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Geoscientific Model Development Discussions

Interactive comment on "The Subgrid Importance Latin Hypercube Sampler (SILHS): a multivariate subcolumn generator" *by* V. E. Larson and D. P. Schanen

Anonymous Referee #3

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This is a very good paper on a topic of importance for Large Scale Models (LSMs), namely the treatment of cloud subgrid variability and associated processes involving cloud variables. The emergence of subgrid column generators in recent years has changed our thinking on cloud parameterizations, and having more options to generate distributions of cloud-related variates within the gridcells of LSMs can only have positive outcomes in the future, even if currently practical roadblocks remain for a full operational implementation. The paper is quite clearly written and well-structured, and I have no hesitation whatsoever to recommend its publication.

Comments:

– A subcolumn generator algorithm curiously not mentioned is that of Norris et al (QJRMS, 2009) based on copulas. I think that for the sake of completeness this paper should be mentioned in the literature overview part of the paper.

– Speaking of missing references, on the topic of geographically varying cloud overlap decorrelation lengths, Oreopoulos et al. (ACP, 2012) should be added when Shonk et al. is mentioned. This paper also parameterized cloud condensate vertical (rank) correlations which may be relevant to the discussion here.

– I'm actually somewhat puzzled by the overlap discussion. All terminology and literature review quoted come from cloud fraction overlap, yet what is being vertically correlated here are cloud properties. It's not the same. All previous work on vertical correlations other than cloud fraction was about cloud water and the quantity of relevance was rank correlation rather than linear correlation of the condensate values themselves. Please comment.

– Is there any reason why thin lines as in Fig. 5-8 cannot also be used for Figs. 1-4 instead of thick lines/symbols? The orange symbols (reference) can hardly be seen in some of the plots.

– How does the computational cost of SILHS (cf. Table 1) scale with the number of sample points?

– Please clarify, does the implementation of SILHS resulting in Figs. 5-8 forego one of the its essential characteristics, i.e., importance sampling? That's what the reference to "equal weighting" means to me.

– Perhaps I'd have known if I was up to date with all previous paper by the first author referenced herein, but can you please explain what the importance of liquid clouds is? Why can't all this be generalized to comprise ice clouds as well?

– What's the nature of SILHS noise? Is it random? What's going to happen if averaging is performed over many realizations of the experiments shown? Convergence to

the analytic solution? In a GCM implementation, will spatial averaging help the performance of the scheme?

Interactive comment on Geosci. Model Dev. Discuss., 6, 2137, 2013.