



Contribution ID: 285

Type: **Poster**

Uniformity of the Cosmic Microwave Background as a non-inflationary geometrical effect

Saturday 5 December 2015 17:55 (3 minutes)

The conventional LCDM cosmological model supplemented by the inflation concept describes the Universe very well. However, there are still a few concerns: new Planck data impose constraints on the shape of the inflation potential, which exclude a lot of inflationary models; dark matter is not detected directly, and dark energy is not understood theoretically on a satisfactory level. We investigate an alternative cosmological model with spherical spatial geometry and an additional perfect fluid with the constant parameter $-1/3$ in the linear equation of state. It is demonstrated explicitly that in the framework of such a model it is possible to satisfy the supernovae data at the same level of accuracy as within the LCDM model and at the same time suppose that the observed cosmic microwave background (CMB) radiation originates from a very limited space region. This is ensured by introducing an additional condition of light propagation between the antipodal points during the age of the Universe. Consequently, the CMB uniformity can be explained without the inflation scenario. The corresponding drawbacks of the model with respect to its comparison with the CMB data will be discussed.

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Session Classification: 08 - Cosmic microwave background