Contribution ID: **45**   Type: **Flash talk**

Dealing with systematic effects: the issue of robustness to model misspecification

Tuesday, November 28, 2023 3:36 PM (3 minutes)

Model misspecification is a long-standing problem for Bayesian inference: when the model differs from the actual data-generating process, posteriors tend to be biased and/or overly concentrated. This issue is particularly critical for cosmological data analysis in the presence of systematic effects. I will briefly review state-of-the-art approaches based on an explicit field-level likelihood, which sample known foregrounds and automatically report unknown data contaminations. I will then present recent methodological advances in the implicit likelihood approach, with arbitrarily complex forward models of galaxy surveys where all relevant statistics can be determined from numerical simulations. The method (Simulator Expansion for Likelihood-Free Inference, SELFI) allows to push analyses further into the non-linear regime than state-of-the-art backward modelling techniques. Importantly, it allows a check for model misspecification at the level of the initial matter power spectrum before final inference of cosmological parameters. I will present an application to a Euclid-like configuration.

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Session Classification: Contributed talks

Track Classification: Paris