Model parameter estimation with data assimilation and MCMC in small and large scale models

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Climate models in general, have non-linear responses to changing environmental forcing. Many of the participating processes contain, partly for computational reasons, simplifications, that is, parametrizations of physical phenomena. Due to lack of complete information and thus mismatch between model world and the real world, the parametrizations are not measurable, but rather approximations of
some abstract simplified processes' properties. Hence they cannot be tuned directly with observations.

We investigate how MCMC using an objective function constructed from the extended kalman filter helps us gain understanding to what the studied parameter posterior PDFs look like. This is done at different levels: using Lorenz96 model as a testbed and then exporting the methods to a full-blown climate model ECHAM5. Additionally, the limitations of the method are discussed.