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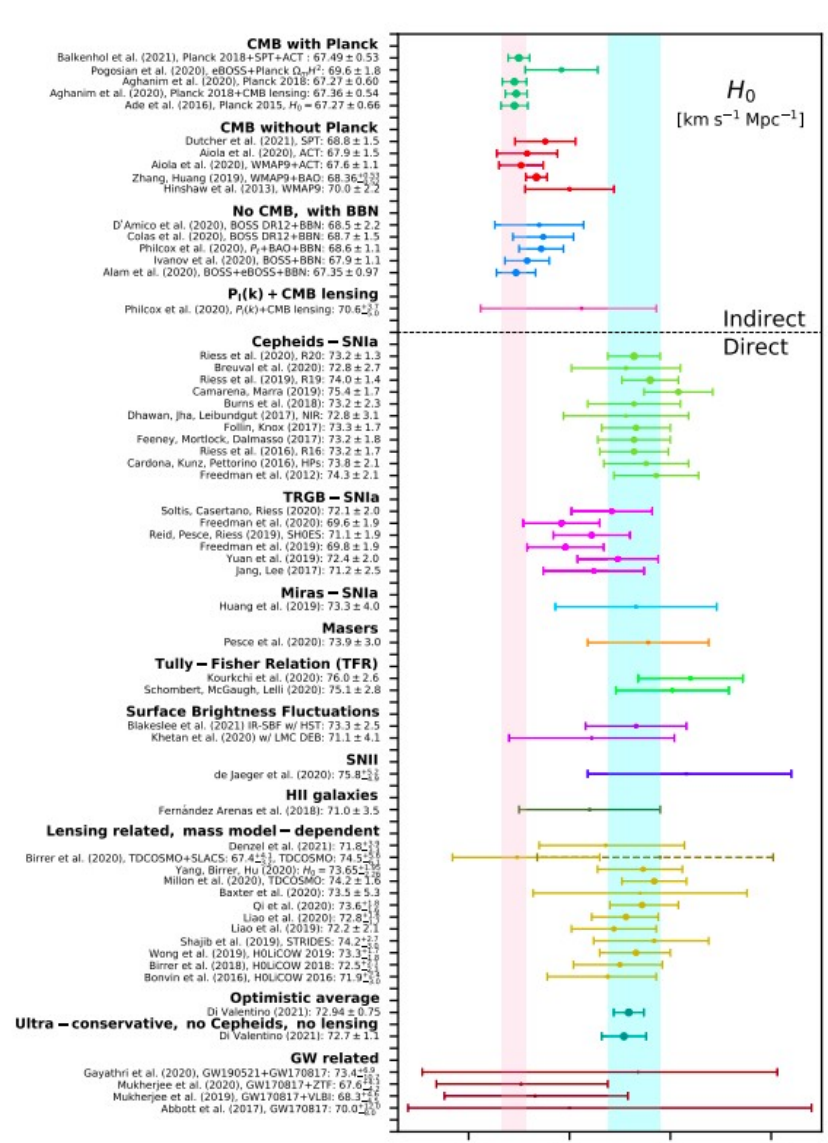
Reconciling astronomical distance scales with variable red giant stars

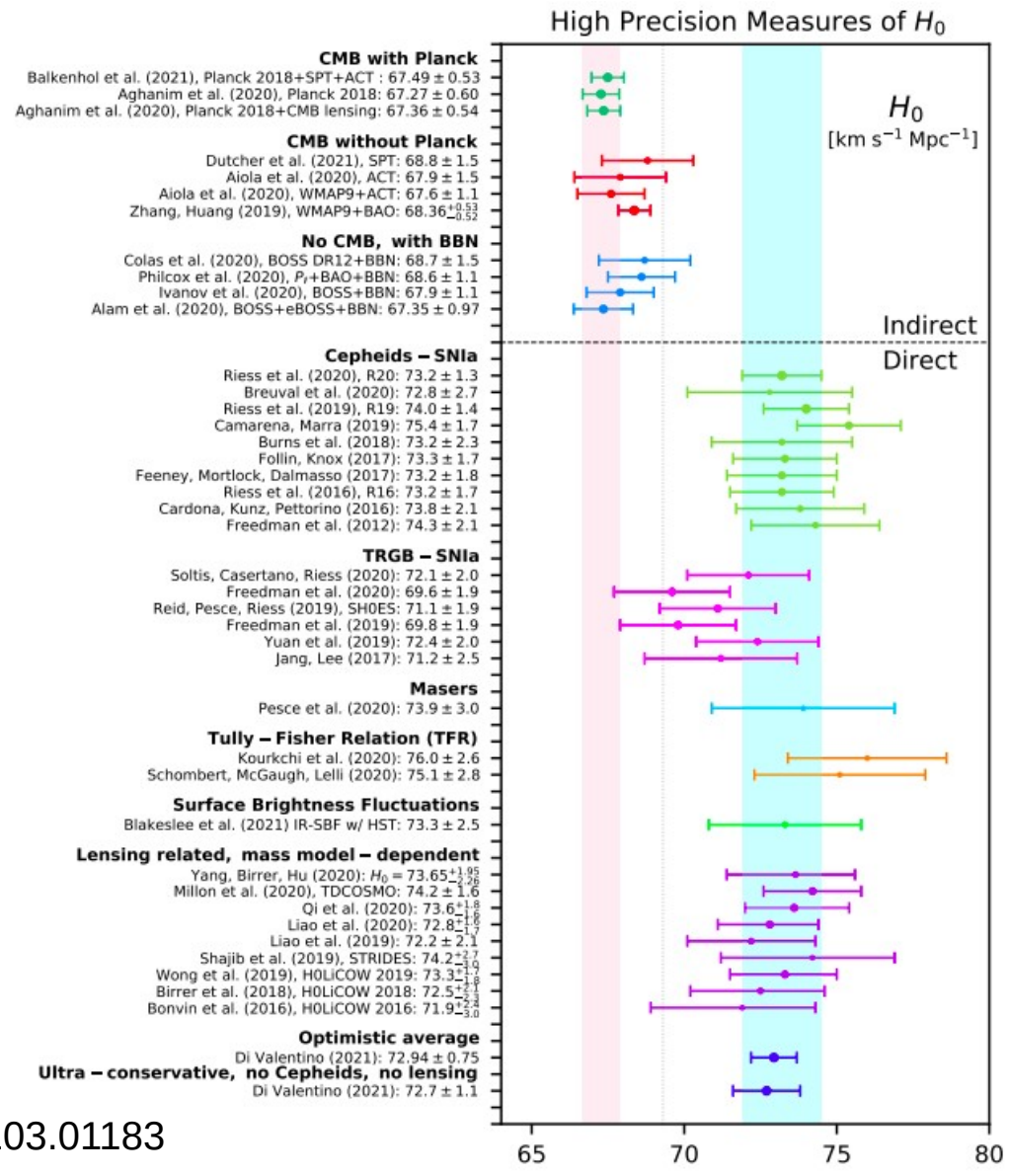
Richard I. Anderson[1*], Nolan W. Koblischke[1,2] and Laurent Eyer[3]

[1*]Institute of Physics, École Polytechnique Fédérale de Lausanne (EPFL), Chemin Pegasi 51, Versoix, 1290, Switzerland.
[2]University of British Columbia, 3333 University Way, Kelowna, V1V 1V7, BC, Canada.
[3]Department of Astronomy, University of Geneva, Chemin Pegasi 51, Versoix, 1290, Switzerland.

*Corresponding author(s). E-mail(s): richard.anderson@epfl.ch;
Contributing authors: nkob@student.ubc.ca;
laurent.eyer@unige.ch;



Credit: arxiv:2103.01183



OGLE small-amplitude red giant stars (OSTARS)

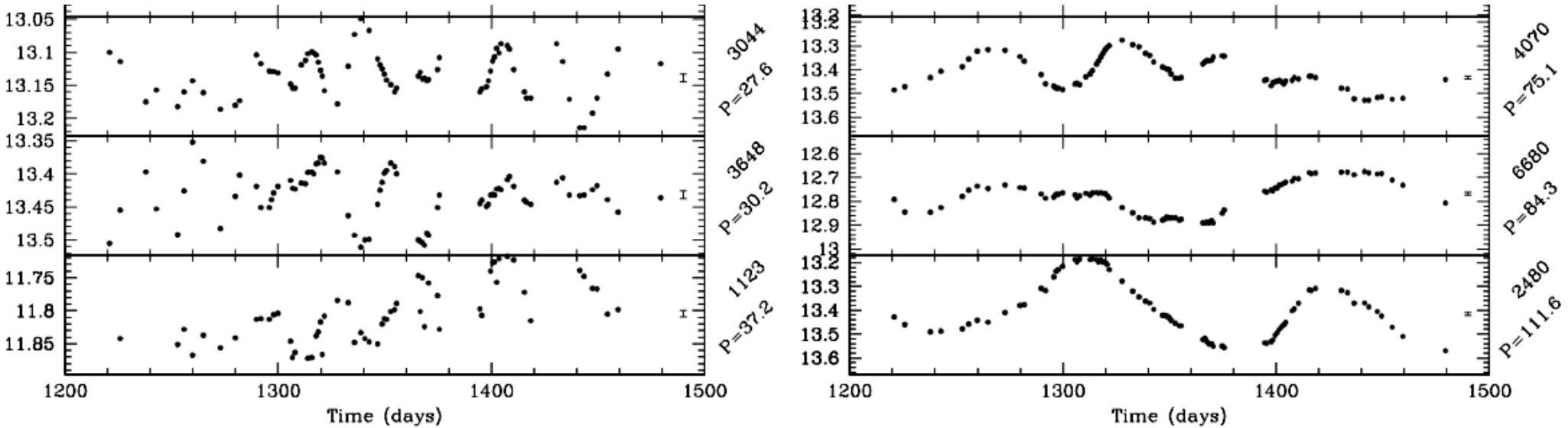


Figure 9. A sample of light curves with periods (in days) increasing from top to bottom, for type A (left) and type B (right) variables.

Credit: Wray+2004, MNRAS, 349

TRGB

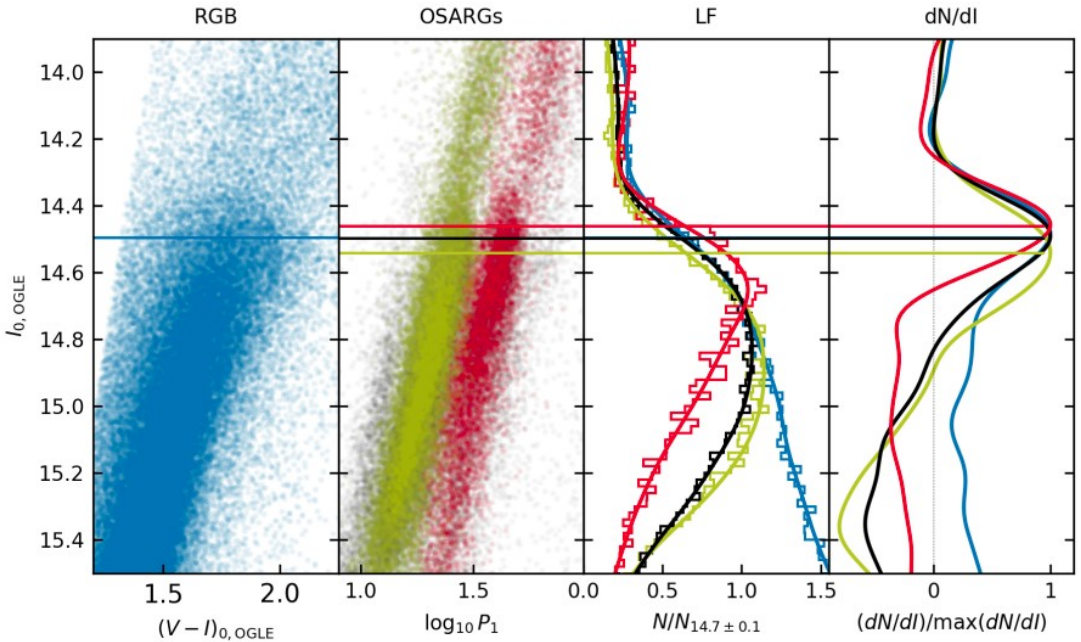


Fig. 2 Illustrations of LFs and samples. Horizontal lines correspond to $m_{I,\mathrm{OGLE}}$ for the sample of identical color, with `RGBs` in blue, `OSARGs` in black, the A-sequence in yellow, and the B-sequence in red. From left to right: `RGBs` CMD; `OSARGs` PL relations zoomed in to A and B sequences; binned and smoothed LFs (here: $\sigma_s = 0.15$) normalized to the number of stars with 0.1 mag of $m_{I,\mathrm{OGLE}} = 14.7$; Sobel edge response curves normalized to peak intensity. Normalization is used purely for visualization purposes.

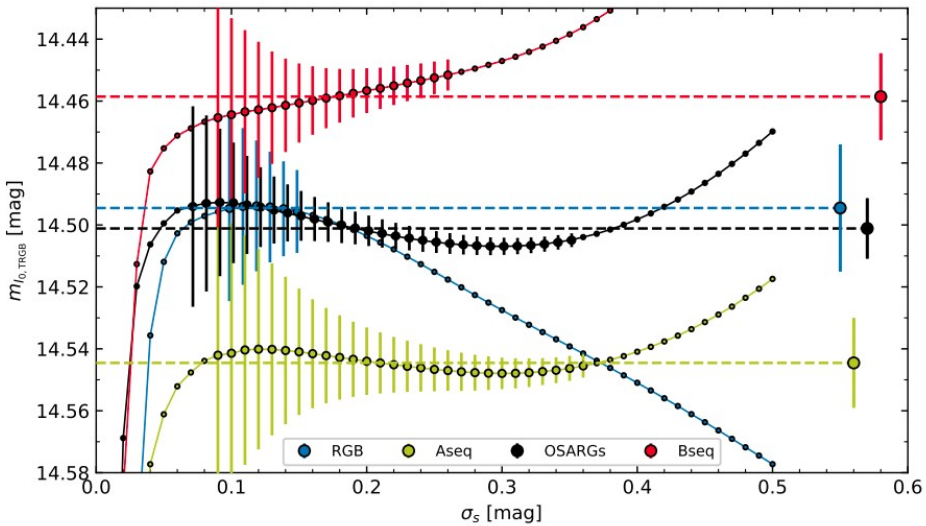


Fig. 3 Dependence of m_I on σ_s. Errorbars are plotted for the `RGBs`, `OSARGs`, Aseq, and Bseq samples across the range of σ_s values deemed stable, which is narrow for `RGBs` and wide for `OSARGs`. Results from Tab. 1 are shown as large errorbars on the right.

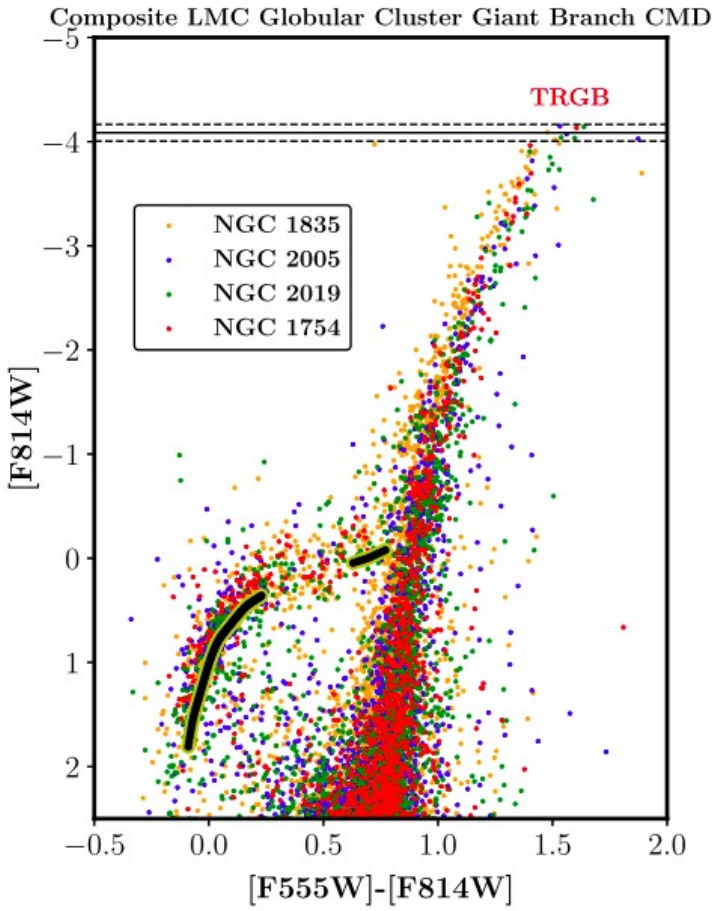
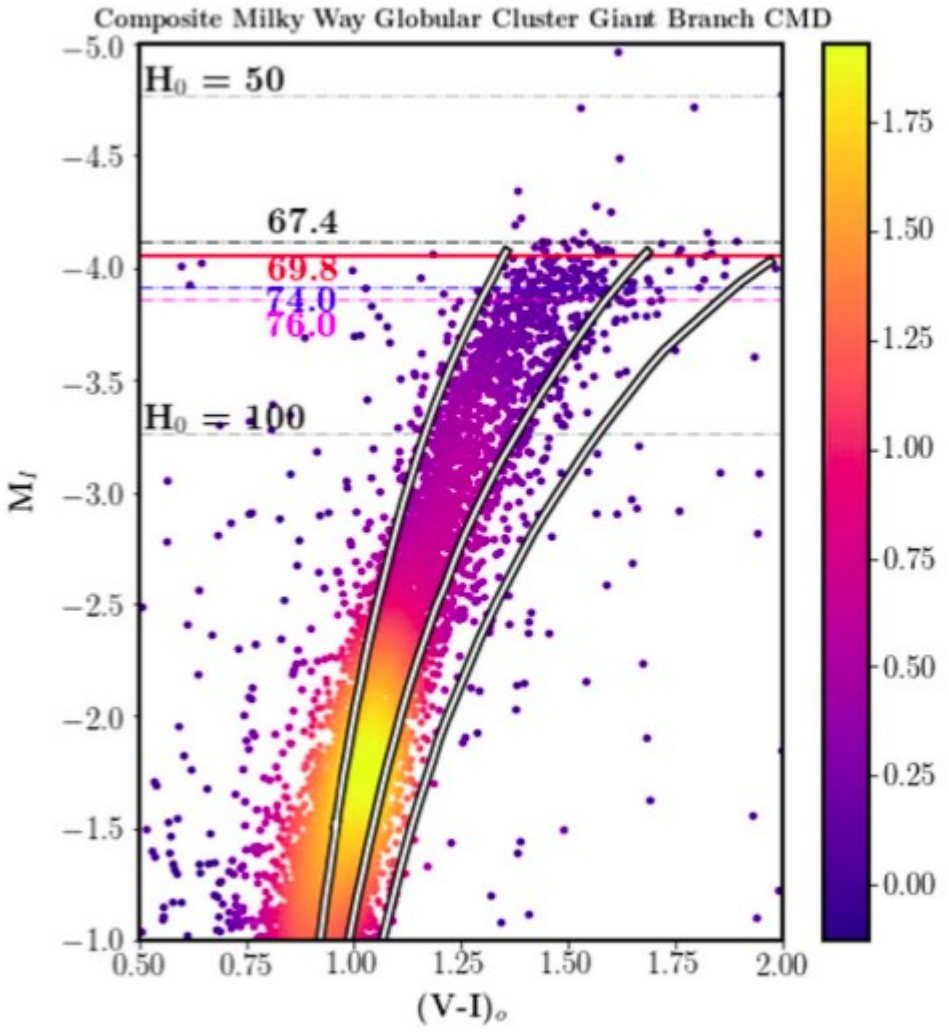


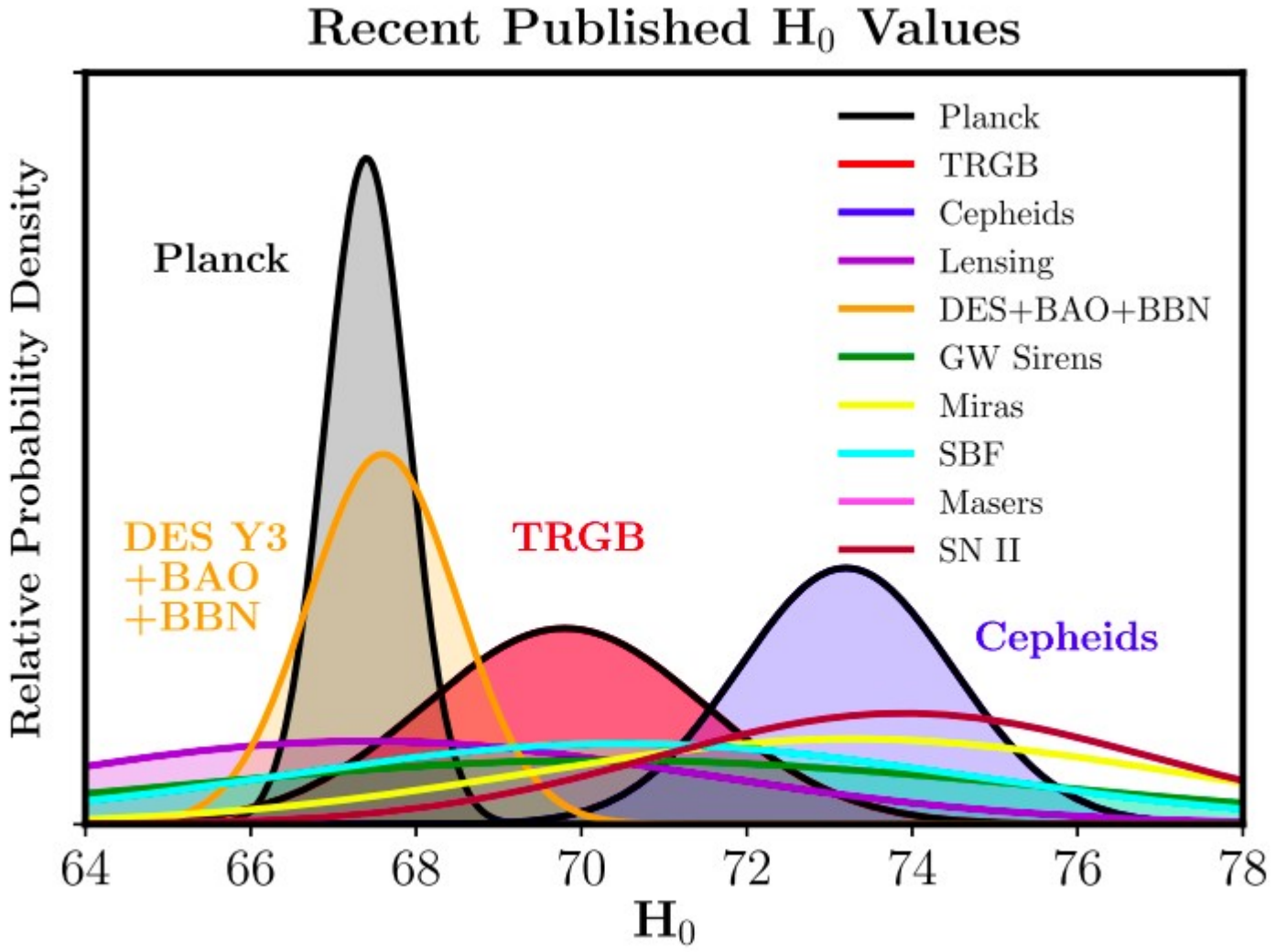
Figure 2. The I vs. $(V-I)$ CMDs for four LMC globular clusters based on HST/ACS data from Olsen et al. (1998). The blue and red fiducial horizontal branches defined by Cerny et al. (2020) are shown. The positions of the tip and 1σ uncertainties are illustrated by the solid and dashed horizontal lines at the top of the figure.



Credit: Freedman+2021, ApJ, 919

Выводы

- Звезды вблизи TRGB – переменные. Можно воспользоваться этим фактом и найти пик более точно (14.491±0.010)
- (TRGB LMC) MF814W,syn= −3.986 ± 0.011 (stat)±0.028 (syst)
- H0=71.8 ± 1.5 km s−1 Mpc−1


Recent Published H_0 Values
Relative Probability Density
Planck
DES Y3
+BAO
+BBN
TRGB
Cepheids
Planck
TRGB
Cepheids
Lensing
DES+BAO+BBN
GW Sirens
Miras
SBF
Masers
SN II
64
66
68
70
72
74
76
78
H_0

Основные проблемы

- Учет покраснения
- Однородность выборки