

# Corrections to “An Efficient Preconditioner for 3D Finite Difference Modeling of the Electromagnetic Diffusion Process in the Frequency Domain”

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**Abstract**—A label of an equation in the FOUR-COLOR CELLBLOCK GAUSS-SEIDEL PRECONDITIONER section of the title article contains a writing mistake, so we are modifying it by: 1) changing “violation of (8)” to “violation of (6)” and 2) changing “free condition in (8)” to “free condition in (6).” This error does not affect the text or results presented in the article.

**Index Terms**—Electromagnetic theory, numerical experiments and analysis, preconditioner, staggered finite-difference magnetotellurics.

In [1], the first paragraph of Section IV, “Four-Color Cellblock Gauss - Seidel Preconditioner” must be replaced with the following: The point (lexicographic) GS algorithm, updating one edge each time [as shown in Fig. 2(a)], is commonly used as an efficient preconditioner for Krylov subspace methods. However, for the diffusion forward modeling problem based on (1) at low frequencies, the violation of (6) makes the point GS algorithm converge inefficiently [44]. This can be improved by the application of the alternative cellblock

GS algorithm. In the cellblock GS algorithm, six edges [red arrows in Fig. 2(b)] attached to one particular node, forming a local linear system, are updated simultaneously, with their 24 surrounding boundary edges [blue arrows in Fig. 2(b)], and each node [e.g., red node in Fig. 2(b)] is coupled with 16 surrounding nodes [e.g., black nodes in Fig. 2(b)]. The divergence free condition in (6) is satisfied for each such local system, since we exactly solve the curl–curl equations for the six-edge system. This process is typically continued in the lexicographic order for all grid nodes.

## REFERENCES

- [1] J. Li, J. Liu, G. D. Egbert, R. Liu, R. Guo, and K. Pan, “An efficient preconditioner for 3-D finite difference modeling of the electromagnetic diffusion process in the frequency domain,” *IEEE Trans. Geosci. Remote Sens.*, to be published. doi: [10.1109/TGRS.2019.2937742](https://doi.org/10.1109/TGRS.2019.2937742).

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