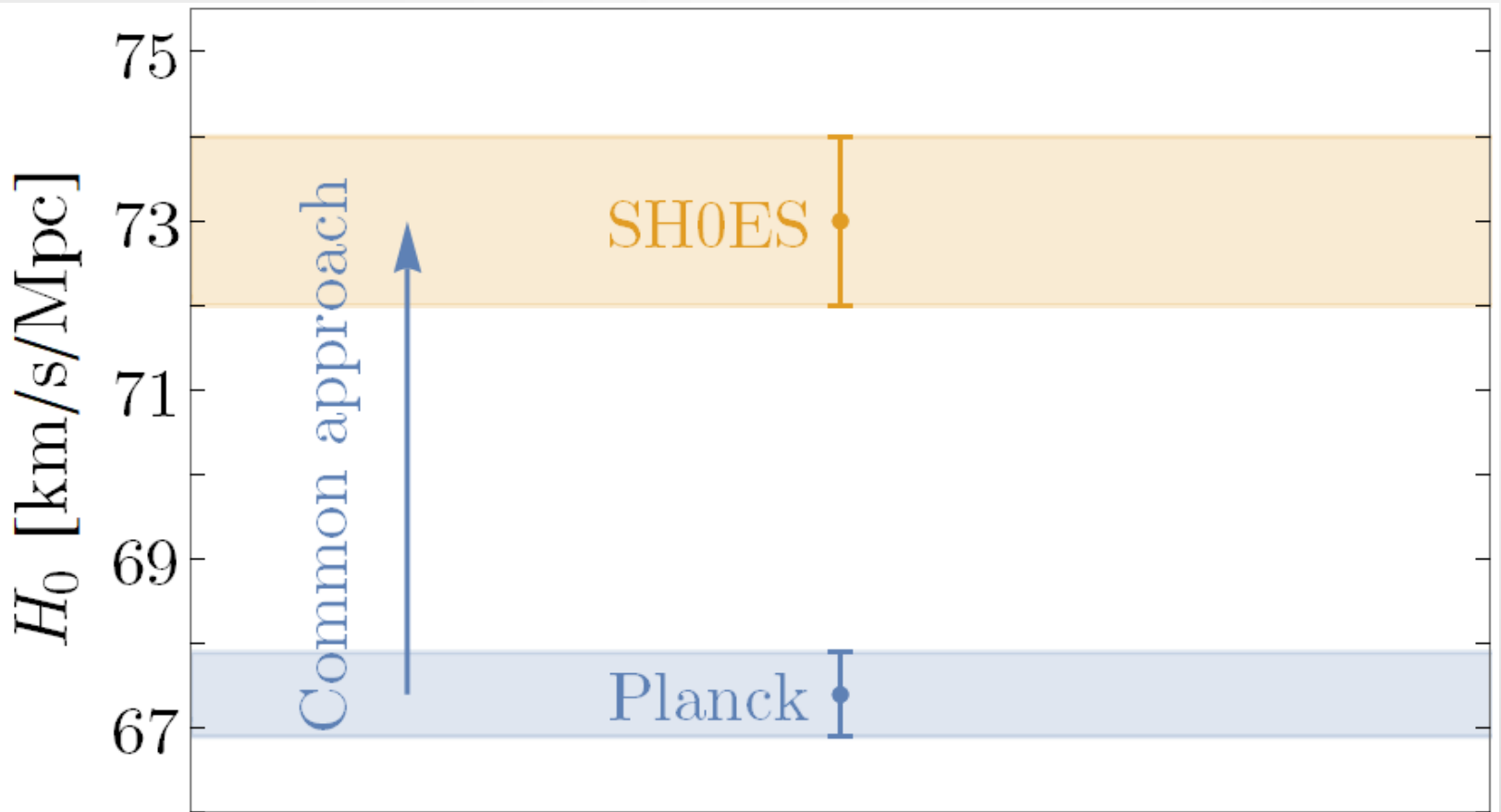
The Hubble tension and fifth forces

Marcus Högå
arXiv:2309.01744

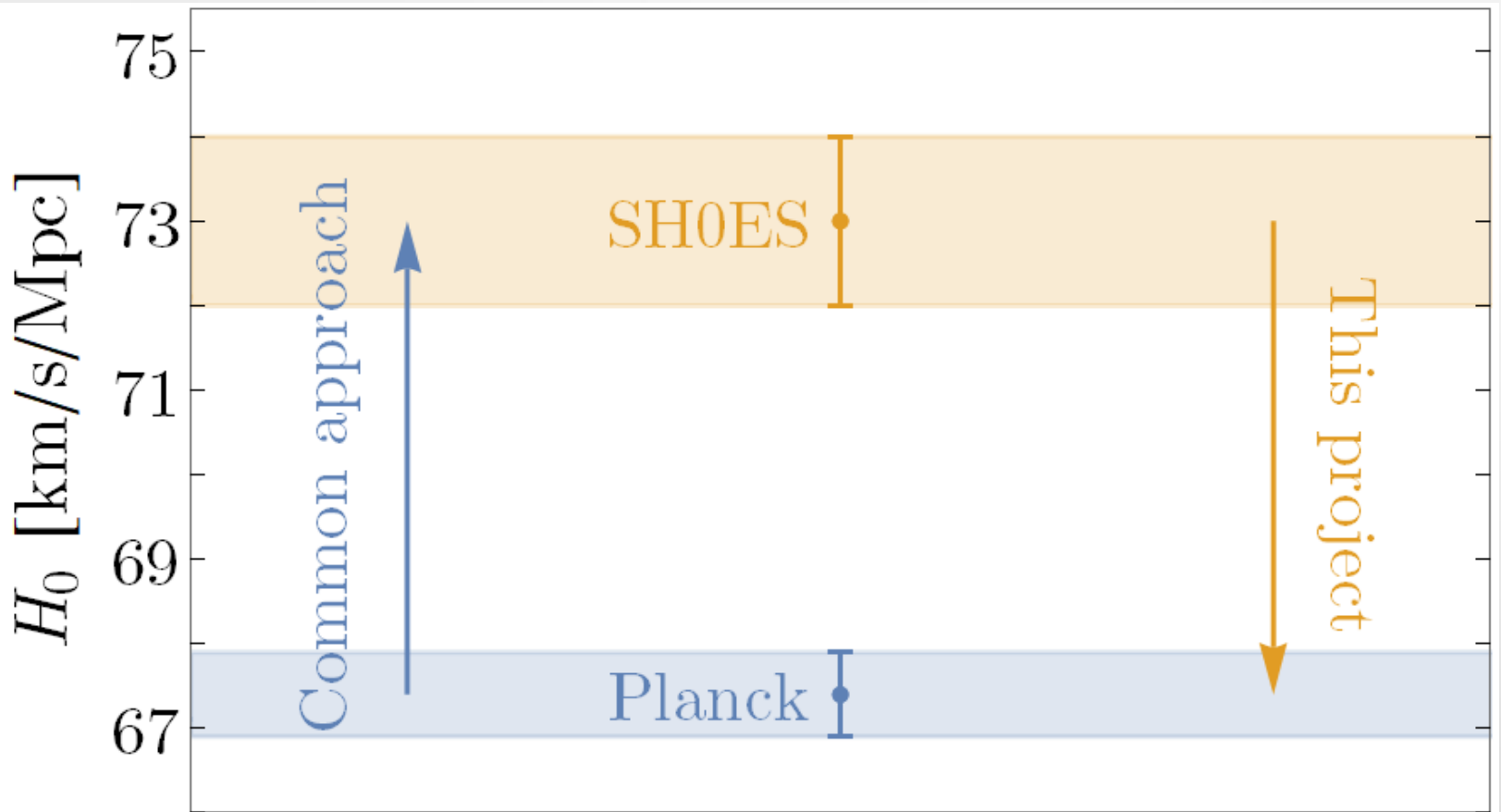
Collaborator: Edvard Mörtzell



H_0 = current expansion rate of the Universe



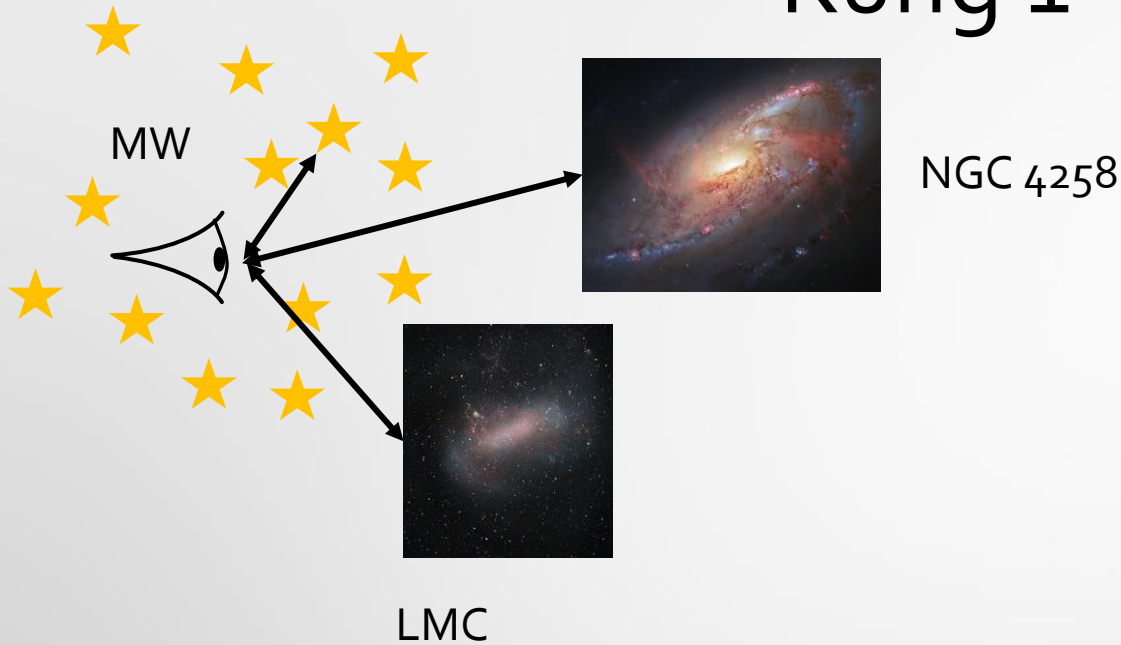
H_0 = current expansion rate of the Universe



H_0 = current expansion rate of the Universe

The cosmic distance ladder

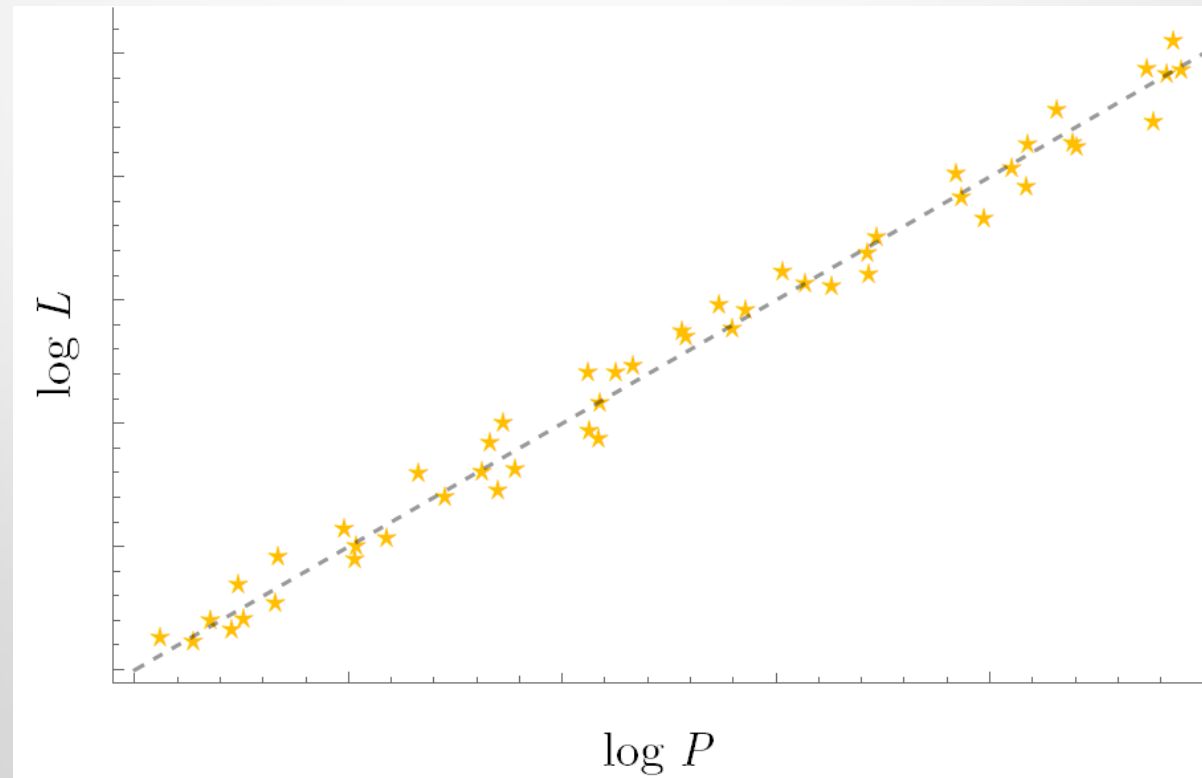
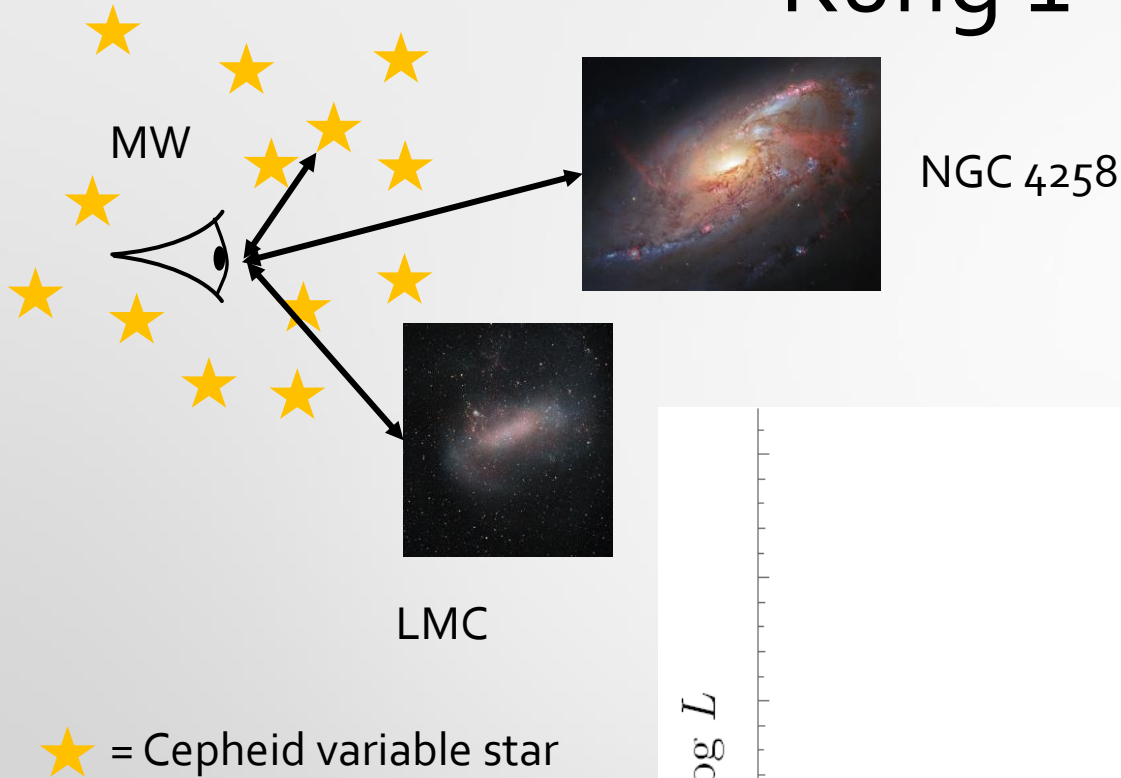
Rung 1



★ = Cepheid variable star


The cosmic distance ladder

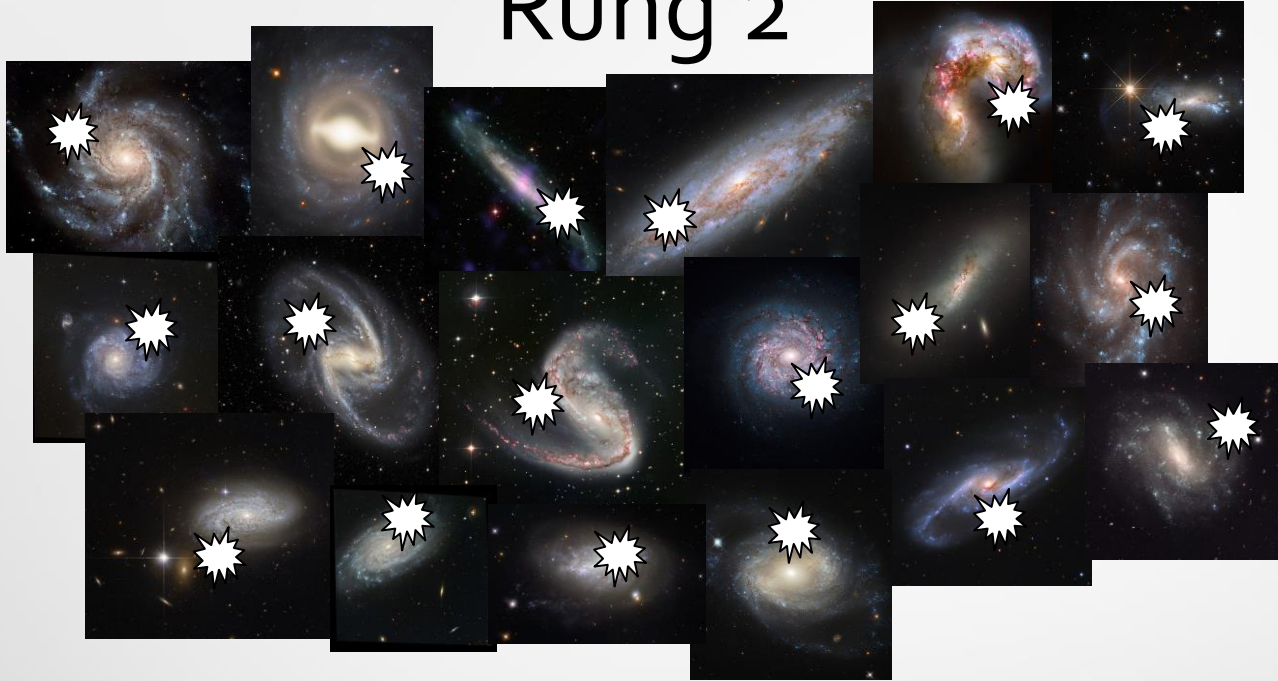
Rung 1



The cosmic distance ladder


Rung 2

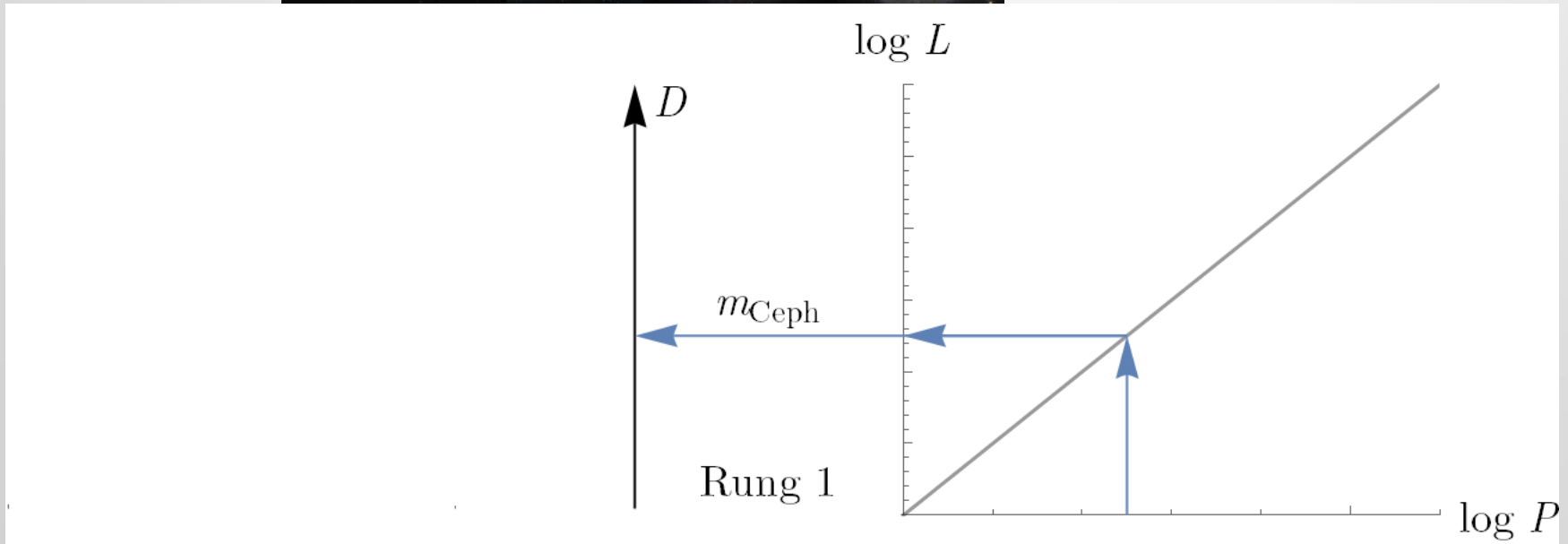
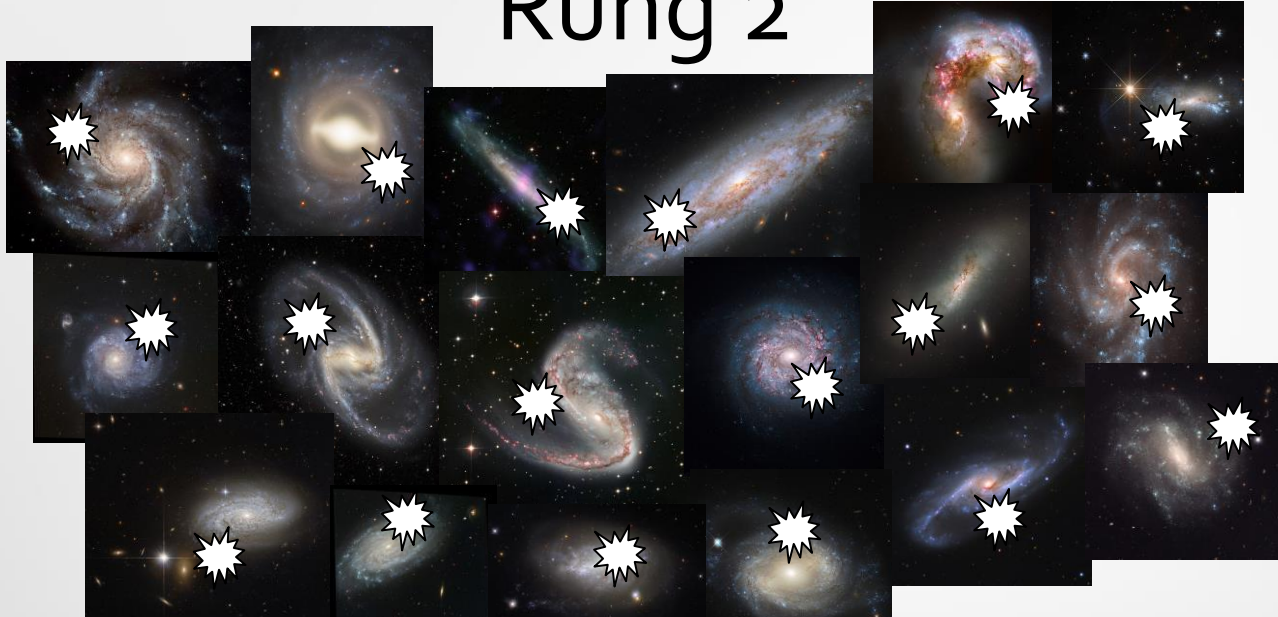
 = SNIa



The cosmic distance ladder


Rung 2

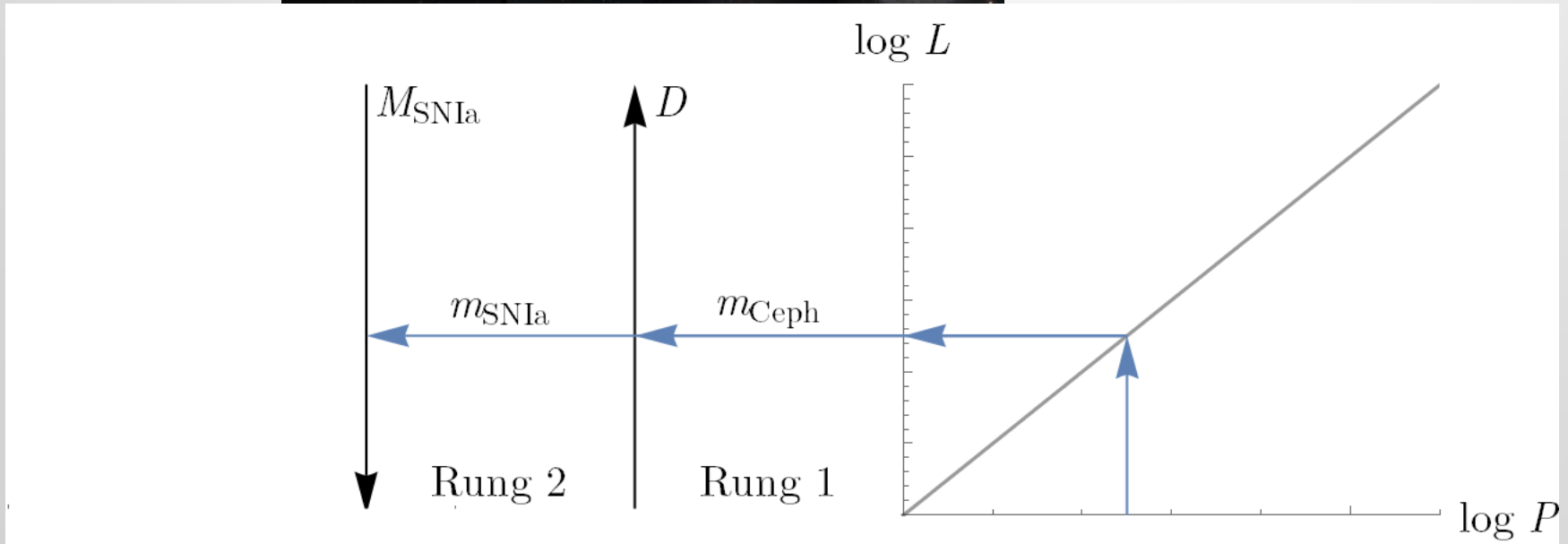
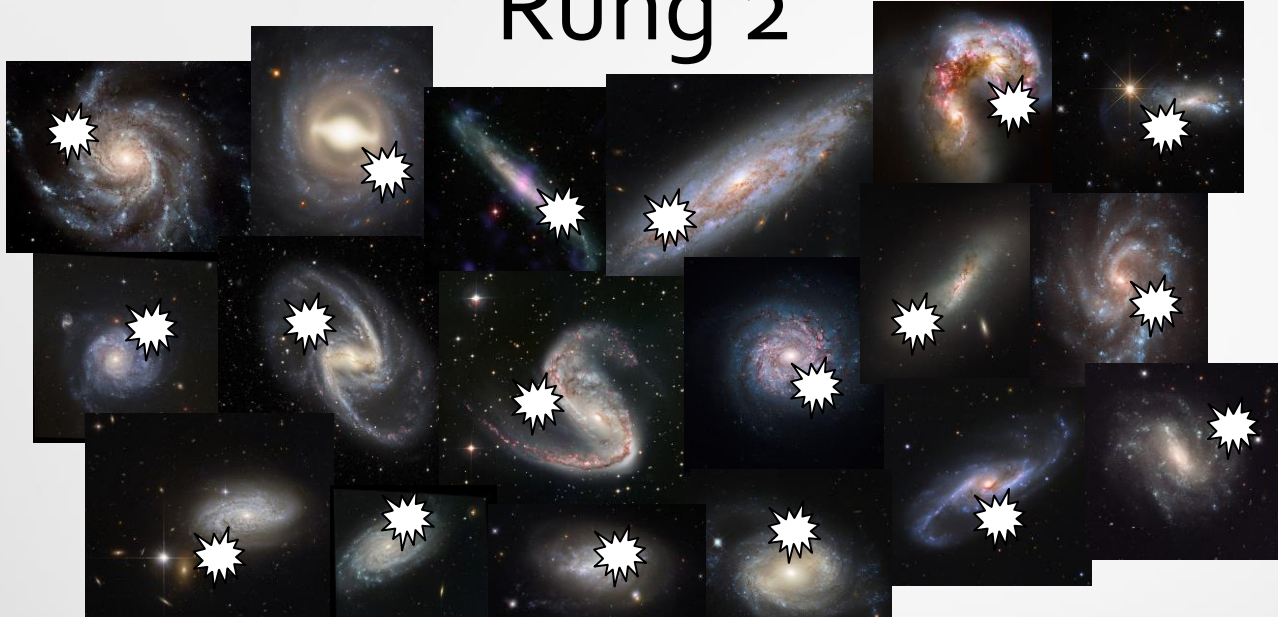
 = SNIa



The cosmic distance ladder

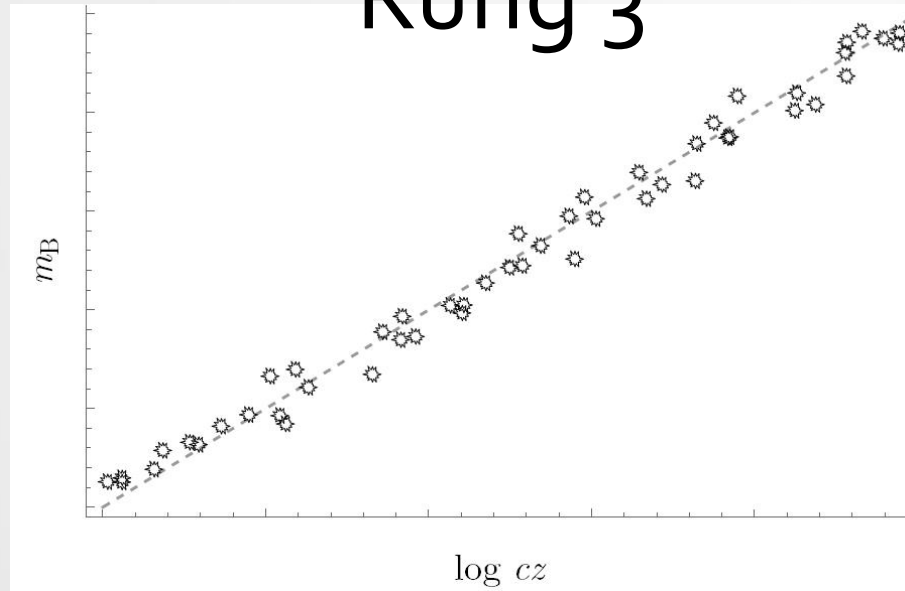
Rung 2

 = SNIa



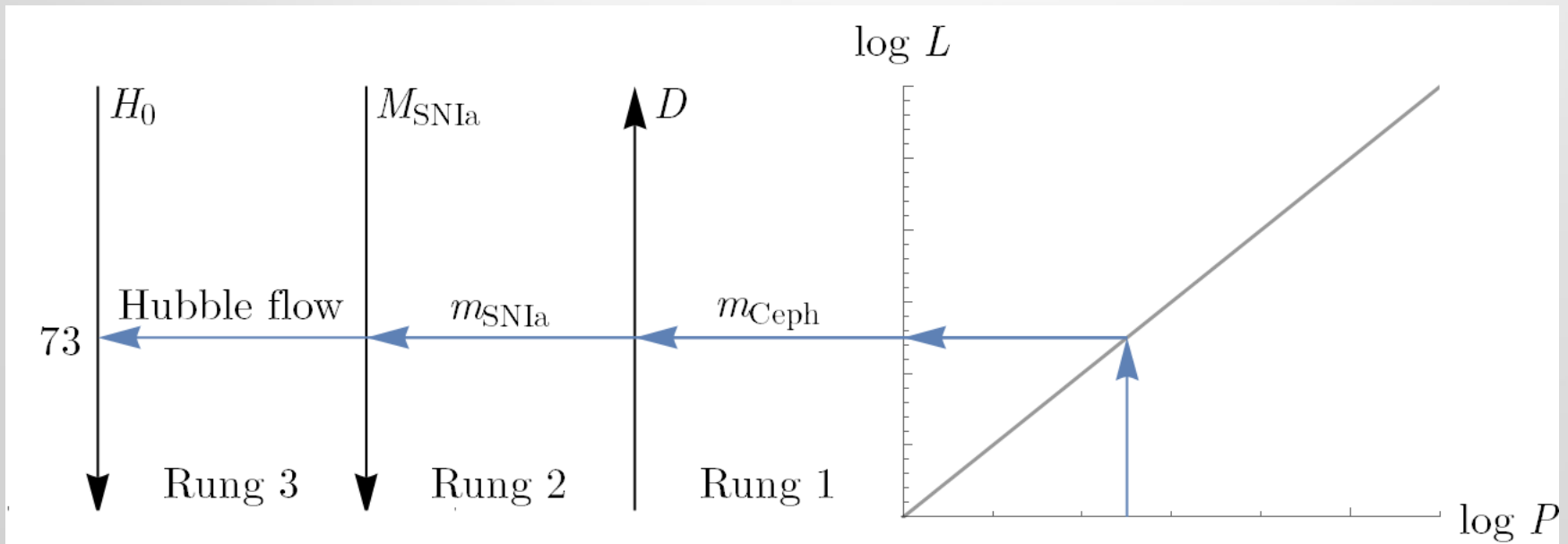
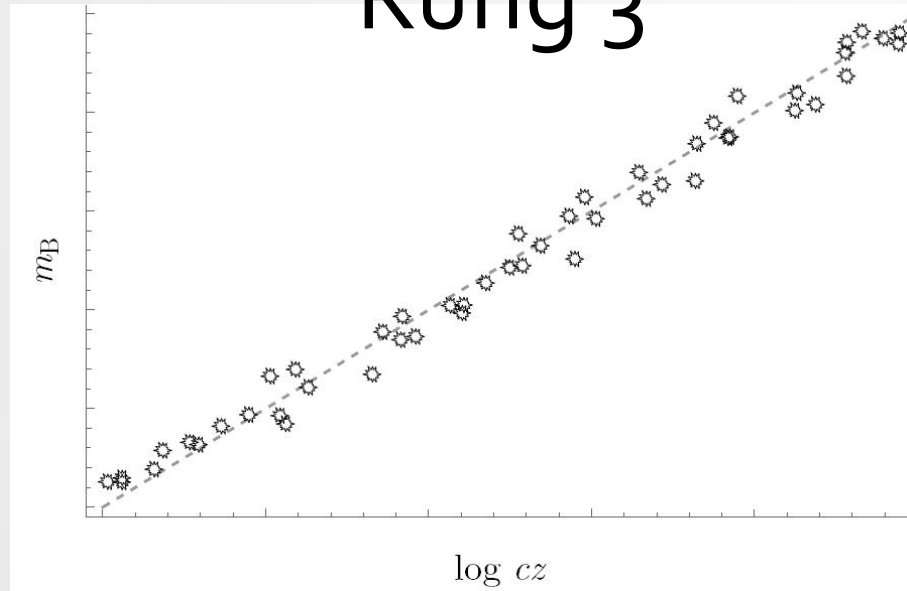
The cosmic distance ladder

Rung 3



The cosmic distance ladder

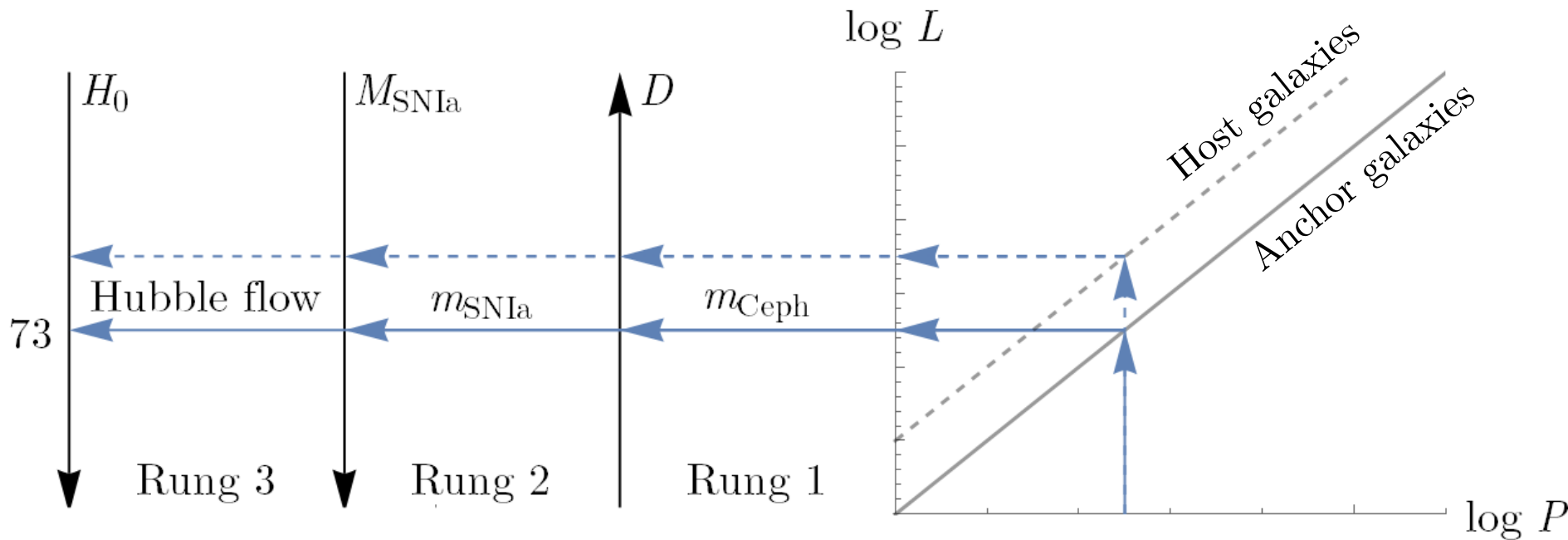
Rung 3



Recalibrating the distance ladder

- Modified theories of gravity (typically) introduce a fifth force

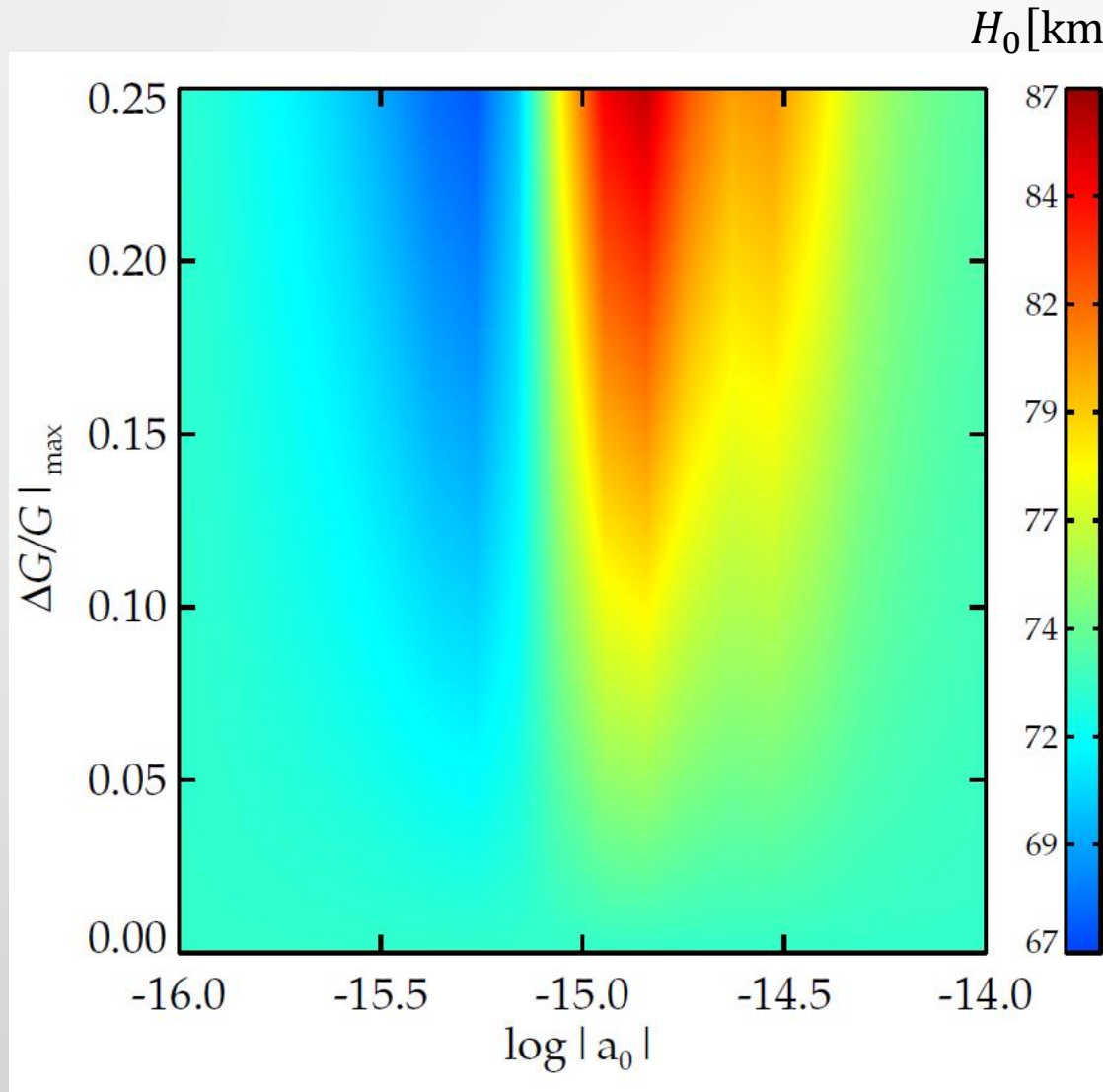
Recalibrating the distance ladder



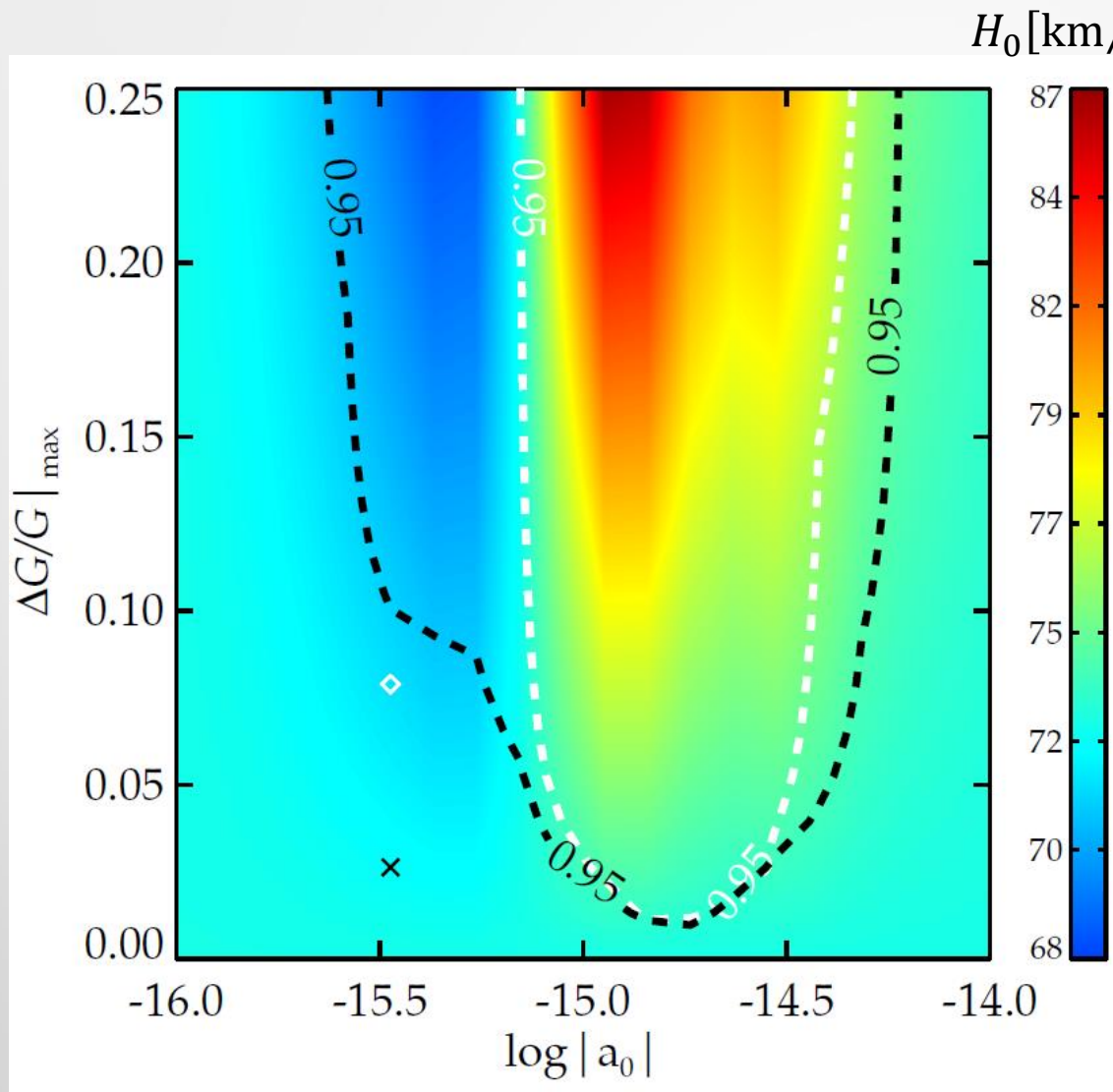
Desmond, Jain, and Sakstein, PRD 100 (2019)

Desmond, Ferreira, Lavaux, and Jasche, MNRAS 474 (2017)

Recalibrating the distance ladder

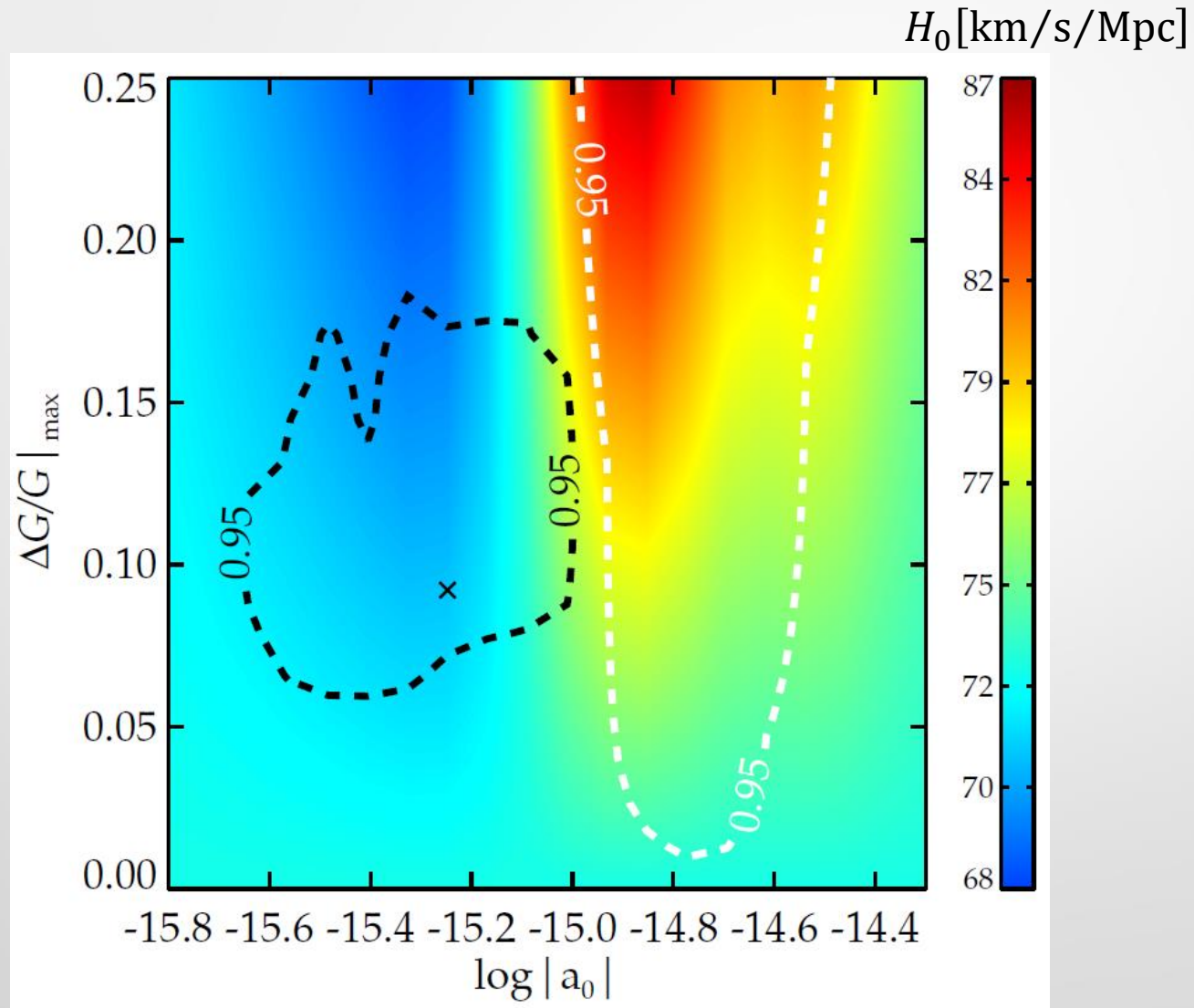


Recalibrating the distance ladder



The distance ladder becomes uncalibrated \rightarrow no H_0

Recalibrating the distance ladder



Standard case: $p = 0.01$

Here: $p = 0.15$

Follow-up

- Theoretical motivation: looking for theories which combine observational viability and these fifth force effects on the distance ladder
- The symmetron model has the opposite effect (arXiv:2303.12827)