



Contribution ID: 3

Type: **Talk**

The m-z relation for type Ia supernovae, locally inhomogeneous cosmological models, and the nature of dark matter

Saturday, 5 December 2015 15:19 (26 minutes)

The magnitude-distance relation for type Ia supernovae is one of the key pieces of evidence supporting the cosmological “concordance model”. The resulting constraints on the cosmological parameters are often derived under the idealized assumption that the universe is perfectly homogeneous (at least as far as light propagation is concerned). However, we know that the universe is not homogeneous on small scales, and we know that such local inhomogeneities affect light propagation and hence distances which depend on angles, such as the luminosity distance. What does this mean for constraints on cosmological parameters derived from the magnitude-distance relation for type Ia supernovae? And, conversely, what does the fact that these constraints, when locally homogeneity is assumed, agree with other constraints mean for the nature of dark matter?

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Session Classification: 04 - Dark energy