



Contribution ID: 128

Type: **not specified**

## Post-Newtonian Cosmological Modelling

*Friday, 11 September 2015 15:00 (20 minutes)*

We construct a framework to probe the effect of non-linear structure formation on the large-scale expansion of the universe. We take a bottom-up approach to cosmological modelling by splitting up our universe into cells. The matter content within each cell is described by the post-Newtonian formalism. We assume that most of the cell is in the vicinity of weak gravitational fields, so that it can be described using a perturbed Minkowski metric. Our cells are patched together using the Israel junction conditions. We impose reflection symmetry across the boundary of these cells. This allows us to calculate the equation of motion for the boundary of the cell and, hence, the expansion rate of the universe. At Newtonian order, we recover the standard Friedmann-like equations. At post-Newtonian orders, we obtain a correction to the large-scale expansion of the universe. Our framework does not depend on the ambiguous process of averaging in cosmology.

### Summary

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**Session Classification:** CMB, LSS and cosmological parameters