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Cosmological models, observational data and tension in Hubble constant

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Abstract. We analyze how predictions of cosmological models depend on a choice of described observational data, restrictions on flatness, and how this choice can alleviate the H_0 tension. These effects are demonstrated in the wCDM model in comparison with the standard ΛCDM model. We describe the Pantheon sample observations of Type Ia supernovae, 31 Hubble parameter data points $H(z)$ from cosmic chronometers, the extended sample with 57 $H(z)$ data points and observational manifestations of cosmic microwave background radiation (CMB). For the wCDM and ΛCDM models in the flat case and with spatial curvature, we calculate χ^2 functions for all observed data in different combinations, estimate optimal values of model parameters and their expected intervals. For both considered models the results essentially depend on a choice of data sets. In particular, for the wCDM model with $H(z)$ data, supernovae and CMB the 1σ estimations may vary from $H_0 = 67.52^{+0.96}_{-0.95}$ km /(s·Mpc) (for all $N_H = 57$ Hubble parameter data points) up to $H_0 = 70.87^{+1.63}_{-1.62}$ km /(s·Mpc) for the flat case ($k = 0$) and $N_H = 31$. These results might be a hint how to alleviate the problem of H_0 tension: different estimates of the Hubble constant may be connected with filters and a choice of observational data.

Keywords: cosmological model, Type Ia supernovae, Hubble parameter, Hubble constant tension
MSC numbers: 83F05,83B05

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