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Why we need to care about unobservable modes

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In the coming decades, large observational efforts will allow us to map the distribution of the large scale structure in the evolved Universe, a.k.a. the cosmic web. The major purpose of these efforts is to extract the cosmological information present in the observed density fluctuations. However, from observations of the Cosmic Microwave Background, we know that there are also fluctuations on ultra-large scales, scales larger than these future surveys. In this talk, I will discuss the impact of these modes. They effectively renormalise the mean matter density and are essentially unobservables, however they contribute to increasing the statistical cosmic variance by their non-linear coupling to observed modes. This increase of uncertainties is called super-sample covariance and has been the subject of intense research since the 2010s. While not giving a comprehensive review of the field, I will present my contribution to it in historical order and showcase the expected impact for the coming European galaxy survey Euclid.

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