Review of: "Annealed Stein Variational Gradient Descent for Improved Uncertainty Estimation in Full-Waveform Inversion"

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Potential competing interests: No potential competing interests to declare.

This paper presents a novel application of Annealed Stein Variational Gradient Descent (ASVGD) for uncertainty quantification in Full-Waveform Inversion (FWI), addressing limitations of traditional methods. The introduction of annealing to mitigate mode collapse and variance collapse in SVGD is particularly creative, and numerical experiments on the Marmousi model effectively highlight the potential of ASVGD. ASVGD distinguishes between the exploration and exploitation phases through annealing, optimizing particle interactions to achieve higher SNR and lower data misfit compared to standard SVGD.

Overall, ASVGD represents an innovative approach to addressing uncertainty quantification challenges in FWI, offering significant improvements over existing methods. The experimental results underscore the potential of the proposed method, and this study marks an important contribution to the field of FWI.