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Interactive comment on "Efficient multi-scale Gaussian process regression for massive remote sensing data with satGP v0.1" *by* Jouni Susiluoto et al.

Anonymous Referee #2

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Review of "Efficient multi-scale Gaussian process regression for massive remote sensing data with satGP v0.1"

by Jouni Susiluoto, Alessio Spantini, Heikki Haario, and Youssef Marzouk

The manuscript considers the important and challenging problem of modelling global CO_2 satellite data with Gaussian processes. The problem is computationally extremely difficult, especially as the authors utilise laptop-based solutions instead of running the model on supercomputing facilities. The authors set a consistent probabilistic framework within Bayesian statistical estimation theory, and fully describe their model. The key features of the benefits include: computationally fast (C/LAPACK/BLAS), spa-

tiotemporal multiscale kernels, spatial dependence of the mean function estimated as a Gaussian Markov random field, can do large-scale observations and marginals (e.g. 10^8), covariance localisation, methods to estimate mean and covariance function parameters.

In general, solving general spatial statistics problems with Gaussian processes, one gets means, uncertainties, and realisations of GPs. Paper contributes for space-dependent mean function estimation, multiscale kernel for many spatial scales, data-driven covariance parameter estimation, and the final result is computation of a posteriori distributions for OCO-2 datasets.

The manuscript is timely, well-written and makes a significant contribution to GPs and geophysics. Hence, the paper should be published without any delays.

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