Contribution ID: **19** Type: **Talk in a parallel session**

Underestimation of Hubble constant error bars: a historical analysis

Friday, 12 July 2024 17:00 (20 minutes)

The aim of this analysis of a historical compilation of Hubble-Lemaître constant (H0) values in the standard cosmological model is to determine whether or not the stated error bars truly represent the dispersion of values given. For this analysis, a chi-squared test was executed on a compiled list of past measurements. It was found through statistical analyses of the data (163 data points measured between 1976 and 2019), that the chi^2 values (between 480.1 and 575.7) have an associated probability that is very low: Q = 1.8E-33 for a linear fit of the data vs. epoch of measurement and Q = 1.0E-47 for the weighted average of the data. This means that either the statistical error bars associated with the observed parameter measurements have been underestimated or the systematic errors were not properly taken into account in at least 15-20% of the measurements.

The fact that the underestimation of error bars for H0 is so common might explains the apparent 4.4-sigma discrepancy formally known today as the Hubble tension. Here we have carried out a recalibration of the probabilities with the present sample of measurements and we find that x-sigmas deviation is indeed equivalent in a normal distribution to the x_eq.sigmas deviation, where x_eq. =0.83x^0.62. Hence, the tension of 4.4-sigma, estimated between the local Cepheid-supernova distance ladder and cosmic microwave background (CMB) data, is indeed a 2.1-sigma tension in equivalent terms of a normal distribution, with an associated probability P(> x_eq.) = 0.036 (1 in 28). This can be increased to an equivalent tension of 2.5-sigma in the worst cases of claimed 6-sigma tension, which may in any case happen as a random statistical fluctuation.

Primary author: LÓPEZ CORREDOIRA, Martín (Instituto de Astrofísica de Canarias)

Presenter: LÓPEZ CORREDOIRA, Martín (Instituto de Astrofísica de Canarias)

Session Classification: Current status of the H_0 and growth tensions: theoretical models and model-independent constraints

Track Classification: Cosmic Microwave Background, Cosmological Tensions (CM): Current Status of the H_0 and growth tensions: theoretical models and model-independent constraints