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Discussions

Interactive comment on "Notably improved inversion of Differential Mobility Particle Sizer data obtained under conditions of fluctuating particle number concentrations" *by* B. Mølgaard et al.

Anonymous Referee #3

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The authors propose a model for inversion of Differential Mobility Particle Sizer data, where Gaussian process prior is used to include smoothness assumption of the particle number size distribution. This is quite sensible approach as GPs are flexible way to present such assumptions and accurate approximative inference is usually feasible.

The covariance function along the particle size follows the Matern covariance function with 5/2 degrees of freedom and the covariance function along the time domain is exponential. There is no explanation why these specific covariance functions were selected, but I assume that the choice includes use of prior information and some model assessment?

The priors for GP covariance function parameters are almost as recommended in Gelman (2006) and Vanhatalo et al (2013). Gelman (2006) recommend priors to be defined on sigma not sigma^2. Reason for defining here the prior on sigma^2 instead of sigma is not explained, but I assume that the posterior is not sensitive to this choice?

The approximative posterior inference is made using common Laplace approximation with also previously used stabilized Newton method to handle the non-log-concave likelihood. This approach provides fast computation and the methods have been successfully used before and they seem to produce good results here, too.

The hyperparameter inference is based on type II MAP estimate. It is not mentioned whether the results are insensitive to not integrating over the hyperparameters, but taking into account the small number of hyperparameters compared to the amount f data it is likely that type II MAP estimate is sufficiently accurate.

Overall the model and computation is described with sufficient accuracy and the included code makes it possible to replicate the experiments. There were couple issues the authors could clarify: 1) how they decided which covariance functions were used, 2) why prior on sigma^2 instead of prior on sigma as recommend in the previous literature, and 3) the sensitivity to using type II MAP.